Course Libraries 2022/23

Courses A – C

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: MSc in Advanced Air Mobility Systems

1. What is the course?

Course information

Course Title	MSc in Advanced Air Mobility Systems
Course code	MSAASFTC, MSAASPTC, PDAASFTC, PDAASPTC, PCAASFTC, PCAASPTC
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University campus
School(s)	School of Aerospace, Transport and Manufacturing (SATM)
Theme	Aerospace
Centre	Centre for Autonomous and Cyberphysical Systems
Course Director	Dr Yan Xu
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	Not Applicable
Is the Degree apprenticeship integrated or non-integrated?	Not Applicable
Is the Mastership offered as an open and/or closed course?	Not Applicable
Teaching Institution	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Admissions body	Cranfield University
Entry requirements	Standard University Entry Requirements
UK Qualifications Framework Level	QAA FHEQ level 7
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc: 1year; Part-time MSc: up to 3 years
Course Start Month(s)	October

Institutions delivering the course

This course is delivered by Centre for Autonomous and Cyberphysical Systems where the research interests include:

Unmanned Aircraft Systems (UAS) Traffic Management
Air Traffic Management (ATM)
Connected systems
Communications, Navigation and Surveillance sensors in support to ATM and UTM
Autonomous and Intelligent Systems
Systems Engineering and Integration
Sensor Fusion

Cranfield University interacts with the following institutions and in the following ways:

The Industrial Advisory Board (IAB) will be shared with the Applied Artificial Intelligence (AAI) MSc IAB in the first year and as the student cohorts grow in numbers it is expected that the Advanced Air Mobility MSc will have its own IAB. There are already members of the AAI MSc that would be ideal to also be part of the AAM IAB, such as: BAE Systems, Boeing, NATS, Inmarsat, ANRA Technologies, QinetiQ, Airbus D&S, Thales, Aveillant, Northrop Grumman, Spirent Communications, Etihad, Leonardo and others. The board will propose suitable topic for the Individual Research Projects.

Cranfield University remains fully responsible for the quality of the delivery of the course.

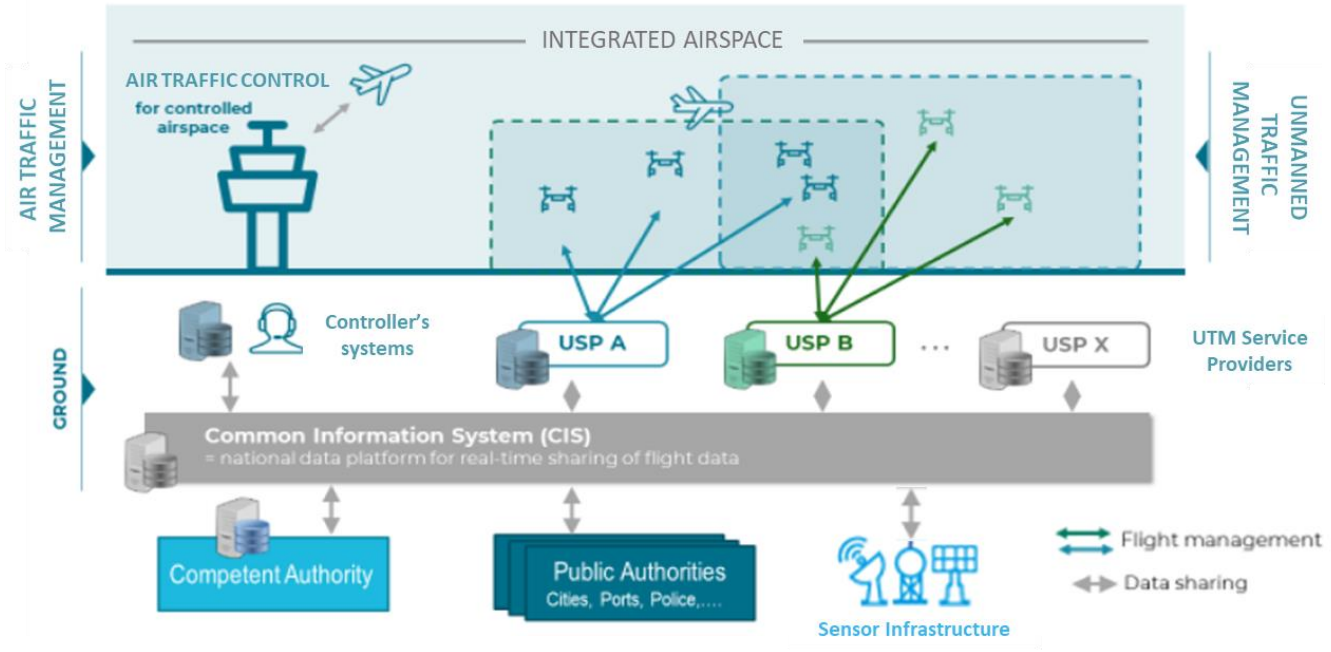
Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

Being a new course, this course is not currently accredited.

2. What are the aims of the course?

A recent study by PWC on the potential of drone applications, estimated that deploying drones in various industries will have a net impact on the UK economy of £42bn by 2030, with £16bn net cost savings from the uptake of drone technology and 76,000 drones in use across UK skies by 2030[3]. In this context, the Aerospace deal and Aviation strategy stress the importance of future highly skilled workers to support this Advanced Aviation transformation. Thus, the demand for engineers familiar with the latest aviation technologies and trends, in the field of Air Traffic Management (ATM) digitalisation, Unmanned Aircraft Systems (UAS) Traffic Management (UTM) and Urban Air Mobility (UAM) is increasing remarkably.

[3] PwC – Skies without limit, 2018.



The course aims to train engineers in the overall Systems-of-Systems architecture of the integrated ATM and UTM ecosystems, their enabling sensor infrastructure (incl. communication, navigation and surveillance) and their relevant algorithms (e.g. flight management, trajectory planning and prediction, capacity balancing, etc). The course provides an in depth understanding of the need to digitalise ATM and demonstrate the methods to increase automation and autonomy in both ATM and UTM, in order to fully unlock the potential of drone applications seamlessly in an integrated airspace. Particular attention is going to be given to real world applications (e.g. Urban Air Mobility and autonomous regional flights), so that scalability and complexity of techniques is taken into account in the design of any architecture, solution and algorithm. The engineering, regulatory, safety and ethical context will be also provided.

The course is targeted at both fresh graduates of STEM disciplines and to engineers currently working in the aviation, aerospace and autonomous sectors wishing to train in intelligent and connected air traffic systems in order to improve their career perspectives and bring benefits to their employers.

In more details, the specific aims of the course are:

- To provide the students a relevant theoretical knowledge of the ATM and UTM ecosystems, their corresponding connected sensor infrastructure (incl. communication, navigation and surveillance) and their intelligent algorithms (e.g. flight management, trajectory planning and prediction, capacity balancing, etc).
- To provide the students a formation that will allow them to apply the ATM and UTM knowledge to real world applications.
- To enable students to be able to analyse new real-world ATM and UTM problems, to critically evaluate different solutions and to create and design new automated and autonomous applications to fully unlock the potential of an seamlessly integrated airspace.
- To meet the increasing demand of "Next Generation aviation professionals " having a solid knowledge in automation, autonomy, general AI and of systems engineering.
- To support Cranfield University's mission to offer a comprehensive teaching offer in the aerospace sector.

This programme naturally lends itself to the following range of students:

- Engineers wishing to train/reskill in the area of ATM and UTM, e.g. digitalising ATM or fully unlocking the potential of drone applications.
- Aviation and aerospace professionals wishing to keep-up with the pace of technology advances in the ATM/UTM sector, and learn how automation and autonomy are transforming these sectors.
- Graduates in Engineering disciplines, Computer Science or STEM area.

Students with the above background will be expected to have the required technical knowledge to delve directly into the course.
However, it is clear that the industry would also benefit from students from social sciences, human factors and similar backgrounds, as public acceptance, ethical and regulatory matters are also major challenges in this space. Thus, students with these backgrounds are also encouraged to apply, with the understanding that they will need to expend significant additional effort to be brought up to speed with the technical background required to successfully achieve this MSc qualification. Support will be provided through facilities and services such as Linkedin Learning and a tailored personal development plan where applicable. These would of course also be available to students with technical background, that need to refresh their skills.

Successful graduates of this MSc course become conversant in key aspects of automation and autonomy within the ATM and UTM industries, which places them at an advantage in today's competitive employment market. Additionally, successful graduates of this MSc course will also be cognisant of the ethical, safety and regulatory challenges in the ATM and UTM industries, and the methods by which these matters should be considered in the design of products, solutions and services to address these markets.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate (PgCert)

In completing this course, and achieving the associated award, a diligent student should be able to:

- ILO 1. Differentiate Air Traffic Management (ATM), Unmanned Aircraft Systems (UAS) Traffic Management (UTM) architectures and systems, locate their role in the overall ecosystem and identify their appropriate applications.
- ILO 2. Appraise and contrast the different enabling communication, navigation and surveillance technologies used in ATM and UTM.
- ILO 3. Apply a range of professional design and system engineering practices to build reliable, safe and scalable ATM and UTM components and services to time, quality and budget.
- ILO 4. Formulate and manage the ethical, social and regulatory implications in the design and use of automated and autonomous systems.
- ILO 5. Synthesise and critically assess the performance of ATM and UTM system components, based on functional, safety and regulatory metrics.

B. Postgraduate Diploma (PgDip)

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

- ILO 6. Design integrated ATM and UTM architectures/solutions, debate and solve their integration into more complex systems
- ILO 7. Critically analyse and contrast complex ATM and UTM architectures/solutions performance, using appropriate technical, safety and regulatory performance metrics.
- ILO 8. Clearly formulate and communicate effectively (both orally and in writing) the main challenges of seamless ATM/UTM integration and methods to address them.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

- ILO 9. Propose and design a solution to address a significant challenge of their chosen topic area in ATM or UTM and document their thought process and methodology to achieve this.
- ILO 10. Evaluate and critique their own research findings and the ones of their peers.

4. How is the course taught?

This course is unique in that it offers a combination of subjects much sought after in the Air Traffic Management and Unmanned Traffic Management industries, that are not covered in a single MSc course anywhere else, giving particular emphasis to the digitalised integrated architecture, the enabling sensor infrastructure (incl. communication, navigation and surveillance) and intelligent algorithms, such as flight management and planning, and deconfliction. The MSc course consists of three major components – the taught modules (eight), the group design project and the individual research project. This format applies to both full-time and part-time students.

Taught modules are mainly delivered through lectures. These are complemented with laboratory, practical sessions or case studies at least on two afternoons for each module, in order to put into practice what was learnt during the lectures and thus to really consolidate the information conveyed. Lectures will be mainly delivered face-to-face for full-time students, however some of the lectures may be delivered by online means. For part-time student, lectures will be delivered both face-to-face and remotely to meet the needs of the students. For example, remote delivery may be prioritised to accommodate schedules of specific cohorts of part-time students. Specific group exercises where remote break-out rooms can facilitate interaction and learning methods, remote delivery will be preferred for both part-time and full-time students. Lectures, practical and lab sessions will be supported by interactive tools (e.g. polls, Q&As, quizzes etc) such as Socrative, padlet and others.

It is encouraged wherever possible that students (particularly full-time ones) attend classes on campus, to be able to take advantage of all the facilities, infrastructure and services that the University makes available to them, to make the most of the student experience.

A group design project activity will take place in order to enable students to work as part of a team, develop project design planning and management skills, and communications abilities. An academic supervisor will be overseeing each group and progress meetings will be planned to support the project development and provide feedback before final submission of the group report and associated presentation.

At the end of taught modules, students will select an individual research project (IRP), that would have been suggested by members of the Industrial Advisory Board. The real-world relevance of the IRP topics is another unique feature of the MSc course and can be another effective differentiator in the job market. The IRP provide an opportunity for the students to get familiarised with a specific company and could pave the way for a potential job application to that company. Examples of previous IRPs have included the following subjects:

- Use of Artificial Intelligence in the management of Unmanned Aircraft Systems (UAS) operation
- Detect and Avoid Configuration Influence in Heterogenous Unmanned Air Vehicle Airspace (U-Space)
- Radar discrimination of small airborne target through optimal trajectory pattern matching
- Modelling of Unmanned Traffic Management (UTM) Architectures
- Multi-modal surveillance system for UTM
- Characterising counter UAS performance and formalising mitigation strategies
- Airline big data compression and reconstruction framework
- Adaptive or Demand based Air Traffic Management

Throughout the course, the students will be supported by the Cranfield Virtual Learning Environment (CANVAS), which will provide online content, details of modules, coursework and reading material. CANVAS will be the main portal for communicating administrative, logistical and module specific information to the students.

Finally, from the outset the students will be encouraged to make use of the University's learning and development resources (e.g. Linkedin Learning amongst others) for their personal development and to

support them throughout the MSc course (e.g. follow webinars on how to write a literature review, on effective time management, presentation skills etc)

Students will be supported in their learning and personal development by:

- the School Student and Academic (SAS) Lead - first point of contact for anything course/study related;
- the Course Director and Module leads – point of contact for specific module queries, assessment and project work;
- Student Advice Centre – independent department where to seek information, advice or support whenever students need it, particularly to help work through any difficulties no matter how big or small they may seem. The Advice Centre provides an integrated, professional, student-centred service which offers information, advice, guidance and support to enable students to develop and achieve their full potential.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction Module 2 (Introduction to Advanced Air Mobility) Module 3 (Air Traffic Management Systems) Module 9 (Unmanned Traffic Management)	0 10 10 10
ELECTIVE MODULES:	
Any other three modules from 4, 5, 6, 7, 8	30
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction Modules 2-9 Group Design Project	0 80 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Induction Modules 2-9 Group Design Project Individual Research Project	0 80 40 80
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [4]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

The MSc course consists of three major components – the taught modules (eight of 10 credits each), the group design project (40 credits) and the individual research project (80 credits).

The taught component includes eight taught compulsory modules for MSc and PgDip (3 compulsory modules for PgCert), which are generally delivered from October to March. The course begins with the fundamentals of Air Traffic Management (ATM) and communications systems, and progresses to the core

[4] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

subjects of sensor fusion, guidance and navigation, AI for autonomous systems, and Unmanned Traffic Management (UTM).

The taught modules are typically delivered over 1 week, delivered mainly through lectures which are complemented by laboratory, practical sessions or case studies depending on the module. The following week is largely free of structured teaching, so that the students are given enough reflection time for assignments and other course work.

Full-time students register for the course in October and are expected to complete the course within 11 calendar months. Full-time students go through the course as recommended in the table in Section 7 (as shown by the dates next to the abbreviation FT).

Part-time students register for the course in October and are expected to complete the course within 3 years. Part-time students go through the course as recommended in the table in Section 7 (as shown by the dates next to the abbreviation PT)

Part-time students are recommended to complete 4 modules on the first year (suggested modules are: Intro to AAM, Air Traffic Management Systems, Intelligent Cyber Physical Systems, Unmanned Air Traffic Management) and 4 modules, plus the Group Design Project on the second year (suggested modules are: Communications Systems, Sensor Fusion, AI for Autonomous Systems, Guidance and Navigation for Autonomous Systems).

It is recommended that the Sensor Fusion Module is taken before the AI for Autonomous Systems module, although if it not possible, the student should inform the Course Director for guidance on some preliminary reading that may be of benefit.

The final year is expected to be focused on the Individual Research Project.

7. Course Level Assessment Strategy[5]

The taught modules are assessed by submitted coursework, to encourage students to develop an appropriate written style. This also ensures that students are given enough time to research the subject, critically think about the topic at hand and provide a critical assessment of it. It enables students to absorb more information that will be stored in their long-term memory. Students can thus expect to have 8 pieces of assessment by submitted coursework (modules 2-9). Course work may consist of problem-solving exercises, assessment of a case study or a critical thought piece. These different types of individual coursework will allow the student to develop different but complementary analytical and written skills.

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The pre-requisite induction module will introduce the students to the course, the life on campus and some basic concepts of programming. This is an attendance-only module, hence is not going to be assessed. Modules 2-9 are introducing various practical aspects of ATM and UTM and will be assessed through essays and reports. These will be of varying lengths, recognising that writing articles to a short length can be more challenging for some and can develop different skills relevant to professional practice. The length of each assessment task will be conveyed by the module lead during module delivery and where applicable it will be stated within the module descriptor. Students will write employability relevant policy briefing documents to equip them with the skills they require to succeed in the area of ATM, UTM and UAM and to address the specific award ILOs 1-5.

A number of formative tasks including group discussion, case studies and oral presentations supports the modules 2-9 and the group design project. Formative feedback is given verbally within the classroom following discussions, via a written summary for case studies from the module leader and oral feedback

[5] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

provided by the Course Director and peers for presentations. Students will also engage with an interactive learning activity, which incorporates formative feedback.

In addition, all students undertake a group design project (GDP), that is assessed by an individual presentation and group report, as well as a reflective piece on their contribution to the project, as well as the ones of the team members. This provides the opportunity to the students to develop their communication skills and their ability to work effectively in groups. Students are expected to design, implement, validate and test an advanced air mobility system component, applying the knowledge acquired in the taught modules and integrate the various concepts learnt. The GDP aims at providing the students with the experience of working on a collaborative engineering project, satisfying the requirements of a potential customer and respecting deadlines. These activities will address ILOs 6-8.

Finally, following completion of the taught modules, all students will complete an individual research project (IRP) that addresses a significant challenge in advanced air mobility, providing an opportunity to implement the knowledge learnt to solve a real-life problem. The IRP will assess both their written and oral presentation skills, through a submitted thesis and oral examination. The thesis will be based on a structured programme of research and should satisfactorily demonstrate the student's ability to conduct original investigations, to test ideas (whether their own or those of others) and to obtain appropriate conclusions from the work. The course industrial advisory board proposes the topics of the IRPs. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through a pair of academic supervisors. The IRP addresses ILOs 9 and 10 and takes the form of a Thesis and a final presentation of the student to the teaching team. Finally, a further, unassessed, occasion for dissemination and receiving formative feedback is through the final poster session to which all members of the industrial advisory boards are invited.

The 3-part assessment approach (coursework, GDP and IRP) has been adopted in order to ensure that students demonstrate their understanding of the taught modules and their capability to apply the knowledge learnt in real-life applications both through working as group and through individual research.

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
1	New N-AAM - IDW-	Induction	Dr Yan XU	12	0	0	N	28/09 /2022	28/09/ 2022	30/09/ 2022	N/A	AO					N/A	N/A
2	New N-AAM - IAAM	Introduction to Advanced Air Mobility	Dr Yan XU	28	0	10	N	03/10 /2022	03/10/ 2022	07/10/ 2022	50%	ICW	100%				FT 04/11/2022 PT 18/11/202 2	March 2023

[6] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[7] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[8] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[9] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education.
[10] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[11] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[12] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers [7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
3	New N-AAM-ATM	Air Traffic Management Systems	Dr Yan XU	28	0	10	N	17/10/2022	17/10/2022	21/10/2022	50%	ICW	100%				FT 18/11/2022 PT 02/12/2022	March 2023
4	New N-AAM-CS	Communications Systems	Dr Saba Al-Rubaye	28	0	10	N	31/10/2022	31/10/2022	04/11/2022	50%	ICW	100%				FT 02/12/2022 PT 16/12/2022	March 2023
5	N-AVC-SF	Sensor Fusion	Prof Hyo-Sang shin	28	0	10	Y	21/11/2022	21/11/2022	30/11/2022	50%	ICW	100%				FT 06/01/2023 PT 20/01/2023	Next Available date
6	N-AAI-ICPS	Intelligent Cyber Physical Systems	Dr Saba Al-Rubaye	28	0	10	Y	01/12/2022	01/12/2022	09/12/2022	50%	ICW	100%				FT 23/01/2023 PT 06/02/2023	May 2023
7	N-AVC-AIAS	Artificial Intelligence for Autonomous Systems	Dr Ivan Petrunin	28	0	10	Y	04/01/2023	04/01/2023	10/01/2022	50%	ICW	100%				FT 03/02/2023 PT 17/02/2023	Next available date

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers [7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
8	N-AVC-GNS	Guidance and Navigation for UAS	Dr Hyo-Sang Shin	28	0	10	Y	16/01/2023	16/01/2023	24/01/2023	50%	ICW	100%				FT 17/02/2023 PT 03/03/2023	Next available date
9	New N-AAM-UTM	Uncrewed Traffic Management	Dr Yan XU	28	0	10	N	30/01/2023	30/01/2023	03/02/2023	50%	ICW	100%				FT 03/03/2023 PT 20/03/2023	May 2023
10	New N-AAM-GDP	Group Design Project	Dr Yan XU	50	0	40	N	12/01/2023	12/01/2023	14/04/2023	50% 50% 50%	RP IPRES GCW	25% 25% 50%				FT 14/04/2023 PT 28/04/2023	At the next available opportunity which may not be until the course runs the following year
11	New N-AAM-IRP	Individual Research Project	Prof Antonios Tsourdos	20	0	80	N	17/04/2023	17/04/2023	20/08/2023	50% 50%	THESIS OR	80% 20%				18/08/2023 29/08/2023	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-AVC-SF	Sensor Fusion	Autonomous Vehicles Dynamics and Control	Advanced Air Mobility Systems, Defence and Security Programme
N-AAI-ICPS	Intelligent Cyber Physical Systems	Applied Artificial Intelligence	Advanced Air Mobility Systems, Defence and Security Programme
N-AVC-AIAS	Artificial Intelligence for Autonomous Systems	Autonomous Vehicles Dynamics and Control	Advanced Air Mobility Systems, Defence and Security Programme
N-AVC-GNS	Guidance and Navigation for Autonomous Systems	Autonomous Vehicles Dynamics and Control	Advanced Air Mobility Systems, Defence and Security Programme

8. How are the ILOs assessed?

The following assessment types are utilised:

Individual Coursework assignment, Group Design Projects and Individual Research Projects.

This approach has been adopted because:

MSc-level assessment of Intended Learning outcomes (ILOs) in the area of Engineering requires the students to exhibit a deep knowledge and comprehension of the topic, but also the capability of the students to synthesise and evaluate complex strategies for problem solving. Thus, in many practical engineering subjects this can be readily done relying on individual coursework assignments that are based upon realistic applications and problems.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate (PgCErt)

Award ILOs / **Module No.**	**ILO 1**	**ILO 2**	**ILO 3**	**ILO 4**	**ILO 5**
2 IAAM			ICW	ICW	
3 ATM	ICW		ICW	ICW	ICW
4 CS	ICW	ICW			ICW
5 SF		ICW	ICW		ICW
6 ICPS		ICW	ICW		
7 AIAS	ICW		ICW		
8 GNC		ICW			ICW
9 UTM	ICW		ICW	ICW	ICW

B. Postgraduate Diploma (PgDip)

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 6	ILO 7	ILO8
2 IAAM			
3 ATM	ICW	ICW	
4 CS			
5 SF			
6 ICPS			
7 AIAS			
8 GNC			
9 UTM	ICW	ICW	
10 GDP	RP IPRES GCW	RP IPRES GCW	RP IPRES GCW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 9	ILO10
2 IAAM		
3 ATM		
4 CS		
5 SF		
6 ICPS		
7 AIAS		
8 GNC		
9 UTM		
10 GDP	GCW IPRES	GCW IPRES
11 IRP	THESIS OR	THESIS OR

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as

a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The Advanced Air Mobility Systems MSc course is designed both for improving the graduates' attractiveness to the market, broaden their career options and being more valuable resources if they are currently employed and attend the course as part of an apprenticeship program. Graduates would be able to get into ATM and UTM related jobs, as for example Airports, Air Navigation Service Providers, Air Traffic Control Engineering, Original Equipment Manufacturers of radar, communication and navigation systems (e.g. SAAB, Thales, Boeing, Airbus etc), regulatory authorities (e.g. Civil Aviation Authority); established or new companies that would use drone operations in their business, or want to develop that capability, and would manage it in-house (e.g. end users such Network Rail, Energy companies etc), UTM service providers (e.g. Altitude Angel, ANRA, Airmap, Unifly etc); startups offering new systems or services as mentioned in the next box, such as Vertical Aerospace, Neuron, Flock, and Skyports; engineering consultancies dealing with ATM, UTM or UAM (e.g. Atkins, ARUP, Amey).

Upon completion of the course, graduates will be exposed to the following opportunities:

- Research Degree (PhD);
- Direct employment or graduate schemes in a number of industries: Aerospace, Defence, Air Transport, Aviation, Air Traffic Management, Unmanned Traffic Management, Regulatory and Public Sector related to drones.
- As possible career path, various roles are available: Air Traffic Engineer, Airport Engineer, Air Traffic Management Specialist, Unmanned Traffic Management Engineer, Air Traffic Regulator, Air Traffic Policy Lead, Systems Engineer.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: 18/03/22

1. What is the course?

Course information

Course Title	Advanced Chemical Engineering
Course code	MSACGFTC, MSACGPTC, PDACGFTC, PDACGPTC, PCACGFTC, PCACGPTC
Academic Year	2022/23
Valid entry routes	PgCert, PgDip, MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield
School(s)	School of Water, Energy & Environment
Theme	Energy & Power
Centre	Centre for Climate and Environmental Protection
Course Director	Dr Ali Nabavi
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No
Is the Mastership offered as an open and/or closed course?	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	Full-time MSc - one year, part-time MSc - up to three years Full-time PgDip – one year, part-time PgDip – up to two years Full-time PgCert – one year, part-time PgCert – up to two years
Course Start Month(s)	October

Institutions delivering the course

This course is delivered by Centre for Climate and Environmental Protection where the research interests include:

- Energy Markets & Policy, Future Energy System
- Biofuels Processes & Technologies
- Thermodynamics in Bio-process Systems
- Biomass and Energy Conversion Technology
- Process and Energy Systems Design, Simulation and Optimisation
- Downstream process: Product Separation and Product Recovery
- Process Control
- Environmental Protection & Management
- Bioprocess Engineering
- Thermal management and energy storage
- Decarbonisation of power, industry and transport sectors.
- Carbon capture utilisation and storage

Hydrogen, biomethane, ammonia, and sustainable fuel production
Cranfield University interacts with the following institutions and in the following ways:

- Seek support from industry for students to have professional experiences through group project.
- Seek industrial support for sponsoring MSc Thesis projects.
- Associated industrial advisory committee. The industrial advisory committee will meet on a yearly basis to help in steering the course content.
- Develop double degree relationships with European academic institutions.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

The course is accredited by the Energy Institute until August 2025.

2. What are the aims of the course?

Cranfield University offers this course in order to provide engineering and applied science graduates with an advanced understanding and practical experience of the methodologies employed in chemical engineering research and chemical process technology.

The aim of the course is to prepare engineering and applied science graduates to meet the increasing demand in industry, consultancies, and the education and public sectors for engineers, scientists and advisors with expertise in a range of areas. This course equips students with diversified engineering skills, which includes theoretical and practical elements in design, optimisation, and operation of a wide range of chemical processes in energy, materials, environments, biorefining, biochemicals, petrochemicals, and waste management. Graduates will acquire a unique skill set that combines a wide variety of experimental techniques; numerical modelling and simulations, including computational fluid dynamics, process simulation, and machine learning; economic, life cycle, and safety assessment; and management component, including project management, social and ethical assessment, and business development.

This programme is intended for the following range of students:

- Graduates with engineering or related applied science degrees keen to pursue a career as chemical engineering professionals.
- Graduates currently in employment keen to extend their qualifications or to pursue a career change.
- Applicants are required to have at least a UK 2nd class honours degree or its equivalent.
- Applications from candidates with lesser qualifications but with considerable relevant working experience will be considered.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Advanced Chemical Engineering

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Holistically apply advanced theory and practice to chemical production processes.

ILO 2. Combine and compare appropriate techniques and tools for the operation, design, evaluation, simulation, control and optimisation of a range of chemical processes.

ILO 3. Critically evaluate technologies and strategies for the generation and application of heat and power across a number of chemical processes and energy systems scenarios.

ILO 4. Critically evaluate and assess the current and future biorefining technologies for the sustainable production of bioenergy and biofuels based on the type of biomass used as feedstock and the targeted products.

B. Postgraduate Diploma in Advanced Chemical Engineering

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Integrate knowledge and understanding of business operation, and commercial, marketing and finance aspects in a context relevant to chemical and energy industries.

ILO 6. Integrate knowledge, understanding and skills from the taught modules in a real-life Situation.

ILO7. Effectively work in a small project team to identify project objectives and select appropriate methodologies to address problems faced by industrial clients; collaborating with other team members to communicate findings in a professional manner in written, oral and visual forms.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 8. Define a research question, develop aim(s) and objectives, select and execute a methodology, analyse data, and evaluate findings and draw appropriate conclusions.

ILO 9. To communicate their findings successfully via a thesis, written in an approved School style and in an oral presentation.

4. How is the course taught?

The teaching methods include:

- Combination of online and in class structured lectures, tutorial sessions, computer-based workshops, lab-based practices and private study;
- Personal Development Planning is explicitly and implicitly developed during the course, including topics such as communication, time-management, team work, learning strategies and project management;
- Seminars delivered by invited industrial or academic experts in some areas covered by the course;
- Visits to industrial sites;
- Knowledge and understanding are further developed and enhanced through the assignments associated with some of the taught modules, the group project activity, and the final MSc individual thesis project;
- Timely and informative feedback on the assignments are an essential part of the learning process.

In addition to the teaching methods outlined above, students will be supported in their learning and personal development by:

- A dedicated electronic Canvas site
- Workshop in MATLAB training
- 3-day laboratory training short course for students undertaking MSc research projects which involve experimental work
- Arrangement of attendance of relevant modules offered by other MSc programmes

The taught programme is generally delivered from October to December and from January to February. The seven modules are divided into 3 core modules and 4 applied modules. Research Methods for Chemical Engineering module is allocated six weeks on timetable. The remaining modules are allocated 2 weeks each on the timetable and will be delivered flexibly during this time, using a combination of online and face to face interactions. The applied modules build on and apply the material taught in the core modules and utilise more interactive teaching methods, such as workshops and practicals. The modules are assessed by individual course work.

The group project/ is taken between February and May. Each group will typically include 3-6 students and two academic supervisors will be assigned to each group.

Group Project teams are expected to hold a minimum of 5 team meetings during the project which must be minuted and all participants must sign off the minutes. The academic supervisor will attend at least two of these meetings to record attendance, to assess individual contribution, and to provide guidance as appropriate. Students undertaking the group project are required to participate in these 5 meetings. Additionally, it is expected that students will meet and work on the project outside of the formal weekly meetings. A (student) project co-ordinator will be responsible to ensure that these meetings are used to good effect, and that appropriate minutes are taken and findings reported to the academic supervisor. Part-time (and full-time) students are encouraged to use tele-conferencing, video-conferencing and web-

conferencing facilities to participate in the group project review meeting i.e. they are not always required to attend in person. This will afford students with the experience of working within a disperse project team. However, all students will be required to attend in person the initial and final project review meetings. Facilities for telephone and web-conferencing already exist in several of the available meeting rooms in Building 52 and are routinely used for research project meetings as well as MSc group project meetings within the School. Facilities for video-conferencing also exist in Building 83. Moreover, when accessing the campus is not feasible, the meetings can be held through Microsoft Teams, Zoom, and Skype.

Part time students have the option of completing a Dissertation as an alternative to the Group Project. Students opting for the Part-Time Dissertation will be assigned a supervisor by the Course Director and will agree with the supervisor an appropriate topic of study. This may be related to a workplace/industrial activity that is relevant to the student's work environment. The Dissertation will include a comprehensive literature review of classical and contemporary related material and also a discussion and properly argued conclusions. Where appropriate the Dissertation will acknowledge the work and contribution of others. The Dissertation module will be assessed in a similar way to the group project by presentation and formal report.

The individual thesis project is typically pursued between May and September. Each student is allocated an academic supervisor who will guide and assess the students work. Again, it is expected that a formal weekly review meeting will occur at which the student will provide a brief presentation on the work performed to date and record minutes and arising actions.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction	0
Advanced Reaction Kinetics for Energy	10
Separation and Purification Design	10
Research Methods for Chemical Engineering	20
ELECTIVE MODULES:	
2 modules chosen from:	
Thermal Systems Operation and Design	10
Applied Thermochemical Pilot Design	10
Bioprocess Engineering	10
Biofuels and Biorefining	10
Process Instrumentation and Control Engineering	10
TOTAL:	60

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

B. Postgraduate Diploma

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction Advanced Reaction Kinetics for Energy Separation and Purification Design Research Methods for Chemical Engineering Engineering Project Management Biofuels and Biorefining Applied Thermochemical Pilot Design Full-time students: Group Project	0 10 10 20 10 10 10 40
ELECTIVE MODULES:	
Full-time and Part-time student to choose one: Bioprocess Engineering Thermal Systems Operation and Design Process Instrumentation and Control Engineering Part-time student to choose one: Group Project Dissertation	 10 10 10 40 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Induction Advanced Reaction Kinetics for Energy Research Methods for Chemical Engineering Separation and Purification Design Biofuels and Biorefining Applied Thermochemical Pilot Design Engineering Project Management Individual Thesis project Full-time students: Group Project	0 10 20 10 10 10 10 80 40
ELECTIVE MODULES:	
Full-time and Part-time student to choose one: Bioprocess Engineering Thermal Systems Operation and Design Process Instrumentation and Control Engineering	 10 10 10

[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

Part-time student to choose one: Group Project Dissertation	40 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [5]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in October and are expected to complete the course within 12 calendar months. This course is also offered on a part-time basis. Students would instead attend the required modules of the taught component according to a schedule agreed with the course director. Part time students taking the group project would still be expected to complete the group project within the same time and with full-time students.

[5] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

Alternatively, part time students may opt to undertake an individual dissertation instead of the group project over a period of six months. MSc individual thesis projects for part time students are commonly undertaken in collaboration with the candidate's place of work.

The modules, except RMCE, are taught mainly over two weeks, with the assignment completed during that period. The first week is mainly allocated to structured teaching, with the following week largely free of structured teaching to allow time for more independent learning and reflection, and completion of assignments. Research Methods for Chemical Engineering module is delivered over six weeks, with week 1, 3, and 5 mostly allocated to structured teaching, and week 2, 4, and 6 mainly allocated for more independent learning.

7. Course Level Assessment Strategy[6]

Taught modules: The thought modules are designed to deliver a high-quality academic experience and enable students' achievements to be assessed reliably and aligned with module and course levels' ILOs. For every module, the full details of the assessment, including the purpose, requirements, and expected standards are clearly specified and provided to students. Assessments are developed to provide equal opportunities for all students. The quality of every assessment, against module ILOs, is critically reviewed internally and externally. The module assessments are reviewed annually to identify and implement any potential improvements.

The assessment criteria for core modules are designed to ensure students can utilise acquired engineering and analytical tools (i.e. computational fluid dynamics, life cycle assessment, and techno-economic analysis) and advanced knowledge to design, develop, and evaluate chemical products and processes. For applied modules, students are expected to demonstrate their capability to engage with a range of real-world applications. Therefore, the assessments are designed with a developmental purpose to ensure sufficient feedback on students' performance is provided throughout the process.

Summative assessments are based on Individual coursework (ICW) and individual presentation (IPRES). The ICW and IPRES are designed based on short and extended reports and presentation to simulate different scenarios of professional practices in workplaces. The summative feedback on students' works is provided within 20 working days after the submission, in the form of specific and general comments via the VLE. On the other hand, formative feedback is provided throughout the lectures; practical, tutorial and Q&A sessions; and experimental- and simulation-based laboratories to ensure students are able to identify their strengths and limitations, and how to improve their performance.

Group Project: The group project provides the students with the opportunity to gain professional skills expected of the workplace. In addition to technical skill practice, students develop a range of soft skills such as team working, problem solving, communication skills and reflective practice. The students work in small consultancy teams typically on a client sponsored project for a period of 10 weeks. Many teams will be made up of students from different courses giving the students the opportunity of working in an interdisciplinary team. The students are responsible for interpreting the brief, developing a project plan, selecting and implementing a methodology, deriving results, analysing the results and drawing conclusions in alignment with the aims and objectives. All students participate in a peer review activity providing them with the opportunity to reflect on the practices of their colleagues as well as their own. Peer review feedback is provided individually by an independent member of academic staff. A single group report is produced and the project is presented orally at the concluding Exhibition Day, both elements are summatively assessed by independent markers and a group mark is assigned for element. Individual assessment is derived from supervisor observation and meeting minute actions and an individual reflective report where the students reflect on the development of three soft skill competencies based on objectives

[6] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

that they set for themselves. The team working competency is mandatory as one of the three skills for each student.

Dissertation: Part time students are not required to complete the Group Project undertaken by the full time registered students on a SWEE MSc course. An alternative assignment takes the form of a dissertation or design project which in most situations will be based around a topic relevant to the work of the part-time student. It is evident that some aspects of the Group Project experience that the work-based dissertation replaces – for example the client interaction and group dynamics components will not directly replicated by undertaking this assignment. It is expected that these experiences would normally be a part of the normal working life of the part-time student.

It is expected that the dissertation will normally consist of the following elements: Abstract, Background context, Introduction to the theme(s) addressed within the dissertation, setting out the issues that will be covered, Methodology, In-depth analysis/discussion of the topics discussed, Concluding remarks, References, Appendices (if relevant). Two supervisors are allocated to the dissertation and supervision follows the model used for the independent research project. The student will submit a 6000 word report and will give an oral presentation of their work. Both elements of assessment will be marked by independent assessors.

Individual Research Project: The individual research project (or thesis) requires students to further develop problem definition, hypothesis setting, select and execute a methodology, analyse data, and evaluate findings and draw appropriate conclusions in the context of research questions relevant to the course followed by a student. The student is required to communicate their findings successfully via a standard thesis (Energy), and an oral presentation based around a poster. The projects are designed to integrate knowledge, the taught modules, and apply understanding and skills from the group project, to deliver a high-quality written thesis and oral presentation. The individual research project is typically delivered through collaboration with an industrial sponsor, or it may be an ‘internal’ project reflecting the research interests of the School.

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments [11](100%)	Type of Assessment	Weighting of individual elements of multi-part [12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
1	I-ENE-INWK Occ A	Induction	Patrick Verdin	24		0	Y		03/10/22	07/10/22	N/A	AO	N/A				N/A	
2	N-BPE-PCP	Advanced Reaction Kinetics for Energy	Peter Clough	30		10	N		10/10/22	21/10/22	50	ICW	100				FT 22/10/22 PT 05/11/22	05/23

[7] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[8] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[9] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[10] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education.
[11] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[12] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-tak)*n.
[13] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers [8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments [11](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
3	N-ACE-RMCE	Research Methods for Chemical Engineering	Mingming Zhu	60		20	N		24/10/22	02/12/22	50	ICW	100				FT 03/12/22 PT 17/12/22	05/23
17	N-ACE-SPD	Separation and Purification Design	Ali Nabavi	30		10	N		05/12/22	16/12/22	50	ICW	100				FT 17/12/22 PT 14/01/23	05/23
5	N-BPE-BPT	Biofuels and Biorefining	Vinod Kumar	35		10	N		09/01/23	20/01/23	50	ICW	100				FT 21/01/23 PT 04/02/23	05/23
6	N-ACE-ATPD	Applied Thermochemical Pilot Design	Stuart Wagland	40		10	N		23/01/23	03/02/23	50	ICW	100				FT 04/02/23 PT 18/02/23	05/23
7	N-BPE-BE	Bioprocess Engineering	Vinod Kumar	30		10	N		06/02/23	17/02/23	50	ICW	100				FT 18/02/23 PT 04/03/23	05/23
8	N-PSE-TSOD Occ A	Thermal Systems Operation and Design	Ali Nabavi	30		10	N		06/02/23	17/02/23	50	ICW	100				FT 18/02/23 PT 04/03/23	05/23
9	N-APE-PICE_	Process Instrumentation and Control Engineering	Liyun Lao	30		10	N		06/02/23	17/02/23	50	IPRES	100				FT 18/02/23 PT 04/03/23	05/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers [8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments [11](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
10	N-AME-EPM Occ A	Engineering Project Management	Phil Hart	20		10	Y		20/02/23	03/03/23	50	ICW	100				FT 04/03/23 PT 18/03/23	05/23
11	I-ENE-GRPP Occ A	Group Project	Patrick Verdin	16		40	Y		06/03/23	12/05/23	50 50 50 50	GCW GPRES ICW RP	64 16 10 10				05/05/23 02/05/23 12/05/23 13/05/23	TBC
12	I-ENE-DISS Occ A	Dissertation (P-T option only)	Patrick Verdin	10		40	Y		06/03/23	29/09/23	50	IPROJ IPRES	80 20				22/09/23 @ 16.00 W/C 25/09/23	09/24
13	I-ENE-THESIS Occ A	Individual Research Project	Patrick Verdin	20		80	Y		15/05/23	08/09/23	50 50	OR THESIS	10 90				w/c 28/08/23 04/09/23	TBC

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-AME-EPM	Engineering Project Management	Advanced Mechanical Engineering	• Advanced Mechanical Engineering • Advanced Chemical Engineering • Renewable Energy - Management Advanced Heat Engineering

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students can expect to have 5 (PgCert), 8 (PgDip), or 9 (MSc) pieces of assessment by submitted work and 1 (PgDip), or 2 (MSc) elements of assessment by presentation or viva.

This approach has been adopted because:

- Assess the knowledge of the students using methods appropriate to the nature of the subject area.
- Help the students to improve their technical writing and oral presentation skill.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate in Advanced Chemical Engineering

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4
2	ICW	ICW		
3	ICW	ICW	ICW	ICW
4	ICW	ICW	ICW	
5	ICW	ICW		ICW
6		ICW	ICW	
7		ICW		ICW

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4
8	ICW	ICW	ICW	
9		IPRES		

B. Postgraduate Diploma in Advanced Chemical Engineering

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO5	ILO6	ILO7
10	ICW		
11		GCW GPRES ICW RP	GCW GPRES ICW RP
12		IPROJ IPRES	

C. MSc in Advanced Chemical Engineering

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO8	ILO9
13	OR/THESIS	OR/THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and

procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in-depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Graduates will be equipped with advanced interdisciplinary skills in chemical engineering, which includes theoretical and practical elements in operation, design, and control of a wide range of chemical and energy processes, as well as rapidly growing and dynamic bioenergy sector. This includes skill training in management applied to the energy sector which will enable graduate engineers to effectively fulfil a wider role in a business organisation.

Graduates are likely to work in companies competing in a range of industries, including chemicals, petrochemicals, biochemicals, conventional energy and bioenergy, materials, consultancy and management. Those wishing to continue their education via PhD or MBA studies in the chemical or energy sectors will be greatly facilitated by the interdisciplinary, project-oriented profile that they will have acquired through this course.

COURSE SPECIFICATION

ILO

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision:	01/03/22

1. What is the course?

Course information

Course Title	Advanced Digital Energy Systems
Course code	MSADEFTC, MSADEPTC, PDADEFTC, PDADEPTC, PCADEFTC, PCADEPTC
Academic Year	2022-23
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	NA
Mode of delivery	Full-time and Part-time
Location(s)[1] of Study	Cranfield
School(s)	School of Water, Energy and Environment
Theme	Energy and Power
Centre	Energy Systems and Strategy
Course Director	Dr Chao Long
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No
Is the Mastership offered as an open and/or closed course?	N/A

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	NA
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - up to three years, Full-time PgDip - one year, Part-time PgDip - two years, Full time PgCert - one year, Part time PgCert - two years
Course Start Month(s)	October

Institutions delivering the course

This course is delivered by the Centre for Energy Systems and Strategy, Energy & Power Theme, School of Water, Energy and Environment where the research interests include:

Community Energy Systems, Renewable Energy Technologies, Power System Analysis, Power Transmission and Distribution Systems, Artificial Intelligence (AI) and Blockchain technology and Renewable Energy Systems

The course is supported by the Centre for Simulation and Analytics (Cranfield Defence and Security), the Centre for Autonomous and Cyberphysical Systems, School of Aerospace, Transport and Manufacturing, and the School of Management.

Cranfield University interacts with the following institutions and in the following ways:

N/A

Cranfield University remains
fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

What are the aims of the course?

The aim of the course is to provide electrical engineering, computer science, mathematics, engineering, energy and information technology graduates with current theory and practice of energy systems so that they can apply information and data analytical technologies to solve energy problems. These skills will be applicable in a wide range of industrial energy systems, including the oil and gas, renewable energy, petrochemical, chemical, pharmaceutical, water, food and drink, and power industries. In particular, by equipping the students with advanced computational methods, the course graduates will have employment prospects across the energy industry (from generators, suppliers to network operators, consultancies), policy and academia. Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) entry routes are provided for students who wish to access only parts of the course provided.

This programme is intended for the following range of students:

Electrical Engineering, Computer Science, Mathematics, Engineering and Information Technology and Energy graduates and practicing IT or Energy engineers wishing to pursue a technical management career in the growing energy industry sector.

Applicants are required to have at least a UK 2nd class honours degree or its equivalent for overseas applicants.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate (PgCert)

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Design an appropriate data acquisition system for energy related processes.
ILO 2. Design an appropriate data acquisition system for energy related processes.
ILO 3. Critically analyse industrial data collected from different energy systems.
ILO 4. Develop systematic strategies using a range of software for energy systems modelling, optimisation and control to resolve the technical issues involved in the design and operation of industrial energy systems.

B. Postgraduate Diploma (PGDip)

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Apply the analytical knowledge gained to solve practical problems in the principle subject areas of energy systems.
ILO 6. Integrate knowledge, understanding and skills from the taught modules in a real-life situation to address problems faced by industrial clients; creating new problem diagnoses designs or systems insights; and communicating findings in a professional manner in written, oral and visual forms.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 7. Define a research question, develop aim(s) and objectives, select and execute a methodology, analyse data, evaluate findings critically and draw justifiable conclusions, demonstrating self-direction and originality of thought.
ILO 8. Communicate their individual research via a thesis and in an oral presentation in a style suitable for academic and professional audiences

D. Postgraduate Diploma (PGDip)

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Apply the analytical knowledge gained to solve practical problems in the principle subject areas of energy systems.
ILO 10. Integrate knowledge, understanding and skills from the taught modules in a real-life situation to address problems faced by industrial clients; creating new problem diagnoses designs or systems insights; and communicating findings in a professional manner in written, oral and visual forms.

E. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 11. Define a research question, develop aim(s) and objectives, select and execute a methodology, analyse data, evaluate findings critically and draw justifiable conclusions, demonstrating self-direction and originality of thought.

ILO 12. Communicate their individual research via a thesis and in an oral presentation in a style suitable for academic and professional audiences

4. How is the course taught?

Students will be supported in their learning and personal development by:

1) A dedicated electronic VLE site.
2) A one-day workshop for MATLAB training (part of the induction week).
3) A one-day training and practice workshop on an industrial scale pilot plant for all students.

The taught programme is generally delivered from October to February and is divided into 5 core and 3 applied modules. Each core module is generally delivered over one week, whereas each applied module is delivered over two weeks at Cranfield.

The Group Project is delivered between late February and May. Each group will typically include 4-6 students and an academic supervisor will be assigned to each group. The academic supervisor will participate in these project review meetings to record attendance, assess the individual oral presentations and level of contribution to the project and to provide guidance as appropriate. Students within a group project are required to participate in these review meetings. Additionally, it is expected that students will meet and work on the project outside of the formal meetings.

Part-time students have the option of completing a dissertation as an alternative to the Group Project. Students opting for the part-time dissertation will be assigned a supervisor by the Course Director and will agree with the supervisor an appropriate topic of study. This may be related to a workplace/industrial activity that is relevant to the student's work environment. The dissertation will include a comprehensive review of classical and contemporary related material and also a discussion and properly argued conclusions

The Individual Research Project is typically delivered between May and September. Each student is allocated a supervisor, who will guide and assess the student work. During the Individual research project period, the supervisor and the student should agree a schedule of meeting to review progress made and agree future actions.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

Description	Credits
COMPULSORY MODULES:	
Renewable Energy Technologies 1	10
Renewable Energy Technologies 2	10
Cybersecurity for Energy Systems	10
Data Analytics for Energy Systems	10
Artificial Intelligence for Energy Systems	10
ELECTIVE MODULES:	
1 from the following 3 modules:	
Applications of Blockchain Technology	10
Energy Entrepreneurship	10
Energy Systems Case Studies	10
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Renewable Energy Technologies 1	10
Renewable Energy Technologies 2	10
Cybersecurity for Energy Systems	10
Data Analytics for Energy Systems	10
Artificial Intelligence for Energy Systems	10
Applications of Blockchain Technology	10
Energy Entrepreneurship	10
Energy Systems Case Studies	10
Group Project	40
ELECTIVE MODULES:	
Part time students only select one from the following:	
Dissertation	40
Group project	40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Renewable Energy Technologies 1	10
Renewable Energy Technologies 2	10
Cybersecurity for Energy Systems	10
Data Analytics for Energy Systems	10
Artificial Intelligence for Energy Systems	10

[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

Applications of Blockchain Technology Energy Entrepreneurship Energy Systems Case Studies Group Project Individual Research Project	10 10 10 40 80
ELECTIVE MODULES:	
Part time students only select one from the following: Dissertation Group project	 40 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [5]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

[5] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

Full-time students register for the course in October and are expected to complete the course within 12 calendar months.

Part-time students register for the course in October and are expected to complete the course within 3 years.

This course is also offered on a part-time basis. Students would instead attend the required modules of the taught component according to the schedule agreed with the course director. MSc research projects are commonly undertaken in collaboration with the candidate's place of work.

Each core module is taught over two weeks, with the second week largely free of structured teaching to allow time for more independent learning and reflection, and completion of assignments. Each applied module is delivered over two weeks at Cranfield.

7. Course Level Assessment Strategy[6]

Taught modules:
The taught modules are primarily assessed through individual coursework, allowing students to gain experience of written communication in a number of styles. This is supported by formative group work discussions and presentations that develop oral communication and group working skills. The course work set ranges from evaluation of coding examples through to assessment of case studies and critical reviews of the current state of the art.

Group Project:
The group project provides the students with the opportunity to gain professional skills expected of the workplace. In addition to technical skill practice, students develop a range of soft skills such as team working, problem solving, communication skills and reflective practice. The students work in small consultancy teams typically on a client sponsored project for a period of 10 weeks. Many teams will be made up of students from different courses giving the students the opportunity of working in an interdisciplinary team. The students are responsible for interpreting the brief, developing a project plan, selecting and implementing a methodology, deriving results, analysing the results and drawing conclusions in alignment with the aims and objectives. All students participate in a peer review activity providing them with the opportunity to reflect on the practices of their colleagues as well as their own. Peer review feedback is provided individually by an independent member of academic staff. A single group report is produced, and the project is presented orally at the concluding Exhibition Day, both elements are summatively assessed by independent markers and a group mark is assigned for element. Individual assessment is derived from supervisor observation and meeting minute actions and an individual reflective report where the students reflect on the development of three soft skill competencies based on objectives that they set for themselves. The team working competency is mandatory as one of the three skills for each student.

Dissertation:
Part time students are not required to complete the Group Project undertaken by the full time registered students on a SWEE MSc course. An alternative assignment takes the form of a dissertation or design project which in most situations will be based around a topic relevant to the work of the part-time student. It is evident that some aspects of the Group Project experience that the work-based dissertation replaces – for example, the client interaction and group dynamics components will not directly replicated by undertaking this assignment. It is expected that these experiences would normally be a part of the normal working life of the part-time student.

[6] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

It is expected that the dissertation will normally consist of the following elements: Abstract, Background context, Introduction to the theme(s) addressed within the dissertation, setting out the issues that will be covered, Methodology, In depth analysis/discussion of the topics discussed, Concluding remarks, References, Appendices (if relevant). Two supervisors are allocated to the dissertation and supervision follows the model used for the independent research project. The student will submit a 6000 word report and will give an oral presentation of their work. Both elements of assessment will be marked by independent assessors.

Individual Research Project/Thesis:
The individual research project requires students to further develop problem definition, hypothesis setting, select and execute a methodology, analyse data, and evaluate findings and draw appropriate conclusions in the context of research questions relevant to the course followed by a student. The student is required to communicate their findings successfully via a thesis, written in the style of a standard thesis, and an oral presentation based around a poster. The projects are designed to integrate knowledge, the taught modules, and apply understanding and skills from the group project, to deliver a high quality written thesis and oral presentation. The individual research project/thesis is typically delivered through collaboration with an industrial sponsor, or it may be an 'internal' project reflecting the research interests of the School.

Course modules

The following modules outline all parts of the programme leading to
MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments[11](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
0	I-ENE-INWK Occ A	Induction Week	Dr Patrick Verdin	24	0	0	Y		03/10/22	07/10/22	N/A	AO	N/A		N/A	N/A	N/A	N/A
1	N-BPE-PRET	Renewable Energy Technologies 1	Dr Sagar Jain	30	0	10	Y		10/10/22	21/10/22	50	ICW	100				FT 22/10/22 PT 05/11/22	05/23

[7] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[8] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[9] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[10] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education.
[11] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[12] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[13] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments[11](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
2	N-RNE-PGERE	Renewable Energy Technologies 2	Dr Jerry Luo	40	0	10	Y		24/10/22	04/11/22	50	ICW	100				FT 05/11/22 PT 19/11/22	05/23
3	N-ADE-CES	Cybersecurity for Energy Systems	Dr Adam Zagorecki	30	0	10	N		07/11/22	18/11/22	50	ICW	100				FT 19/11/22 PT 03/12/22	05/23
4	N-ADE-DAB	Data Analytics for Energy Systems	Dr Chao Long	28	0	10	N		21/11/22	02/12/22	50	ICW	100				FT 03/12/22 PT 03/01/23	05/23
5	N-ADE-AIES	Artificial Intelligence for Energy Systems	Dr Da Huo	30	0	10	N		05/12/22	16/12/22	50	ICW	100				FT 17/12/22 PT 14/01/23	05/23
6	N-OFF-ESCS Occ A	Energy Systems Case Studies	Dr Nazmiye Ozkan	32	0	10	Y		09/01/23	20/01/23	50	ICW	100				FT 21/01/23 PT 04/02/23	05/23
7	N-ADE-ABT	Applications of Blockchain Technology	Dr Chao Long	32	0	10	N		23/01/23	03/02/23	50	ICW	100				FT 04/02/23 PT 18/02/23	05/23
8	N-RNE-EE	Energy Entrepreneurship	Orsolya Ihasz	28	0	10	Y		06/02/23	17/02/23	50	GCW	100				FT 18/02/23 PT 04/03/23	05/23
9	I-ENE-GRPP	Group Project	Dr Patrick Verdin	16		40	Y		06/03/23	12/05/23	50	GCW	64				05/05/23	TBC

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments[11](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
	Occ A											GPRES	16				02/05/23	
											50	ICW	10				12/05/23	
												RP	10				13/05/23	
10	I-ENE-DISS Occ A	Dissertation (PT Students only)	Dr Patrick Verdin	10		40	Y		06/03/23	29/09/23	50	IPROJ	80				22/09/23 @ 16.00	09/24
											50	IPRES	20				wc 25/09/23	
11	I-ENE-THESIS Occ A	Individual Research Project	Dr Patrick Verdin	20		80	Y		15/05/23	08/09/23	50	OR	10				w/c 28/08/23	N/A
											50	THESIS	90				04/09/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
I-ENE-INWK	Induction Week	Energy Programme	Advanced Mechanical Engineering, Advanced Chemical Engineering, Advanced Heat Engineering, Renewable Energy
N-BPE-PRET	Renewable Energy Technologies 1	Renewable Energy	Renewable Energy
N-RNE-PGERE	Renewable Energy Technologies 2	Renewable Energy	Renewable Energy
N-OFF-ESCS	Energy Systems Case Studies	Renewable Energy	Renewable Energy
N-RNE-EE	Energy Entrepreneurship	Renewable Energy	Renewable Energy
I-ENE-GRPP	Group Project	Energy Programme	Advanced Mechanical Engineering, Advanced Chemical Engineering, Advanced Heat Engineering, Renewable Energy
I-ENE-DISS	Dissertation (PT Students only)	Energy Programme	Advanced Mechanical Engineering, Advanced Chemical Engineering, Advanced Heat Engineering, Renewable Energy
I-ENE-THESIS	Individual Research Project	Energy Programme	Advanced Mechanical Engineering, Advanced Chemical Engineering, Advanced Heat Engineering, Renewable Energy

8. How are the ILOs assessed?

The following assessment types are utilised:

Individual Course Work, Group Course Work, Group Presentation, Individual Research Project, Individual Presentation, and Thesis

This approach has been adopted because:

A balance of different types of group and individual course work to assess both fundamental knowledge and ability for practical applications

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO1	ILO2	ILO3
1		ICW	ICW
2	ICW	ICW	ICW
3		ICW	ICW
4	ICW	ICW	
5	ICW	ICW	
6	ICW	ICW	ICW
7		ICW	ICW
8		GCW	GCW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO4	ILO5
9	GCW GPRES ICW RP	GCW GPRES ICW RP
10	IPROJ/ IPRES	IPROJ/ IPRES

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO6	ILO7
11	THESIS OR	THESIS OR

D. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO4	ILO5
9	GCW GPRES ICW RP	GCW GPRES ICW RP
10	IPROJ/ IPRES	IPROJ/ IPRES

E. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO6	ILO7
11	THESIS OR	THESIS OR

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
NA			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6-year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principle means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition, students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5-year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Graduates from the course will be equipped with the academic skills and requirements to successfully pursue a career in:
1) Engineering consultancies and design practices.
2) Industries including: Power, Oil and gas, Petrochemical, Chemical, Pharmaceutical, Water, and Food and drink
3) Research organisations.
4) Academic institutions.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: 22/01/2021 / 1/03/2022

1. What is the course?

Course information

Course Title	Advanced Heat Engineering
Course code	PCAHEFTC, PCAHEPTC, PDAHEFTC, PDAHEPTC, MSAHEFTC, MSAHEPTC
Academic Year	2022/23
Valid entry routes	Cranfield - MSc, PgDip PgCert
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-Time, Part-Time
Location(s)[1] of Study	Cranfield
School(s)	School of Water, Energy and Environment
Theme	Energy & Power
Centre	Centre for Thermal Energy Systems and Materials
Course Director	Dr Kumar Patchigolla
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No
Is the Mastership offered as an open and/or closed course?	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	1 year Full-Time, 3 years Part-time
Course Start Month(s)	October at Cranfield

Institutions delivering the course

This course is delivered by the School of Water, Energy and Environment, Energy & Power Theme, Centre for Thermal Energy Systems and Materials where the research interests include:

- Process and Thermal Energy Systems Design, Thermodynamics, Simulation and Optimisation
- Heat recovery and energy storage
- NetZero thermal engineering approaches
- Multi-Phase Flow and Processes
- Process Flow Measurement and Control
- Technical and Economic Viability Assessments of Conventional and Renewable Energy Systems
- Environmental Protection

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Institution of Mechanical Engineers (IMechE) until August 2026 and the Energy Institute (EI) until August 2025 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in response to the growing concerns about the need for the conservation of energy and for combating the increasing environmental degradation. The course, established in 1972 to train and educate oil and gas engineers, was the first of its type to be instituted in Europe, and remains the most prestigious degree in technical energy management in the UK.. It is widely acknowledged that we need to begin to decarbonise power and heat we use and the global shift towards efficiency improvements, sustainable energy sources, and the use of low/zero carbon technologies in these sectors.

Changing the way, we produce heat and power to meet present and growing future demands is a fundamental transition for most of the businesses globally. Therefore, the course content and structure are restructured to reflect/emphasize the heat engineering aspects and appeal to the future engineers to enhance their expertise in heat aspects around green economy (fuel/source). In addition, this approach furnishes students with the skills to develop their competence in the use of high efficiency energy conversion systems, advanced approaches for centralised heating and cooling to help meet rising urban energy needs by using low/zero carbon systems. This course is specifically designed to understand the heat flows and to step towards meeting carbon budgets from power sector to domestic applications.

The course prepares students for a successful career as energy professionals in a wide range of industries, consultancies, research organisations and local and central government departments. The course has evolved over the past 38 years from discussions with Industrial Advisory Panels, employers, sponsors and previous students. The content of the programme of study is up-dated regularly to reflect changes arising from technical advances, economic factors and changes in legislation, regulations and standards.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) exit routes are provided for students who wish to access only parts of the course provided.

This programme is intended for the following range of students:

- Engineering and applied science graduates and practicing engineers interested in thermal energy and its efficient utilisation in industrial and commercial applications, and working towards low/zero carbon systems.
- Applicants are required to have at least a UK 2nd class honours degree or its equivalent. Applications from candidates with lesser qualifications but with considerable relevant working experience will be considered.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Advanced Heat Engineering

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Critically evaluate the current concepts and theories governing heat flows, heat and mass transfer and energy conversion advancements.

ILO 2. Debate the technical, economic and environmental issues involved in power generation and other industrial sectors, the management of heat in these sectors and the design of energy-efficient systems and processes.

ILO 3. Effectively analyse complex energy systems and heat networks in order to achieve a cost-effective solution or transition to low (or zero) carbon systems.

ILO 4. Design and implement appropriate thermodynamic simulations using a range of software package employed in heat mass and momentum analysis, system and process modelling, the design of district heat networks and energy management assessment.

ILO 5. Demonstrate an ability to apply and critically evaluate key engineering management principles,
including project management, people management, technology marketing, product development and finance.

B. Postgraduate Diploma in Advanced Heat Engineering

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 6. Integrate knowledge, understanding and skills from the taught modules in a real-life situation to address problems faced by power and industrial clients; creating novel problem diagnosis, design advancements, or system insights; and efficient communication approaches in a professional manner in written, oral and visual forms.

C. MSc in Advanced Heat Engineering

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 7. Define a research problem statement, develop aim(s) and objectives based on knowledge gap identification, select and execute a methodology, critically analyse data, evaluate findings critically and draw justifiable conclusions, demonstrating self-direction and originality of thought.

ILO 8. To communicate their individual research in an oral presentation in a good academic standard and attractive for professional audiences.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- A dedicated electronic Virtual Learning Site
- One-week software training which includes MATLAB, ASPEN, CFD, EES and other packages including online tutorial videos
-

The taught programme is generally delivered from October to February and is divided into 4 core and 4 applied modules. Each of these modules is generally delivered over two weeks . Each module is delivered flexibly during this time, using a combination of online and face to face interactions. The modules will be assessed by either an exam or an assignment.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. **Postgraduate Certificate** (PgCert)

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction	0
Industrial Thermal Operations	10
Thermal Energy Systems	10
District Heat Networks	10
Computational Fluid Dynamics for Industrial Processes	10
Applied Thermal Energy Systems	10
Engineering Project Management	10
TOTAL:	60

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

B. **Postgraduate Diploma** (PgDip)

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

Description	**Credits**
COMPULSORY MODULES:	
Induction	0
Industrial Thermal Operations	10
Thermal Energy Systems	10
Advanced Heat Exchanger Design	10
Computational Fluid Dynamics for Industrial Processes	10
Applied Thermal Energy Systems	10
Engineering Project Management	10
Process Design and Simulation	10
District Heat Networks	10
Group Project	40
ELECTIVE MODULES:	
Part Time Students: Group Project OR Dissertation	 40 40
TOTAL:	120

C. **MSc** (at Cranfield)

D.

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	
Induction	0
Industrial Thermal Operations	10
Thermal Energy Systems	10
Advanced Heat Exchanger Design	10
Computational Fluid Dynamics for Industrial Processes	10
Applied Thermal Energy Systems	10
Engineering Project Management	10
Process Design and Simulation	10
District Heat Networks	10
Group Project	40

[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

Individual research project	80
ELECTIVE MODULES:	
Part Time Students: Group Project OR Dissertation	 40 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [5]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in October and are expected to complete the course within 12 calendar months.

[5] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

This course is also offered on a part-time basis. Students would instead attend the required modules of the taught component according to the schedule agreed with the course director. Part time students typically elect to complete the individual dissertation instead of the group project. The dissertation and the MSc research projects are commonly undertaken in collaboration with the candidate's place of work.

The taught programme is generally delivered from October to February and is divided into core and applied modules. Each core module is generally delivered over two weeks.

7. Course Level Assessment Strategy[6]

Taught modules:
These high-quality taught modules are delivered by experienced academics to enable student's requirements and reliably assessed to meet the module and course level ILOs. The taught modules are assessed through a combination of six assignments and two exams, and the full details of these requirements and standards are provided to students well in advance before start of these modules. This is designed to test student's ability to perform in a number of different situations. Formative assessments test several skills including group work, presentations and practical skills (lab and modelling). Most of the assessment will be assignments and scores of these assignments will make up students' overall marks. Each module assessment strategy is accessible via module descriptors page, and will inform the category each assignment falls into. For exam modules, a summative assessment is followed where an exam is used to identify a lack of understanding in a particular area of taught lectures. Through core modules students can acquire advanced knowledge in theory behind the engineering technologies, design and evaluate the efficient energy systems. For applied modules, students are expected to demonstrate "theory to practice" and their applicability to real world problems. The above assessments are designed in a way to provide necessary feedback throughout their studies. The quality of each these modules are reviewed annually by module managers, course director, programme manager, education director including external examiners to improve any potential course content.

Group Project:
The group project provides the students with the opportunity to gain professional skills expected of the workplace. In addition to technical skill practice, students develop a range of soft skills such as team working, problem solving, communication skills and reflective practice. The students work in small consultancy teams typically on a client sponsored project for a period of 10 weeks. Many teams will be made up of students from different courses giving the students the opportunity of working in an interdisciplinary team. The students are responsible for interpreting the brief, developing a project plan, selecting and implementing a methodology, deriving results, analysing the results and drawing conclusions in alignment with the aims and objectives. All students participate in a peer review activity providing them with the opportunity to reflect on the practices of their colleagues as well as their own. Peer review feedback is provided individually by an independent member of academic staff. A single group report is produced and the project is presented orally at the concluding Exhibition Day, both elements are summatively assessed by independent markers and a group mark is assigned for element. Individual assessment is derived from supervisor observation and meeting minute actions and an individual reflective report where the students reflect on the development of three soft skill competencies based on objectives that they set for themselves. The team working competency is mandatory as one of the three skills for each student.

Dissertation:
Part time students are not required to complete the Group Project undertaken by the full time registered students on a SWEE MSc course. An alternative assignment takes the form of a dissertation or design project which in most situations will be based around a topic relevant to the work of the part-time student. It is evident that some aspects of the Group Project experience that the work-based dissertation replaces

[6] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

– for example the client interaction and group dynamics components will not directly replicated by undertaking this assignment. It is expected that these experiences would normally be a part of the normal working life of the part-time student.

It is expected that the dissertation will normally consist of the following elements: Abstract, Background context, Introduction to the theme(s) addressed within the dissertation, setting out the issues that will be covered, Methodology, in depth analysis/discussion of the topics discussed, Concluding remarks, References, Appendices (if relevant). Two supervisors are allocated to the dissertation and supervision follows the model used for the independent research project. The student will submit a 6000 word report and will give an oral presentation of their work. Both elements of assessment will be marked by independent assessors.

Individual Research Project/Thesis:
The individual research project requires students to further develop problem definition, hypothesis setting, select and execute a methodology, analyse data, and evaluate findings and draw appropriate conclusions in the context of research questions relevant to the course followed by a student. The student is required to communicate their findings successfully via a thesis, written in the style of a standard thesis, and an oral presentation based around a poster. The projects are designed to integrate knowledge, the taught modules, and apply understanding and skills from the group project, to deliver a high-quality written thesis and oral presentation. The individual research project/thesis is typically delivered through collaboration with an industrial sponsor, or it may be an ‘internal’ project reflecting the research interests of the School.

Course modules

The following modules outline all parts of the programme leading to **MSc in Cranfield.** Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments[11] (%)	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
1	I-ENE-INWK Occ A	Induction	Patrick Verdin	24		0	Y		03/10/22	07/10/22	N/A	AO	N/A				N/A	N/A
2	N-ESP-TES	Thermal Energy Systems	Kranthi Jonnalagadda	30		10	N		17/10/22	11/11/22	50	EX	100				w/c 02/01/23	05/23
3	N-PSE-PSD	Process Design and Simulation	Dawid Hanak	25		10	Y		24/10/22	04/11/22	50	ICW	100				FT 05/11/22 PT 19/11/22	05/23

[7] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[8] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[9] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[10] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[11] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[12] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[13] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments[11]	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
	Occ A																		
4	N-PSE-CETIP	Computational Fluid Dynamics for Industrial Processes	Patrick Verdin	30		10	Y		21/11/22	02/12/22	50	ICW	100				FT 03/12/22 PT 17/12/22	05/23
5	N-ESP-ITO	Industrial Thermal Operations	Kumar Patchigolla	30		10	N		05/12/22	16/12/22	50	EX	100				w/c 02/01/23	05/23
6	N-ESP-ATES	Applied Thermal Energy Systems	Gurpreet Singh Sodhi	30		10	N		09/01/23	20/01/23	50	ICW	100				FT 21/01/23 PT 04/02/23	05/23
7	N-AHE-DHN	District Heat Networks	Renaldi Renaldi	30		10	N		23/01/23	03/02/23	50	ICW	100				FT 04/02/23 PT 18/02/23	05/23
8	N-ESP-AHE	Advanced Heat Exchanger Design	Kapil Garg	30		10	N		06/02/23	17/02/23	50	ICW	100				FT 18/02/23 PT 04/03/23	05/23
9	N-AME-EPM Occ A	Engineering Project Management	Phil Hart	20		10	Y		20/02/23	03/03/23	50	ICW	100				FT 04/03/23 PT 18/03/23	05/23
10	I-ENE-GRPP Occ A	Group Project	Patrick Verdin	16		40	Y		06/03/22	12/05/22	50 50	GCW GPRES	64 16				05/05/2023 @16.00 02/05/2023 @ 16.00	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments[11]	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
												ICW RP	10 10				12/05/2023 @ 16.00 13/05/2023 @ 23.59	
11	I-ENE-DISS Occ A	Dissertation for part time students	Patrick Verdin	10		40	Y		06/03/23	29/09/23	50	IPROJ IPRES	80 20				22/09/23 @ 16.00 wc 25/09/23	
12	I-ENE-THESIS Occ A	Energy Individual Research Project (IRP)	Patrick Verdin	20		80	Y		15/05/23	08/09/23	50 50	OR THESIS	10 90				w/c 28/08/23 04/09/23 @ 16.00	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-PSE-PSD	Process Design and Simulation	Advanced Heat Engineering	• Advanced Heat Engineering •
N-AME-EPM	Engineering Project Management	Advanced Mechanical Engineering	• Advanced Heat Engineering • Advanced Chemical Engineering • Renewable Energy (Management route)

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students can expect to have 2 written examinations, 6 pieces of assessment by submitted work and 2 elements of assessment by presentation or viva.

This approach has been adopted because:

- Assess the knowledge of the students using methods appropriate to the nature of the subject area
- Help the students to improve their technical writing and oral presentation skills

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

A. Postgraduate Certificate in Advanced Heat Engineering

Award ILOs / **Module No.**	ILO 1.	ILO 2.	ILO 3.	ILO 4.	ILO5
2	EX	EX	EX		
3	ICW	ICW	ICW	ICW	
5	EX	EX	EX		
6	ICW	ICW	ICW	ICW	
8	ICW	ICW	ICW	ICW	
9					ICW

B. Postgraduate Diploma in Advanced Heat Engineering

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3.	ILO 4.	ILO 5.	ILO 6.
4	ICW		ICW	ICW		
8	ICW	ICW	ICW	ICW		
10						GCW GPRES ICW RP
11						IPROJ IPRES

C. MSc in Advanced Heat Engineering

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 7.	ILO 8.
12	THESIS OR	THESIS OR

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6-year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principle means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Graduates of the course have been successful in gaining employment in:

- Energy, environmental and engineering consultancies and design practices
- Industry
- Research organisations
- Central government departments
- Local governments
- Academic institutions

COURSE SPECIFICATION

Cranfield University: Course Specifications
Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Advanced Lightweight and Composite Structures
Course code	MSACSFTC, PDACSFTC, PCACSFTC
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Structures, Assembly and Intelligent Automation
Course Director	Dr Yigeng Xu
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	NON/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University Entry Requirements (2.2 in an Engineering related subject)
UK Qualifications Framework Level	QAA FHEQ level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	1 year full-time
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Structures, Assembly and Intelligent Automation where the research interests include:

- Structural analysis (linear/non-linear).
- Numerical methods development (mesh and meshless methods).
- Crashworthiness and material response to impact loading (ranging from quasi-static to dynamic).

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This MSc course is accredited by the Institution of Mechanical Engineers (IMechE) until August 2026 and the Royal Aeronautical Society (RAeS) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- Provide in-depth understanding of the importance / implications of using advanced materials in the development of lightweight structures and their response to a range of loading (from quasi-static to dynamic loads).
- Acquire a systematic understanding of structural behaviour and failure and develop an awareness of impact and crash protection issues and phenomena, with the ability to apply this knowledge to structural design.
- Meet employer demand for graduates who have strong applied analytical skills in structural behaviour and failure, who can practically apply this knowledge to real engineering problems using the latest industry standard numerical tools.
- To develop a firm grasp of the relationship of basic phenomena to real life engineering systems, and develop industrially relevant and marketable applied skills in structures and crashworthiness.
- To supply high grade personnel to the structures and crashworthiness communities in UK, European and world industry, including aerospace, automotive, offshore and defense sectors.
- To provide a prime focus for Cranfield's growing activity in analysis and design for structural crashworthiness and impact.

This programme is intended for the following range of students:

- Any 1st or 2nd class UK honours degree (or equivalent) in an engineering related discipline.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Develop a comprehensive knowledge and understanding of concepts, theories, and engineering methods associated with the stress analysis and design of advanced lightweight materials and structures.

ILO 2. Apply relevant scientific principles and appropriate engineering analysis techniques to solve complex engineering problems such as the impact and crashworthiness analysis of advanced lightweight structures.

ILO 3. Assess limitations of current practice in the context of social, commercial and industrial constraints and use fundamental knowledge to investigate new and emerging technologies and developments.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Understand design processes and methodologies and use theory or experimental research to apply and adapt them in unfamiliar situations to generate innovative designs for advanced lightweight materials and structures with optimised mechanical performance.

ILO 5. Understand different roles within a teamworking environment, utilise individual skills and expertise to contribute to team output, and collaborate effectively with others, taking account of risk issues in the context of the particular specialisation, including health & safety, environmental and commercial risk.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 6. Collect and analyse research data and use appropriate engineering analysis tools in tackling unfamiliar problems, such as those with uncertain or incomplete data or specifications, by the appropriate innovation, use or adaptation of engineering analytical methods.

ILO 7. Develop advanced level knowledge and understanding of a wide range of engineering materials and structures, skills in problem solving, communication, information retrieval, and awareness of the need for a high level of professional and ethical conduct in engineering.

ILO 8. Develop advanced level knowledge and understanding of management and business practices, awareness that engineering activities should promote sustainable development, ability to apply quantitative techniques effectively and evaluate them critically where appropriate, and ability to monitor and adjust a personal programme of work on an on-going basis.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Lectures.
- Computer based workshops.
- Tutorial / video sessions (where appropriate)/
- The group and individual projects are used to develop research and presentation skills (feedback provided to aid development and time management skills).

- The students will be exposed to seminars from leading national and international figures in crashworthiness and impact fields.
- Industrial visits (where appropriate).
- IT and Library Training Courses.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction (1)	0
ELECTIVE MODULES:	
6 modules from 2-9	60
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction (1) Modules 2-9 Group Design Project	0 80 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Induction (1) Modules 2-9 Group Design Project (10) Individual Research Project (11)	0 80 40 80
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months. Each module is taught over one, or two weeks, depending upon module length.

Sufficient "free" time is allocated in the timetables to provide additional time for independent learning and reflection. In addition, the larger contact hour modules are split over two weeks, with the timetable specifically designed to incorporate at least a one week break between parts to allow students to consolidate the previously taught material, before attending the concluding part(s) of the module.

7. Course Level Assessment Strategy[4]

The assessment tasks are challenging and are designed to enable students to demonstrate the full range of learning, skills and attributes and equip them with the skills they require to succeed after graduation in academic, policy oriented or practitioner service. Therefore, a range of assessment practices is employed

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

across modules. Students are not only required to write essays but also to give oral presentations, defend their arguments and conclusions by way of interview, and to write employability relevant policy briefing documents and a written dissertation.

Course Team also offers:

• Working with course teams to help integrate assessments across modules
• Presenting to staff on aspects of integrated assessment
• Workshops on engaging students with formative assessment and feedback
• Resources and strategies for increasing clarification of standards and criteria

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%)	Weighting within multi-part module of assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment and/or Submission exam date[11]	Assessment / Exam Retake date
1		N-ALS-INWK	Induction Week (ALCS Course)	Dr Yigeng Xu	16		0	N	03/10/22	03/10/22	07/10/22	N/A	AO	N/A				N/A	
2		N-ALS-ICM	Introduction to Continuum Mechanics	Dr Iman Dayyani	20		10	N	10/10/22	10/10/22	14/10/22	40	EX	100				15/12/22	15/05/2023
3		N-ALS-ACAS	Advanced Composite Analysis and Impact	Dr Hessam Ghasemnejad	20		10	Y	24/10/22	24/10/22	28/10/22	50	ICW	100				25/11/22	03/03/2023
4		N-ALS-TS	Thin-walled Structures	Dr Yigeng Xu	20		10	N	07/11/22	07/11/22	11/11/22	50	EX	100				04/01/23	19/05/2023

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%. This will be at the Board of Examiners discretion.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually.
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
													Type of Assessment	Weighting within module[8] (%)	Weighting of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment and/or Submission exam date[11]	Assessment / Exam Retake date
5		N-ALS-FEM	Finite Element Methods	Dr Iman Dayyani	30		10	N ST	21/11/22	21/11/22	30/11/22	40	EX	100				06/01/23	05/06/2023
6		N-ALS-MCS2	Materials Characterisation and Failure Simulations	Dr Mehdi Yasaee	20		10	N	09/01/23	09/01/23	13/01/23	50	ICW	100				10/02/23	05/05/2023
7		N-ALS-SS	Structural Stability	Dr Yigeng Xu	20		10	N	23/01/23	23/01/23	27/01/23	50	EX	100				30/03/23	09/06/2023
8		N-ALS-SIC	Advanced Simulation for Impact	Dr Mehdi Yasaee	20		10	N	06/02/23	06/02/23	10/02/23	50	ICW	100				10/03/23	12/05/2023
9		N-ALS-CRASH	Crashworthiness	Dr Hessam Ghasemnejad	20		10	N	20/02/23	20/02/23	24/02/23	50	ICW	100				24/03/23	24/05/2023
10		N-ALS-GA	Group Design Project	Dr Mehdi Yasaee	20		40	N	16/01/23	16/01/23	28/04/23	50	GCW	100				28/04/23	At the next available opportunity which may not be until the course runs the following year
11		N-ALS-THES	Individual Research Project	Dr Hessam Ghasemnejad	20		80	N	02/05/23	02/05/23	01/09/23	50	THESIS	100				01/09/23	As recommended by the Board of Examiners

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-ALS-FEM	Finite Element Methods	Advanced Lightweight and Composite Structures	Shared Teaching with CSTE and ACE, N-CST-CES, Computational Engineering Structures
N-ALS-ACAS	Advanced Composite Analysis and Impact	Advanced Lightweight and Composite Structures	Astronautics ad Space Engineering
N-ALS-CRASH	Crashworthiness	Advanced Lightweight and Composite Structures	Shared teaching with N-AEN-ASC, Introduction to Aircraft Structural Crashworthiness: Aircraft Engineering Airworthiness Military Aerospace and Airworthiness Safety and Accident Investigation

8. How are the ILOs assessed?

The following assessment types are utilised:

- Exam, assignment, group and individual projects

This approach has been adopted because:

- The analytical skills can be assessed by the exam while the numerical skills are mainly assessed by the assignments which give students an opportunity to apply their knowledge in practical applications. The experimental studies are examined by individual and group projects which judge students' capabilities in planning and evaluating of technical solutions in the advanced lightweight structures.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / **Module No.**	ILO 1.	ILO 2.	ILO 3.
1	*Not Assessed*		
2	*EX*	*EX*	

Award ILOs Module No.	ILO 1.	ILO 2.	ILO 3.
3	*ICW*	*ICW*	*ICW*
4	*EX*	*EX*	*EX*
5	*EX*	*EX*	
6	*ICW*	*ICW*	
7	*EX*	*EX*	*EX*
8	*ICW*	*ICW*	*ICW*
9	*ICW*	*ICW*	*ICW*

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs Module No.	*ILO 1.*	*ILO 2.*	*ILO 3.*	*ILO 4.*	*ILO 5.*
1	*Not Assessed*				
2	*EX*	*EX*			
3	*ICW*	*ICW*	*ICW*	*ICW*	
4	*EX*	*EX*	*EX*	*EX*	
5	*EX*	*EX*			
6	*ICW*	*ICW*			
7	*EX*	*EX*	*EX*	*EX*	
8	*ICW*	*ICW*	*ICW*		
9	*ICW*	*ICW*	*ICW*	*ICW*	
10		*GCW*	*GCW*	*GCW*	*GCW*

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs Module No.	*ILO 1.*	*ILO 2.*	*ILO 3.*	*ILO 4.*	*ILO 5.*	*ILO 6.*	*ILO 7.*	*ILO 8.*
1	*Not Assessed*							
2	*EX*	*EX*						
3	*ICW*	*ICW*	*ICW*	*ICW*				
	EX	*EX*	*EX*	*EX*				
5	*EX*	*EX*						
6	*ICW*	*ICW*						
7	*EX*	*EX*	*EX*	*EX*				

8	*ICW*	*ICW*	*ICW*					
9	*ICW*	*ICW*	*ICW*	*ICW*				
10		*GCW*	*GCW*	*GCW*	*GCW*		*GCW*	
11		*THESIS*	*THESIS*			*THESIS*	*THESIS*	*THESIS*

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Based on the past five years, the following patterns have emerged for typical career paths and employability of graduands:

- Return to home EU institution to complete double degree
- Continued Higher Education - PhD at different UK institutions and at Cranfield University
- Direct employment / Graduate trainee schemes (Automotive / Aerospace / Offshore/Defence)
- Consultancy – Software Development / Software Application / Crashworthiness, etc.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: August 2022

1. What is the course?

Course information

Course Title	MSc in Advanced Materials
Course code	MSADMFTC, MSADMPTC, PDADMFTC, PDADMPTC, PCADMFTC, PCADMPTC
Academic Year	2022-23
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	n/a
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Manufacturing
Centre	Composites and Advanced Materials Centre
Course Director	Dr David Ayre
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	Not applicable
Is the Degree apprenticeship integrated or non-integrated?	Not applicable
Is the Mastership offered as an open and/or closed course?	Not applicable
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	One year full-time, three years part-time
Course Start Month(s)	Full-time: September. Part-time: September.

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Manufacturing Theme, Enhanced Composites and Structures Centre, where the research interests include:

- Enhanced Composites and Advanced Structures.
- Surface Engineering and Nanotechnology
- Precision Engineering
- Welding Engineering and Laser Processing
- Sustainable Materials and Sustainable Manufacturing

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by:

- The Institute of Materials, Minerals and Mining (IOM3) on behalf of the Engineering Council as further learning for CEng for intakes 2019 to 2024
- The Institution of Engineering and Technology (IET) on behalf of the Engineering Council as further learning for CEng for intakes 2020-2025
- The Welding Institute (TWI) on behalf of the Engineering Council as further learning for CEng for intakes 2020-2025
- The Royal Aeronautical Society (RAeS) on behalf of the Engineering Council as further learning for CEng for intakes 2021-2025
- The Institution of Mechanical Engineers (IMechE) on behalf of the Engineering Council as further learning for CEng for intakes 2021-2025

Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

Students completing an accredited degree are deemed to have met part or all of the academic requirements for registration as a Chartered or Incorporated Engineer and are in a strong position to move on to achieve professional engineering status after a period of initial professional development in industry.

2. What are the aims of the course?

AIM
The aim of the course is to provide graduate scientists and engineers with a fundamental understanding of materials properties and processing, and the necessary skills to apply their knowledge in a wide range of careers in engineering and related industries.

OBJECTIVES
The objectives of the course are to provide students with:

1. A scientific understanding of materials properties and an appreciation of how this understanding can be applied to relevant problems.

2. A scientific understanding of the processes and manufacturing routes used to convert materials into engineering products, and of the influence of processing conditions on product performance.
3. An introduction to a wide range of specific materials, including metals, polymers, ceramics and composites, and to the basic principles of materials selection for engineering and other applications.
4. An introduction to a research environment, providing familiarity with testing and processing equipment, practical approaches to problem solving, critical evaluation of data, and use of information technology.
5. The skills required to pursue a successful career in engineering and related industries.

On successful completion of the course students should be able to:

- Apply their understanding of materials properties and processing characteristics to problems in the areas of materials development, materials and process selection, and component design.
- Plan, execute and manage materials-related projects.
- Operate effectively in a team.
- Make effective oral and written presentations of their work.

This programme is intended for the following range of students:

- recent graduates wishing to extend their knowledge and skills in the above areas.
- qualified engineers wishing to apply their skills into new areas.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Evaluate current materials used in engineering applications
ILO 2. Compare and contrast developing and current manufacturing methods applicable across various material classes
ILO 3. Determine suitable alternative materials and processes for specified application/structure
ILO 4. Implement practical and/or numerical approaches to problem solving
ILO 5. Justify appropriate management strategies for managing projects

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would be expected to:

ILO 6. ILO 6. Plan, execute and manage a materials-related project.
ILO 7. ILO 7. Appraise technical and/or commercial literature
ILO 8. ILO 8. Deliver an effective presentation of work.
ILO 9. ILO 9. Contribute to and operate effectively in a team.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would be expected to:

ILO 10. ILO 10. Undertake a substantial critical appraisal of technical and/or commercial literature.
ILO 11. ILO 11. Deliver a substantial scientific programme of study.

4. How is the course taught?

Students will be supported in their learning and personal development by:

Comprehensive course materials are provided, as well as a web-site using the Virtual Learning Environment (VLE). Students are guided through the use of interactive exercises, group and individual discussion. Students engage in class activities to practise the techniques taught.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

FULL TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 2, 3, 7 Module 1	30 0
ELECTIVE MODULES:	
Three Modules from 4, 5, 6, 8, 9	30
TOTAL:	60

PART TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 2, 3, 7 Module 1	30 0
ELECTIVE MODULES:	
Three Modules from 4,5, 6, 8, 9 and 10	30
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

FULL TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 2 to 9 Module 1 Group Project (11a)	80 0 40
TOTAL:	120

PART TIME STUDENTS

Description	Credits

COMPULSORY MODULES:	
Modules 2, 3 and 7 Module 1	30 0
ELECTIVE MODULES:	
Choose 5 modules from modules 4, 5, 6, 8, 9 and 10 Group Project (11a) or Dissertation (11b).	10 each, 50 total 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

FULL TIME STUDENTS

Description	**Credits**
COMPULSORY MODULES:	
Modules 2 to 9 Module 1 Group Project Individual Research Project (12)	80 0 40 80
TOTAL:	200

PART TIME STUDENTS

Description	**Credits**
COMPULSORY MODULES:	
Modules 2, 3 and 7 Module 1 Individual Research Project (12)	70 0 80
ELECTIVE MODULES:	
Choose 5 modules from modules 4, 5, 6, 8, 9 and 10 Group Project (11a) or Dissertation (11b).	10 each, 50 total 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of

your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 11 calendar months.

This course is also offered on a part-time basis. The overall duration of the part-time course would normally be 2 years; the maximum overall duration normally permitted will be 3 years.
Part-time Students are encouraged to take the Group Project component and only in exceptional circumstances, and with approval from the Group Project Co-ordinator, will be permitted to replace the Group Project with an individual dissertation.

Part-time students also have the option to attend Design, Durability and Integrity of Composite Aircraft Structures in place of a non-compulsory module. If you are interested in this option, please discuss this with the Course Director before selecting your elective options.

The course has been structured through discussions with advisors from a range of industries centred on materials. The course comprises an introductory week and eight one week modules which are assessed, and an assessed group project and individual project. The course covers a broad range of materials areas. Specialisation is provided though suitable group and individual projects.

7. Course Level Assessment Strategy[4]

The course comprises taught modules (PG certificate, PG diploma, MSc) a group project (PG Diploma, MSc) and an individual research project (MSc). The intended learning outcomes for each module and project component are introduced to the students at the start of each module and project. Students are provided marking scheme information for all summative assessments and opportunities to revise/discuss content and strategies prior to completion of the assessments to ensure students are better informed to deliver.

---

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Each taught module is assessed separately in addition to the assessment of group project work and individual research project work. Activities during the module delivery allow formative feedback to be provided either individually to each student or generally to the student cohort. Such activities include individual student exercises, group exercises, presentation of group work, class discussions, interactive class quizzes. (lab) demonstrations with limited student interaction, software package tutorials and final recap with question and answer session at end of most modules.

The Introduction to Materials Engineering module (module 2) forms the basis of the course and is assessed by individual course work. A practice examination opportunity might be provided in October/November to give the students experience of the Cranfield University examination procedure and identify the level of revision required.
Summative assessments are varied, aligning with module ILOs and being designed specifically for each individual module. Assessments include closed book examinations, written assignments, group and individual oral presentations, use of associated software packages (documented reports) and reflective writing. The taught module ILOs and feedback from assessments (formative and summative) all develop skills that are further assessed in the group project work and individual research project work.

Assessment of project work (group and individual) is by a combination of observed behaviour, reflective writing, oral presentations (poster and powerpoint) and project reports. Formative feedback is provided during the projects (by supervisors, sponsors, technical staff and peers).

The summative assessments are undertaken by the students throughout the academic year, with first written assessment marks and feedback being provided late November, but feedback on oral presentations (summative assessment) is provided late October. However, the majority of feedback efficiently accessed by students is the formative feedback provided during the week of delivery during class activities.

Summative assessment feedback is primarily provided through the Virtual Learning Environment – written course work is marked and feedback provided within the recommended 20 working day period. General feedback on examinations is provided (posted on VLE) based on a sample size of exam question responses.

Full-time and part-time students are assessed identically where circumstances allow. The only provision for difference is in the Group Project/Dissertation (module 11a/11b); part-time students can be allowed to undertake a dissertation in place of the group project work where it can be demonstrated that a group project activity is unsuitable due to part-time student working restrictions.

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within [8]	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	I-MAT-INWK	Introduction	Dr Sue Impey	39		0	Y	28/09/22	03/10/22	07/10/22	N/A	AO	N/A				N/A	
2	I-MAT-A1009	Introduction to Materials Engineering	Dr David Ayre	30		10	Y	10/10/22	10/10/22	14/10/22	50	ICW	100				07/11/22	TBC – If required
3	I-MAT-A1011	Additive and Subtractive Manufacturin	Dr Claudiu Giusca	30		10	Y	17/10/22	17/10/22	21/10/22	50	ICW	100				14/11/2022	TBC – If required

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date	
		g Technologies																
4	I-MAT-A1015	Failure of Materials and Structures	Dr Muhammad Khan	32		10	Y	31/10/22	31/10/22	04/11/22	50	EX	100				15/12/22	Manufacturing resit exams will be during week commencing: 15/05/23
5	I-MNU-A1018	General Management	Dr Claudiu Giusca	32		10	Y	28/11/22	28/11/22	02/12/22	50	EX	100				06/01/23	Manufacturing resit exams will be during week commencing: 15/05/23
6	I-MAT-A1014	Finite Element Analysis	Dr Muhammad Khan/	35		10	Y	07/11/22	07/11/22	11/11/22	50	GCW	100				05/12/22	TBC – If required.
7	I-MAT-A1017	Materials Selection	Dr Sue Impey/ Dr David Ayre	34		10	Y	09/01/23	09/01/23	13/01/23	50	ICW	100				06/02/23	TBC – If required.
8	I-MAT-A1016	Surface Science and Engineering	Prof John Nicholls	30		10	Y	23/01/23	23/01/23	27/01/23	50	ICW	100				20/02/23	Re- TBC – If required.
9	I-MAT-A1013 Occ A	Composites Manufacturing for High Performance Structures	Mr Andrew Mills	30		10	Y	14/11/22	21/11/22Occ A	25/11/22	50	ICW	100				04/01/23	TBC – If required.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
10	N-AW-ICAS Occ B	Design, Durability and Integrity of Composite Aircraft Structures (option when available)**	Dr Yigeng Xu	35	5	10	Y	10/07/23	10/07/23	14/07/23	50	ICW	100				11/09/23	TBC – If required
11a	I-MAT-GRPP	Group Project	Dr David Ayre	20		40	Y	30/01/23	30/01/23 Occ A FT	25/04/23FT	50	GPRES GCW ICW IPRAC	16 64 10 10				25/04/23 02/05/23 02/05/23 02/05/23	
			Dr David Ayre						06/02/23Occ B PT	01/08/23PT	50	GPRES GCW ICW IPRAC	16 64 10 10				25/07/23 01/08/23 01/08/23 01/08/23	
11b	I-MAT-DISS	Dissertation for Part Time Students	Dr Sue Impey/ Dr David Ayre	20		40	Y	06/02/23	06/02/23	25/08/23	50	ICW ICW	90 10				25/08/23 25/08/23	
12	I-MNU-THESIS	Individual Research Project	Dr Muhammad Khan	20		80	Y	06/02/23	06/02/23Occ A PT	PT 25/08/23	50	THESIS IPRES	90 10				25/08/23 29/08/23	
			Dr Muhammad Khan					28/04/23	28/04/23Occ B FT	FT 25/08/23	50	THESIS IPRES	90 10				25/08/23 29/08/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
I-MAT-INWK	Introduction	Advanced Materials	• Aerospace Materials, • Aerospace Manufacturing, • Engineering and Management of Manufacturing Systems, • Global Product Development and Management, • Management and Information Systems, • Metal Additive Manufacturing, • Manufacturing Technology and Management, • Welding Engineering, • Maintenance Engineering and Asset Management
I-MAT-A1009	Introduction to Materials Engineering	Advanced Materials	• Aerospace Materials, • Manufacturing Technology and Management
I-MAT-A1011	Additive and subtractive Manufacturing Technologies	Advanced Materials	• Manufacturing Technology and Management, Aerospace Manufacturing,
I-MAT-A1015	Failure of Materials and Structures	Advanced Materials	• Aerospace Materials, • Aerospace Manufacturing • Maintenance Engineering and Asset Management
I-MNU-A1018	General Management	Manufacturing Technology and Management	• Global Product Development and Management, • Advanced Materials
I-MAT-A1014	Finite Element Analysis	Advanced Materials	• Aerospace Materials,
I-MAT-A1017	Materials Selection	Advanced Materials	• Aerospace Materials
I-MAT-A1016	Surface Science and Engineering	Advanced Materials	• Manufacturing Technology and Management, • Aerospace Materials
I-MAT-A1013	Composites Manufacturing for High Performance Structures	Advanced Materials	• Manufacturing Technology and Management, • Aerospace Manufacturing, • Aerospace Materials,
N-AW-ICAS	Design, Durability and Integrity of Composite Aircraft Structures	Airworthiness	• Military Aerospace and Airworthiness, • Aerospace Materials, • Aircraft Engineering

I-MAT-GRPP	Group Project	Advanced Materials	• Aerospace Materials, • Manufacturing Technology and Management, • Aerospace Manufacturing, • Engineering and Management of Manufacturing Systems, • Global Product Development and Management, • Management and Information Systems, • Welding Engineering, • Metal Additive Manufacturing, • Maintenance Engineering and Asset Management
I-MAT-DISS	Dissertation for Part Time Students	Advanced Materials	• Aerospace Materials, • Aerospace Manufacturing, • Engineering and Management of Manufacturing Systems, • Global Product Development and Management, • Management and Information Systems, • Metal Additive Manufacturing, • Manufacturing Technology and Management, • Welding Engineering, • Maintenance Engineering and Asset Management
I-MNU-THESIS	Individual Research Project	Aerospace Manufacturing	• Advanced Materials, • Aerospace Materials, • Engineering and Management of Manufacturing Systems, • Global Product Development and Management, • Management and Information Systems, • Metal Additive Manufacturing, • Manufacturing Technology and Management, • Welding Engineering, • Maintenance Engineering and Asset Management

8. How are the ILOs assessed?

The following assessment types are utilised:

Students can expect to have either examinations or assessment by submitted work and elements of assessment by presentation or viva.

This approach has been adopted in order to ensure that students demonstrate their understanding through a wide range of learning techniques, but are not disadvantaged through any one approach.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5				
2	ICW	ICW		ICW					
3		ICW							
4	EX			EX					
5				EX	EX				
6	ICW		ICW	ICW					
7	ICW	ICW	ICW	ICW					
8	ICW	ICW	ICW						
9	ICW	ICW	ICW						
10	ICW	ICW	ICW	ICW					

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.		ILO6	ILO7	ILO8	ILO9
11a		GCW	GCW	GCW GPRES	GCW
11b		ICW	ICW		ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO10	ILO11				
12	THESIS	THESIS IPRES				

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

This course takes graduates on to a wide range of careers involving materials, with responsibilities in research, development, design, engineering, consultancy and management in industries including aerospace, automotive, medical, sports, food and drink processing, chemical processing and power generation.

Annex A: AHEP Mapping[12]

Learning Outcomes / Module Code		I-MAT-INWK	I-MAT-A1009	I-MAT-A1011	I-MAT-A1013	I-MAT-A1014	I-MAT-A1015	I-MAT-A1016	I-MAT-A1017	I-MNU-A1018	N-AW-ICAS	I-MAT-DISS	I-MAT-GRPP	I-MAT-THESIS	
Science and Mathematics	SM7M		C	C	C	C	C	C	C		O	O		C	
	SM8M			C	C	C	C	C			O	O		C	
	SM9M		C	C	C	C	C	C	C		O	O		C	
Engineering Analysis	EA6M			C	C	C	C	C	C			O		C	
	EA5m			C	C			C			O	O		C	
	EA7M				C	C	C		C		O	O		C	
Design	D9M		C	C	C	C	C	C	C					C	
	D10M			C	C	C			C					C	
	D11M			C	C			C			O			C	
Economic, Legal, Social, Ethical and Environmental Context	EL8M									C	O	O	C	C	
	EL9M			C	C				C	C	O		C	C	
	EL10M									C				C	
	EL11M							C		C					
	EL12M				C			C		C	O	O		C	
	EL13M				C				C		O	O	C	C	
Engineering Practice	P12M		C	C	C	C	C	C	C					C	
	P9m		C	C			C	C				O		C	
	P10m		C	C	C			C	C		O	O		C	
	P11m			C						C			C		
Additional General Skills	G1		C	C	C	C	C	C	C		O	O	C	C	
	G2		C		C			C	C		O	O	C	C	
	G3m					C			C			O	C	C	
	G4			C					C			O	C		

[12] When completing the matrix each module on the course should be listed across the top row of the matrix. C (Core) or O (Optional) should be entered against the learning outputs that each module meets.

COURSE SPECIFICATION

Cranfield University: Course Specifications
Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: 11/03/21 / 01/03/22

1. What is the course?

Course information

Course Title	Advanced Mechanical Engineering
Course code	MSAMEFTC, MSAMEPTC, PDAMEFTC, PDAMEPTC, PCAMEFTC, PCAMEPTC
Academic Year	2022/23
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	PgDip, PgCert
Mode of delivery	Full time, Part time
Location(s)[1] of Study	Cranfield
School(s)	School of Water, Energy and Environment
Theme	Energy & Power
Centre	Centre for Thermal Energy Systems and Materials
Course Director	Dr Joy Sumner
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No
Is the Mastership offered as an open and/or closed course?	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	A first or second class UK Honours degree (or equivalent) in mathematics, physics or an engineering discipline. Other recognised professional qualifications or several years' relevant industrial experience may be accepted as equivalent; subject to approval by the Course Director.
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	Full-time MSc, PgDip and PgCert - one year, Part-time MSc, PgDip and PgCert - up to three years
Course Start Month(s)	October

Institutions delivering the course

This course is delivered by the Energy & Power Theme where the research interests include:

fluid mechanics, structural integrity, renewable energy and biofuels.

Cranfield University interacts with the following institutions and in the following ways:

Double degree relationships with European academic institutions have been developed (France, Italy and Spain) and future collaborations with other institutions are planned.

Plans are in place to:
- Establish an industrial advisory committee
- Develop relationships with appropriate international industries

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Institution of Mechanical Engineers (IMechE) until August 2026 and the Energy Institute (EI) until August 2025 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

Provide advanced, post-graduate education in the theory and practice of Mechanical Engineering. The course includes a broad range of Mechanical Engineering topics particularly relevant to the Energy sectors including Mechanical Engineering Design and Assessment. Material presented in the course modules deals with the design, operation and optimisation of machinery, structural integrity and project management. The course will appeal to graduates and practicing engineers who wish to enhance their understanding of Mechanical Engineering with a view to management of large engineering projects. It will also appeal to students as a conversion course from other branches of engineering and as an upskilling course particularly for overseas graduates. This is a broad course complementing the existing specialist MSc courses that the School of Water, Energy and Environment provides.

This programme is intended for the following range of students:

- Graduates and practicing engineers who wish to enhance their knowledge of various mechanical engineering fields with a view to managing key engineering projects.
- Graduates currently in employment, or overseas graduates, who wish to extend their technical qualifications or up-skill their qualifications.
- Graduates with science degrees or from other branches of engineering who wish to pursue a career change and require a conversion course.
- Candidates with other educational qualifications but who possess considerable relevant experience.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Advanced Mechanical Engineering

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Critically evaluate advanced mechanical engineering techniques necessary for solutions in the energy sectors.

ILO 2. Design appropriate strategies for employing advanced technologies and management issues to provide solutions for international industries and/or research organisations.

ILO 3. Appraise, evaluate and interpret information and theories applied to the engineering solution of problems in fluid dynamics and loading, computational fluid dynamics, fatigue and fracture, analytical and computational stress analysis, materials degradation and engineering component life cycles/sustainability.

ILO 4. Assess and interpret management methodologies and techniques that apply to the planning and execution of engineering projects, performed both individually and in teams, and for which self-direction and the ability to work effectively and professionally under time pressure are required.

B. Postgraduate Diploma in Advanced Mechanical Engineering

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Integrate knowledge, understanding and skills from the taught modules in a real-life situation to address problems faced by industrial clients; creating new problem diagnoses, designs, or system insights; and communicating findings in a professional manner in written, oral and visual forms.

C. MSc in Advanced Mechanical Engineering

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 6. Define a research question, develop aim(s) and objectives, select and execute a methodology, analyse data, evaluate findings critically and draw justifiable conclusions, demonstrating self-direction and originality of thought.

ILO 7. To communicate their individual research via a thesis and in an oral presentation in a style suitable for academic and professional audiences.

4. How is the course taught?

Students will be supported in their learning and personal development by:

Engaging with the wider learning environment at Cranfield through attendance of seminars and lectures arranged from time to time. It is confirmed that the course will be delivered by conventional means with no element of distance learning and/or flexible delivery. The students will have access to the e-learning support through the VLE.

The taught programme is generally delivered from October to February and is divided into 5 core and 3 applied modules. Each core module is generally delivered over one week, whereas each applied module is delivered over two weeks at Cranfield.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction Week Structural Integrity Fluid Mechanics Loading Computational Fluid Dynamics for Renewable Energy	0 10 10 10
ELECTIVE MODULES:	
1 module from: Engineering Project Management Short Research Project Plus 2 modules from: Component DesignDesign of Offshore Energy Structures Risk and Reliability Engineering Engineering Stress Analysis: Theory and Simulations Applied Materials and Corrosion	 10 10 10 10 10 10 10
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.
[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

Description	Credits
COMPULSORY MODULES:	
Induction week Fluid Mechanics and Loading Risk and Reliability Engineering Engineering Stress Analysis: Theory and Simulations Computational Fluid Dynamics for Renewable Energy Structural Integrity Applied Materials and Corrosion Group project (Full time students)	0 10 10 10 10 10 10 40
ELECTIVE MODULES:	
Either: Engineering Project Management Component Design Or: Short Research Project Design of Offshore Energy Structures Part Time Students must choose one of: Group Project OR Dissertation	 10 10 10 10 40 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Induction week Fluid Mechanics and Loading Risk and Reliability Engineering Engineering Stress Analysis: Theory and Simulations Computational Fluid Dynamics for Renewable Energy Structural Integrity Applied Materials and Corrosion Group project (Full time students) Individual Research Project	0 10 10 10 10 10 10 40 80
ELECTIVE MODULES:	
Either: Engineering Project Management Component Design	 10 10

Or Short Research Project Design of Offshore Energy Structures Part Time Students must choose one of: Group Project OR Dissertation	 10 10 40 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [5]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

[5] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

Full-time students register for the course in October and are expected to complete the course within 12 calendar months.

This course is also offered on a part-time basis for which students most register in October, and to complete the course within 24 or 36 (accordingly to the study plan agreed) calendar months.

Taught part 1: Modules
Each module is delivered over two weeks, using a combination of face to face and online activities. Modules are given in the period between October and February. The exams will be scheduled for the first week in January. Full time students will undertake all modules in the same academic year. Part time students will agree a time plan with the Course Director before the start of the first year of their studies.

Taught part 2: Group Project / Dissertation (part time students only)
The Group Project takes place after the completion of the taught modules phase and consists of a total of 16 contact hours with a member of the teaching staff and 384 hours of private study and collaboration with the student members of the group. This corresponds roughly to 1.5 contact hours and 38 private study/group working hours per week. This module is compulsory for full time students, and optional for part time students. Part time students have the option of completing a Dissertation as an alternative to the Group Project. If part time students chose to take the Group Project module instead of completing a Dissertation they are required to attend (in person or remotely, i.e. through video conferencing software) the weekly group project meetings. A member of the teaching staff attends these meetings and attendance is recorded. It is compulsory for the part-time students to attend in person the first Group Project meeting (usually on the last week of February) and the last meeting, when a group presentation with a poster is held. The majority of the work involved in the group project occurs outside the weekly meetings and is planned and organized by the students. For part time students, this collaboration outside the weekly meetings can be performed through attendance in person/remotely, phone, e-mail, written interim reports, etc. The group will nominate a minute taker and chair weekly, who take notes of these activities and report them to the group supervisor. Furthermore, the students use a shared drive owned by the Department, this is a repository for all the material produced and collected during the project. The supervisor, as member of the teaching staff, has access to it and he/she can monitor in a direct way the progresses of both part-time and full-time students.

Students opting for the Part-Time Dissertation will be assigned a supervisor by the Course Director and will agree with the supervisor an appropriate topic of study. This may be related to a workplace/industrial activity that is relevant to the student's work environment. The Dissertation will include a comprehensive literature review of classical and contemporary related material and also a discussion and properly argued conclusions. Where appropriate the Dissertation will acknowledge the work and contribution of others. The Dissertation module will be assessed in a similar way to the Group Project by presentation and formal report.

Taught Part 3: Individual Research Project
For full time students, the Individual Research Project takes place during the period (April-September.
By the end of March each year, each student will be allocated to a project supervisor who will guide them in selecting a research project. **Part time students** should define their research projects, to be undertaken commonly either partly or totally at their place of work, by the beginning of the second year of registration.

After the completion of the Group Project, full time students commence working on their research projects on a full-time basis. The research activity for part-time students starts commonly at the beginning of second year of registration (i.e. after successfully completing three taught modules). All students are required and must maintain regular contact (meetings, telephone conversations or e-mail correspondence) with their personal supervisor to discuss progress.

7. Course Level Assessment Strategy[6]

Taught modules:

- The assessment strategy for the taught modules is to have a wide range of assessment types. This includes:
    - Written assignments (individual course work):
        - Engineering Stress Analysis: Theory and Simulations:
        - Fluid Mechanics and Loading: A clear assignment discussing three technical areas.
        - Component Design: a report on student design projects.
        - Computational Fluid Dynamics for Renewable Energy: To attempt and reflect upon the application of CFD.
        - Applied Materials and Corrosion: A simulated lab report with expanded discussion section.
        - Engineering Project Management: A 6-page proposal for a project to include project background, aims and objectives, and methods. This should also include consideration of the project risks, finances and ethical issues, along with a project plan (Gantt chart).
        -
    - Exams:
        - Risk and Reliability Engineering: Demonstrate the understanding and ability to apply the theories and concepts taught in the module
        - Structural Integrity: Demonstrate the understanding and ability to apply the theories and concepts taught in the module
- Summative assessment will address the course ILOs:
    - Engineering Stress Analysis: Theory and Simulations: 3
    - Fluid Mechanics and Loading: 1 & 3
    - Risk and Reliability Engineering: 3
    - Structural Integrity: 3
    - Computational Fluid Dynamics for Renewable Energy: 1 & 3
    - Applied Materials and Corrosion: 1, 2 & 3
    - Component Design: 1, 2 & 3
    - Engineering Project Management: 4
- The reports will help students in their future employment and professional practice in disseminating information, while the exams are intended to evaluate students' handling of applying a novel situation to an existing framework for solution.
- Formative feedback includes:
    - Guided Exercises/Numerical Sessions (Fluid Mechanics and Loading, Structural Integrity): to take students through representative problems and familiarise them with different tactics for tackling them.
    - Case studies/Examples workshops (Fluid Mechanics and Loading, Risk and Reliability Engineering, Applied Materials and Corrosion): to allow students to discuss real world examples of the theory they are learning.
    - Group discussions (Risk and Reliability Engineering, Applied Materials and Corrosion, Engineering Project Management): engage in and contribute to group discussions during the lectures, practical sessions and workshop.
    - Practical/Workshop Sessions (Fluid Mechanics and Loading, Component Design, Risk and Reliability Engineering, Structural Integrity, Computational Fluid Dynamics for Renewable Energy, Applied Materials and Corrosion,): to allow experience of representative skill sets.

[6] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

- Student Presentations (Applied Materials and Corrosion): students practice presentation skills, reflect upon their experience, and get feedback from staff.

- The VLE is used:
  - In standard years for purposes including:
    - Sharing of course materials not limited to lecture materials, notifications and assignment briefings.
    - In Engineering Stress Analysis: Theory and Simulation to provide formative feedback at the end of each day.
    - In Structural Integrity to provide formative feedback at the end of each day.
  - In years with disrupted face-to-face teaching (e.g. pandemics) and as needed in other years:
    - For the dissemination of module information including links to online sessions, project specific discussion boards and other learning materials.

Group Project:
The group project provides the students with the opportunity to gain professional skills expected of the workplace. In addition to technical skill practice, students develop a range of soft skills such as team working, problem solving, communication skills and reflective practice. The students work in small consultancy teams typically on a client-sponsored project for a period of 10 weeks. Many teams will be made up of students from different courses giving the students the opportunity of working in an interdisciplinary team. The students are responsible for interpreting the brief, developing a project plan, selecting and implementing a methodology, deriving results, analysing the results and drawing conclusions in alignment with the aims and objectives. All students participate in a peer review activity providing them with the opportunity to reflect on the practices of their colleagues as well as their own. Peer review feedback is provided individually by an independent member of academic staff. A single group report is produced and the project is presented orally at the concluding Exhibition Day, both elements are summatively assessed by independent markers and a group mark is assigned for element. Individual assessment is derived from supervisor observation and meeting minute actions and an individual reflective report where the students reflect on the development of three soft skill competencies based on objectives that they set for themselves. The team working competency is mandatory as one of the three skills for each student.

Dissertation:
Part time students are not required to complete the Group Project undertaken by the full time registered students on a SWEE MSc course. An alternative assignment takes the form of a dissertation or design project which in most situations will be based around a topic relevant to the work of the part-time student. It is evident that some aspects of the Group Project experience that the work-based dissertation replaces – for example the client interaction and group dynamics components will not directly replicated by undertaking this assignment. It is expected that these experiences would normally be a part of the normal working life of the part-time student.

It is expected that the dissertation will normally consist of the following elements: Abstract, Background context, Introduction to the theme(s) addressed within the dissertation and setting out the issues that will be covered, Methodology, In depth analysis/discussion of the topics discussed, Concluding remarks, References, Appendices (if relevant). Two supervisors are allocated to the dissertation and supervision follows the model used for the independent research project. The student will submit a 6000-word report and will give an oral presentation of their work. Both elements of assessment will be marked by independent assessors.

Individual Research Project/Thesis:
The individual research project requires students to further develop problem definition, hypothesis setting, select and execute a methodology, analyse data, and evaluate findings and draw appropriate conclusions in the context of research questions relevant to the student's course. The student is required to

communicate their findings successfully via a thesis, written in the style of a standard thesis, and via an oral presentation based around a poster. The projects are designed to integrate knowledge from the taught modules, and apply understanding and skills from the group project, to deliver a high-quality written thesis and oral presentation. The individual research project/thesis is typically delivered through collaboration with an industrial sponsor, or it may be an ‘internal’ project reflecting the research interests of the School.

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments[11]	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
1	I-ENE-INWK Occ A	Induction	Patrick Verdin	24		0	Y		03/10/22	07/10/22	N/A	AO	N/A				N/A	
2	N-AME-RR Occ A	Risk and Reliability Engineering	Nigel Simms	27		10	Y		10/10/22	21/10/22	50	EX	100				w/c 02/01/23	05/23
3	N-AME-SI	Structural Integrity	Luofeng Huang	38.5		10	Y		24/10/22	04/11/22	50	EX	100				w/c 02/01/23	05/23

[7] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[8] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[9] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[10] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[11] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[12] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[13] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
4	N-AME-ESA Occ A	Engineering Stress Analysis: Theory and Simulations	Luofeng Huang	32		10	Y		07/11/22	18/11/22	50	ICW	100				FT 19/11/22 PT 03/12/22	05/23
5	I-OOT-A1076 Occ A	Applied Materials and Corrosion	Joy Sumner	30		10	Y		21/11/22	02/12/22	50	ICW	100				FT 03/12/22 PT 17/12/22	05/23
6	N-AME-FML Occ A	Fluid Mechanics and Loading	Liang Yang	30		10	Y		05/12/22	16/12/22	50	ICW	100				FT 17/12/22 PT 14/01/23	05/23
7	N-REE-CFDR	Computational Fluid Dynamics for Renewable Energy	Patrick Verdin	30		10	Y		09/01/23	20/01/23	50	ICW	100				FT 21/01/23 PT 04/02/23	05/23
8	N-AME-CD	Component Design	Paul Lighterness	70		10	N		23/01/23	03/02/23	50	ICW	100				FT 18/02/23 PT 18/02/23	05/23
9	N-RNE-RES	Design of Offshore Energy Structures	Liang Yang	25		10	Y		23/01/23	03/02/23	50	ICW	100				FT 04/02/23 PT 18/02/23	05/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
10	N-OFF-SRP Occ B	Short Research Project	Ying Jiang	10		10	Y		06/02/23	17/02/23	50	ICW	100				FT 18/02/23 PT 04/03/23	05/23
11	N-AME-EPM	Engineering Project Management	Phil Hart	20		10	Y		20/02/23	03/03/23	50	ICW	100				FT 04/03/23 PT 18/03/23	05/23
12	I-ENE-GRPP Occ A	Group Project	Patrick Verdin	16		40	Y		06/03/23	12/05/23	50 50 50 50	GCW GPRES ICW RP	64 16 10 10				05/05/23 02/05/23 12/05/23 13/05/23	
13	I-ENE-DISS Occ A	Dissertation (P/T students only)	Patrick Verdin	10		40	Y		06/03/2	29/09/23	50	IPROJ IPRES	80 20				22/09/23 wc 25/09/23	09/24
14	I-ENE-THESIS Occ A	Energy Individual Research Project	Patrick Verdin	20		80	Y		15/05/23	08/09/23	50 50	OR THESIS	10 90				w/c 28/08/23 04/09/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-AME-EPM	Engineering Project Management	Advanced Mechanical Engineering	• Advanced Mechanical Engineering • Advanced Heat Engineering • Advanced Chemical Engineering • Renewable Energy (Management route)
N-AME-ESA	Engineering Stress Analysis: Theory and Simulations	Advanced Mechanical Engineering	• Renewable Energy (Engineering route) • Mechanical Engineering (Jiangsu)
N-AME-RR	Risk and Reliability Engineering	Advanced Mechanical Engineering	• Mechanical Engineering (Jiangsu)
N-AME-FML	Fluid Mechanics and Loading	Advanced Mechanical Engineering	• Renewable Energy (Engineering route) • Mechanical Engineering (Jiangsu)
I-OOT-A1076	Applied Materials and Corrosion	Advanced Mechanical Engineering	• Advanced Mechanical Engineering • PhD in Materials and Corrosion for Energy Systems (Jiangsu)
N-RNE-RES	Design of Offshore Energy Structures	Renewable Energy	• Advanced Mechanical Engineering
N-OFF-SRP	Short Research Project	Renewable Energy	Renewable Energy (Management route) • Advanced Mechanical Engineering

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students can expect to have two written examinations, eight pieces of assessment by submitted work and two elements of assessment by presentation or viva. This approach has been adopted in order to provide a balance between formal examination and a less rigid written/verbal communication.

Formal lecture courses are examined in accordance with the School of Water, Energy and Environment practice. Prior to the examinations taking place all examination papers are seen and approved first by a member of the department and then by the course external examiner.

The underlying assessment strategy across all modules will be to examine the understanding of mechanical engineering principles and applications. This will be achieved by testing the ability to solve realistic multi-disciplinary problems within a Mechanical Engineering context. Proper application and appreciation of mechanical engineering models and methodologies will be paramount to the successful completion of the course.

Coursework will be set to reinforce and expand taught elements of the course. This will be a combination of open-ended assignments and analytical/numerical based problem solving. Coursework will be assessed on the rigour and quality of the reports with merit given to diligence and evidence of understanding of the underlying methods.

- Each course member is required to make a formal presentation on his/her Individual Research Project.
- Upon submission, all theses are reviewed by two internal examiners (one examiner being the course member's supervisor), plus the external examiner.
- If the Individual Research Project mark awarded by the internal examiners varies significantly, then a third internal examiner is appointed.
- All course members are subject to a presentation or viva voce examination in the presence of members of Academic staff.

Assessment of Individual MSc Theses
The Individual Research Project (IRP) tests:

- The ability to define the project by reference to scientific, technical and/or commercial literature, the critical appraisal of such literature and the justification of the research;
- The ability to plan and manage the research programme, to define the work to be carried out and to report the results in a clear manner;
- The ability to analyse the work, relate it to the work of others where appropriate and to be self-critical;
- To communicate the work, its results and analysis in a technical and well-presented document.

Assessment of the Group Project (GP)
The Group project tests:

- The ability to undertake the design of an engineering component or system, and substantiate the design through analysis;
- The ability to plan and manage the design project programme, to define the work to be carried out and to report the results in a clear manner;
- The ability to analyse the design, relate it to the work of others where appropriate and to be self-critical;
- To communicate the design, its results and analysis in an oral presentation and in a technical and well-presented document.

Assessment of the Dissertation (Part-Time option) module tests:

- The ability to plan, structure and manage a detailed study of an engineering process, system, component or methodology and to communicate results in a clear manner;
- The ability to assemble a workplace/industrial activity into a coherent study formulating properly argued conclusions and where appropriate building upon and acknowledging the work and contribution of others;
- The ability to analyse and where appropriate to relate to the work of others and to be self-critical;
- To communicate the dissertation in an oral presentation and in a technical and well-presented document.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3.	ILO 4.
3	ICW	ICW	ICW	
4	EX	EX	EX	
2	EX	EX	EX	
5	ICW	ICW	ICW	
6	ICW	ICW	ICW	
7		ICW	ICW	
8	ICW	ICW	ICW	
9			ICW	ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 5.
10	GCW GPRES ICW RP
11	IPROJ IPRES

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 6.	ILO 7.
12	THESIS OR	THESIS OR

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

NONE

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.

2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Graduates from the course will be equipped with the academic skills and requirements to successfully pursue a career in a Mechanical Engineering discipline whether this is technical, management or research.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Advanced Motorsport Engineering
Course code	MSAMGFTC, PDAMGFTC, PCAMGFTC
Academic Year	2022-2023
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-Time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Advanced Vehicle Engineering Centre
Course Director	Mr Clive Temple
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	First or Upper Second class UK Honours degrees or the international equivalent in engineering, aerospace, materials science and closely

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

	related disciplines such as Maths and Physics, who wish to gain knowledge of the engineering, , science, technologies and management relevant to motorsport. For students where their first language is not English they will need to provide evidence that they have achieved a satisfactory test result in an English qualification. The minimum requirement is IELTS – 7 or an equivalent (with 7 in both speaking and writing), approved test.
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Advanced Vehicle Engineering Centre and other centres within the School where the research interests include:

- Active and passive aerodynamics
- Computational Fluid Dynamics (CFD)
- Carbon reduction and environmental impact
- Alternative energy sources, energy recovery systems and energy efficiency
- High temperature surface engineering including coatings
- Low carbon vehicles
- Powertrain development and refinement including Internal Combustion Engine (ICE), hybrids and Electric Vehicles (EV)
- Condition monitoring and reliability
- Precision engineering
- Simulation including the supply of race car simulators to F1 (Cranfield Simulation)
- Structural integrity and FIA approved impact testing including F1 and Le Mans Prototype (LMP) (Cranfield Impact Centre)
- Tyre modelling and characterisation
- Vehicle dynamics including on circuit and off road
- Vehicle light weighting, novel materials and composites with special reference to niche vehicles such as competition cars and motorcycles.
- Electronics and data acquisition
- Mechatronics
- The motorsport business cluster, technology transfer and diversification

Teaching and assessment is also provided by staff at the Shrivenham campus. Students benefit from access to motorsport related facilities at both campus sites.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the following PSRBs on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng):

- The Institution of Mechanical Engineers (IMechE) until August 2026,
- The Royal Aeronautical Society (RAeS) until August 2026
- The Institution of Engineering and Technology (IET) until August 2025

Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- provide students with a sound understanding of the fundamental scientific, engineering and managerial principles as applied to motorsport, and their implementation within a high performance technology context
- provide students with a clear knowledge of the design, construction and operation of competition vehicles, and related aspects of materials science, aerodynamics, structural analysis, vehicle systems, and management techniques related to motorsport.
- equip students with the skills required for the planning, execution and reporting of motorsport projects and to prepare them for a variety of roles in motorsport.

This programme is intended for the following range of students:

- First or Upper Second class UK Honours degrees or the international equivalent in engineering, aerospace, materials science and closely related disciplines such as Maths and Physics, who wish to gain knowledge of the engineering, management, science and technologies relevant to motorsport. Maths and physics applicants will be expected to understand mechanical and aeronautical engineering as applied to cars and motorcycles. All applicants should demonstrate an involvement of working with cars and motorcycles, even if this is through hobby interests.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. analyse key engineering and business subjects as applied to motorsport
ILO 2. judge the technologies which underpin motorsport engineering
ILO 3. rate business and engineering related disciplines in the context of motorsport

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. formulate managerial skills for a group project
ILO 5. evaluate one or more motorsport engineering applications.
ILO 6. assess their personal development with reference to individual contribution in a team working context.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 7. appraise an area or areas of motorsport engineering through individual research.
ILO 8. synthesise their individual research in the form of a thesis report and poster

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Provision of lectures from academics, leading industry experts and practitioners highlighting the practical implementation and constraints associated with the theoretical principles introduced on the programme.
- All course material is available via the web-based learning environment Canvas.
- The course is timetabled as a series of modules thereby allowing diligent students to effectively manage the assessment requirements of the course.
- The provision of non-assessed study-skills training covering areas such as; academic report writing, presentation skills, research skills and working with University facilities (IT, library, Student Support Services).
- The extensive use of tutorial sessions and computer aided engineering exercises employing software packages commonly utilised in industry, including Matlab, LabView, AVL Boost, Control Desk, ChassisSim and Dymola.
- The opportunity to complete an individual Research Project, which may be sponsored by industry and using industry scale laboratory facilities and software packages (academic licences or commercial licences where the supporting companies make these available.
- Through the Taught Modules, Group Design and individual Research Project, students are encouraged to develop their transferable skills (such as oral and written communication skills, independent learning, networking and project management).
- Problem-based learning - this kind of learning encourages self-conducted, individualised learning and thereby also the students' own responsibility for learning, it should also support the personal and professional growth of the student.
- Use of experiences from laboratory or industrial practice, as a starting point when training abilities for problem solving and critical analysis, should greatly increase integration between theory and practice.
- Theoretical class exercises as a means for the students to learn how to apply variations of common solutions to standard problems and students get feedback from colleagues and lecturers.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Introduction to Motorsport	0
ELECTIVE MODULES:	
To accumulate 60 credits from Modules 2-9	60
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	

Introduction to Motorsport Modules 2-9 Group Design Project	0 80 40
ELECTIVE MODULES:	
N/A	N/A
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	
Introduction to Motorsport Modules 2-9 Group Design Project Individual Research Project	0 80 40 80
ELECTIVE MODULES:	
N/A	N/A
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
- if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
- it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.

- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months, submitting their thesis, undertaking the oral examination with poster and attending the industrial thesis exhibition in September (students with restricted thesis are not required to attend the exhibition).

Each module is taught over five days, usually with an intervening week for assimilation and time to work on the assignments or revise for examinations.

7. Course Level Assessment Strategy[4]

The assessment strategy encompasses individual as well as group work. There is a blend of assignments and examinations across the assessed modules, although it is important to note that each module has one form of assessment. The modules contribute 80 credits (40%). Where the group design project is concerned students are assessed in terms of their group and individual contribution and reflection. The assessment comprises group coursework and presentation, a self reflective review and contribution evaluation based on evidence such as meeting minutes. This equates to 40 credits in total (20%). Finally the remaining 80 credits (40%) are assigned to the individual research project. Here the distribution is 80% for the thesis and 20% for the thesis individual presentation with research project poster. The combination of these forms of assessment with their various weightings determine the award of the Master's degree. In addition there are exit routes of Postgraduate Diploma (PgD) and Postgraduate Certificate (PgC) should the student not attain the MSc award. Students will be supported in their learning and personal development by:

- Problem-based learning - this kind of learning encourages self-conducted, individualised learning and thereby also the students' own responsibility for learning, it should also support the personal and professional growth of the student.
- Use of experiences from laboratory or industrial practice, as a starting point when training abilities for problem solving and critical analysis, should greatly increase integration between theory and practice.
- Theoretical class exercises as a means for the students to learn how to apply variations of common solutions to standard problems and students get feedback from colleagues and lecturers.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

[Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1		I-MEM-INWK	Motorsport Introduction	Clive Temple	17	0	0	Y	01/09/22	27/09/22	30/09/22	N/A	AO	N/A				N/A	N/A
2		I-MEM-A1519	Motorsport Structural Analysis	Dr Marzio Grasso	35	0	10	N	06/02/2023	06/02/2023	10/02/2023	50	GPRES	100				17/02/2023	At the next available opportunity which may not be until the course runs the following year

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

[Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3		I-MEM-A1001	Motorsport Electronics and Data Acquisition	Dr Kim Blackburn	35	0	10	Y	17/10/2022	17/10/2022	28/10/2022	50	EX	100				04/01/2023	At the next available opportunity which may not be until the course runs the following year
4		I-MEM-A1007	Motorsport Vehicle Dynamics	Dr James Brighton	35	0	10	Y	07/11/2022	07/11/2022	18/11/2022	50	EX	100				04/01/2023	At the next available opportunity which may not be until the course runs the following year)
5		I-MEM-A1006	Motorsport Aerodynamics	Prof Kevin Garry	35	0	10	N	28/11/2022	28/11/2022	02/12/2022	50	GCW	100				09/12/2022	At the next available opportunity which may not be until the course runs the following year
6		I-MEM-A1012	Computational Fluid Dynamics for Motorsport	Clive Temple	35	0	10	N	09/01/2023	09/01/2023	20/01/2023	50	ICW	100				20/01/2023	At the next available opportunity which may

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

[Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																			not be until the course runs the following year
7		I-MEM-A1005	The Business of Motorsport	Clive Temple	35	0	10	Y	31/10/2022	31/10/2022	04/11/2022	50	GCW	100				25/11/2022	At the next available opportunity which may not be until the course runs the following year
8		I-MEM-A1004	Composite Structures for Motorsport	Dr Veronica Marchante Rodriguez	35	0	10	N	23/01/2023	23/01/2023	27/01/2023	50	EX	100				February 2023 (Week 3)	At the next available opportunity which may not be until the course runs the following year
9		I-MEM-A1008	Motorsport Powertrains	Clive Temple	35	32	10	Y	03/10/2022	03/10/2022	14/10/2022	50	ICW	100				14/10/2022	At the next available opportunity which may not be until the course

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

[Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																			runs the following year
10		I-MEM-GRPP	Group Design Project	Clive Temple / Dr Kim Blackburn	40	0	40	Y	27/02/2023	27/02/2023	19/05/2023	50 50 50	GCW GPRES ICW	64 16 20				12/05/23 15/05/23 19/05/23	N/A
11		I-MEM-THESIS	Individual Research Project	Clive Temple / Dr Kim Blackburn	40	n/a	80	Y	27/09/2022	22/05/2023	05/09/2023	50 50	THESIS IPRES	80 20				31/08/23 04/09/23-05/09/23	N/A

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
I-MEM-INWK	Motorsport Introduction	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-A1001	Motorsport Electronics and Data Acquisition	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-A1007	Motorsport Vehicle Dynamics	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-A1005	The Business of Motorsport	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-A1008	Motorsport Powertrains	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-GRPP	Group Design Project	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-THESIS	Individual Research Project	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students can expect to have written examinations, assessment by submitted work and elements of assessment by oral presentation or viva. However, only one form of assessment will be used in relation to a taught module, either an assignment or a closed book examination.

This approach has been adopted in order to offer diversity in assessing students in relation to learning outcomes. The Course also employs peer- and self-assessment activities to reinforce the reflective abilities that are necessary for working effectively in teams. These encourage student involvement with their learning, and give them some sense of responsibility with regards to the unit of study.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3.
1	AO	AO	AO
2	GPRES	GPRES	
3	EX	EX	EX
4	EX	EX	EX
5	GCW	GCW	GCW
6	ICW	ICW	ICW
7		GCW	GCW
8	EX	EX	EX
9	ICW	ICW	ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 4.	ILO 5.	ILO 6.
10	GCW	GPRES GCW	ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 7.	ILO 8.
11	THESIS	IPRES THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
N/A	N/A	N/A	N/A
		N/A	N/A

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as

a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Engineering roles in motorsport and high performance engineering including design roles, technical sales engineering posts and track-side related positions. Former students have gone onto careers in F1, Indy Cars and other single seat formulae, WRC, WRX. Moto GP, BSB, endurance racing including LMP and GT categories, touring cars, electric vehicle racing series such as FIA Formula E, motorsport equipment manufacturers and suppliers, automotive OEMs, niche high performance engineering companies and consultancies

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc Advanced Motorsport Mechatronics
Course code	MSAMMFTC PDAMMFTC PCAMMFTC
Academic Year	2022-2023
Valid entry routes	MSc
Additional exit routes	PGDip, PGCert
Mode of delivery	Full-Time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Advanced Vehicle Engineering Centre
Course Director	Clive Temple
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements and IELTS 7 (with 7 in both speaking and writing)

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	One year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Transport Systems, Advanced Vehicle Engineering Centre where the research interests include:

> motorsport engineering and business, vehicle electrification including powertrain, Internal Combustion Engine (ICE), and hybrid powertrain, advanced control, multi-domain modelling, autonomous technologies, low carbon vehicles, vehicle dynamics on circuit and off road, simulation, electronics and data acquisition. Beyond the centre we will draw upon Cranfield's research related expertise and underpinning facilities.

Cranfield University interacts with the following institutions and in the following ways:

> The Engineering Council in relation to the IET, IMechE and RAeS for accreditation

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the following PSRB's on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng):

- the Institution of Engineering and Technology (IET) until August 2025
- the Institution of Mechanical Engineers (IMechE) until August 2026

Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

- Provide students with a sound understanding of the fundamental scientific, engineering and managerial principles involved in motorsport, and their implementation within a high performance technology context
- Provide students with an overview of the knowledge of the design, construction and operation of competition vehicles, and related aspects of aerodynamics, vehicle dynamics, vehicle systems, control systems, electronics, data acquisition, simulation and the business context of and management techniques related to motorsport and high performance engineering.
- Equip students with the skills required for the planning, execution and reporting of Motorsport mechatronics related projects and to prepare them for a variety of roles in motorsport, either within the factory and/or working trackside with competition teams and their suppliers.
- Meet employer demand for post graduate engineers who have applied analytical skills in motorsport mechatronics and niche high performance vehicle system and component design to meet the challenge of motorsport competition with reference to the technical and sporting regulations. These include the demands associated with the safety of competitors, officials, spectators, along with vehicle and trackside safety. The M-level graduates developed skills will also support performance, competitive advantage and sustainability with reference to environment considerations.
- Provide a primary training and dissemination route for Cranfield University's increasing research portfolio in the area of low carbon vehicle technologies and design methods.

- Supply to the motorsport, niche high performance and mainstream automotive segments (and associated supply chains) high calibre post graduate engineers with the technical, managerial qualities, transferable skills and independent learning ability to make them effective in organisations that utilise mechatronics in their businesses.

This programme is intended for the following range of students:

- First or Second class UK Honours degrees or the international equivalent in engineering, aerospace, mathematics, physics and closely related disciplines such as electronics who wish to gain knowledge of the engineering, management, science and technologies relevant to motorsport mechatronics.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Analyse methodologies and design considerations, in relation to engineering, including mechatronics applications, and business subjects in the context of motorsport.
ILO 2. Evaluate the performance of a range of technologies which underpin motorsport engineering, with reference to those related to mechatronics systems;
ILO 3. Assess the impact of different mechatronic systems as applied to motorsport, using simulation tools and benchmarking.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Select and then apply a range of managerial techniques and business solutions within a group project environment;
ILO 5. Evaluate the engineering trade-offs and design constraints of one or more motorsport mechatronics applications in relation to a motorsport engineering group design project;
ILO 6. Assess their personal development with reference to individual contribution in a team working context.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 7. Appraise an area or areas of motorsport mechatronics through individual research;
ILO 8. Synthesise their individual research in the form of a thesis report and poster.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Provision of lectures from academics, leading industry experts and practitioners highlighting the practical implementation and constraints associated with the theoretical principles introduced on the programme.
- All course material is available via the web-based learning environment Canvas.
- The course is timetabled as a series of modules thereby allowing diligent students to effectively manage the assessment requirements of the course.

- The provision of non-assessed study-skills training covering areas such as; academic report writing, presentation skills, research skills and working with University facilities (IT, library, Student Support Services).
- The extensive use of tutorial sessions and computer aided engineering exercises employing software packages commonly utilised in industry, including Matlab, LabView, AVL Boost, Control Desk, ChassisSim and Dymola.
- The opportunity to complete an individual Research Project, which may be sponsored by industry and using industry scale laboratory facilities and software packages (academic licences or commercial licences where the supporting companies make these available.
-
- Through the Taught Modules, Group Design and individual Research Project, students are encouraged to develop their transferable skills (such as oral and written communication skills, independent learning, networking and project management). Problem-based learning - this kind of learning encourages self-conducted, individualised learning and thereby also the students' own responsibility for learning; it should also support the personal and professional growth of the student.
- Use of experiences from laboratory or industrial practice, as a starting point when training abilities for problem solving and critical analysis, should greatly increase integration between theory and practice.
- Theoretical class exercises including motorsport related case studies as a means for the students to learn how to apply variations of common solutions to standard problems and students get feedback from colleagues and lecturers.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
N/A	
ELECTIVE MODULES:	
60 credits from modules 2-9	60
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules: 2-9 Group Project: 10	80 40

ELECTIVE MODULES:	
N/A	
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules: 2-9 Group Project: 10 Individual Research Project: 11	80 40 80
ELECTIVE MODULES:	
N/A	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months.

Within the first term, all students will attend most of the MSc Advanced Motorsport Engineering modules. During the second term, students will attend most of the MSc Automotive Mechatronics modules. The Group Design Project will be distributed over term 2. For the duration of the 3rd term, students will have the opportunity to undertake their individual Research Project. There are no elective elements within the individual courses.

7. Course Level Assessment Strategy[4]

The assessment strategy encompasses individual as well as group work. There is a blend of assignments and examinations across the assessed modules, although it is important to note that each module has one form of assessment. The modules contribute 80 credits (40%). Where the group design project is concerned students are assessed in terms of their group and individual contribution and reflection. The assessment comprises group coursework and presentation, a self reflective review and contribution evaluation based on evidence such as meeting minutes . This equates to 40 credits in total (20%). Finally the remaining 80 credits (40%) are assigned to the individual research project. Here the distribution is 80% for the thesis and 20% for the thesis individual presentation with research project poster. The combination of these forms of assessment with their various weightings determine the award of the Master's degree. In addition there are exit routes of Postgraduate Diploma (PgD) and Postgraduate Certificate (PgC) should the student not attain the MSc award. Students will be supported in their learning and personal development by:

• Provision of lectures from academics, leading industry experts and practitioners highlighting the practical implementation and constraints associated with the theoretical principles introduced on the programme.
• All course material is available via the web-based learning environment Canvas.
• The course is timetabled as a series of modules thereby allowing diligent students to effectively manage the assessment requirements of the course.
• The provision of non-assessed study-skills training covering areas such as; academic report writing, presentation skills, research skills and working with University facilities (IT, library, Student Support Services).
• The extensive use of tutorial sessions and computer aided engineering exercises employing software packages commonly utilised in industry, including Matlab, LabView, AVL Boost, Control Desk, ChassisSim and Dymola.
• The opportunity to complete an individual Research Project, which may be sponsored by industry and using industry scale laboratory facilities and software packages (academic licences or commercial licences where the supporting companies make these available.
• Through the Taught Modules, Group Design and individual Research Project, students are encouraged to developtheir transferable skills (such as oral and written communication skills, independent learning, networking and project management).
• Problem-based learning - this kind of learning encourages self-conducted, individualised learning and thereby also the students' own responsibility for learning; it should also support the personal and professional growth of the student.
• Use of experiences from laboratory or industrial practice, as a starting point when training abilities for problem solving and critical analysis, should greatly increase integration between theory and practice.
• Theoretical class exercises including motorsport related case studies as a means for the students to learn how to apply variations of common solutions to standard problems and students get feedback from colleagues and lecturers.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

[Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1		I-MEM-INWK	Motorsport Introduction	Clive Temple	17	0	0	Y	01/09/22	27/09/2022	30/09/2022	N/A	AO	N/A				N/A	N/A
2		I-MEM-A1001	Motorsport Electronics and Data Acquisition	Dr Kim Blackburn	35	0	10	Y	17/10/2022	17/10/2022	28/10/2022	50	EX	100				04/01/2023	At the next available opportunity which may not be until the course runs the following year
3		I-MEM-A1007	Motorsport Vehicle Dynamics	Dr James Brighton	35	0	10	Y	07/11/2022	07/11/2022	18/11/2022	50	EX	100				04/01/2023	At the next available opportunity

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

[Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																			which may not be until the course runs the following year
4		N-AP-AM03	Vehicle Control Applications	Dr Marco Cecotti	30		10	Y	06/02/2023	06/02/2023	10/02/2023	50	ICW	100				24/02/2023	Sept 2023
5		I-MEM-A1005	The Business of Motorsport	Clive Temple	35	0	10	Y	31/10/2022	31/10/2022	04/11/2022	50	GCW	100				25/11/2022	At the next available opportunity which may not be until the course runs the following year
6		I-MEM-A1008	Motorsport Powertrains	Clive Temple	35	32	10	Y	03/10/2022	03/10/2022	14/10/2022	50	ICW	100				14/10/2022	At the next available opportunity which may not be until the course runs the following year
7		N-AP-AM01	Mechatronics Modelling for Vehicle Systems	Dr Stefano Longo	30		10	Y	28/11/2022	28/11/2022	02/12/2022	50	ICW	100				09/12/2022	Sept 2023
8		N-AP-AM02	Advanced Control and Optimisation	Dr Daniel Auger	30		10	Y	09/01/2023	09/01/2023	20/01/2023	50	ICW	100				20/01/2023	Sept 2023

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

[Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
9		N-AP-AM04	Embedded Vehicle Control Systems	Dr Stefano Longo	30		10	Y	23/01/2023	23/01/2023	27/01/2023	50	ICW	100				03/02/2023	Sept 2023
10		I-MEM-GRPP	Group Design Project	Clive Temple / Dr Kim Blackburn	40	0	40	Y	27/02/2023	27/02/2023	19/05/2023	50 50 50	GCW GPRES ICW	64 16 20				12/05/2023 15/05/2023 19/05/2023	At the next available opportunity which may not be until the course runs the following year
11		I-MEM-THESIS	Individual Research Project	Clive Temple and Dr Kim Blackburn	40		80	Y	27/09/2022	22/05/2023	05/09/2023	50 50	THESIS IPRES	80 20				31/08/2023 04-5/09/2023	N/A

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
I-MEM-INWK	Motorsport Introduction	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-A1001	Motorsport Electronics and Data Acquisition	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-A1007	Motorsport Vehicle Dynamics	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
N-AP-AM03	Vehicle Control Applications	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year)
I-MEM-A1005	The Business of Motorsport	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-A1008	Motorsport Powertrains	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
N-AP-AM01	Mechatronics Modelling for Vehicle Systems	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year)
N-AP-AM02	Advanced Control and Optimisation	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year)
N-AP-AM04	Embedded Vehicle Control Systems	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year)
I-MEM-GRPP	Group Design Project	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics
I-MEM-THESIS	Individual Research Project	Advanced Motorsport Engineering	Advanced Motorsport Mechatronics

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students can expect to have written examinations, assessment by submitted work and elements of assessment by oral presentation or viva. However, only one form of assessment will be used in relation to a taught module, either an assignment or a closed book examination.

This approach has been adopted because:

This approach has been adopted in order to offer diversity in assessing students in relation to learning outcomes. The Course also employs peer- and self-assessment activities to reinforce the reflective abilities that are necessary for working effectively in teams. These encourage student involvement with their learning, and give them some sense of responsibility with regards to the unit of study.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3
1	AO		
2	EX	EX	EX
3	EX	EX	EX
4	ICW	ICW	ICW
5	GCW	GCW	
6	ICW	ICW	ICW
7		ICW	ICW
8		ICW	ICW
9	ICW		ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 4	ILO 5	ILO 6
10	GCW	GCW GPRES ICW	ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 7	ILO 8
11	THESIS	IPRES THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Engineering roles, especially mechatronics related ones, in motorsport and high performance engineering: students are likely to go onto careers in F1, Formula E, WRC, WRX, Moto GP, endurance racing, touring cars, motorsport equipment manufacturers and suppliers, automotive OEMs and consultancies.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: June 2022

1. What is the course?

Course information

Course Title	Advanced Process Engineering
Course code	MSAPRFTC, MSAPRPTC, PDAPRFTC, PDAPRPTC, PCAPRFTC, PCAPRPTC
Academic Year	2021/22 - No new entries, teach out only
Valid entry routes	Cranfield - PgCert, PgDip, MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-Time, Part-Time
Location(s)[1] of Study	Cranfield
School(s)	School of Water, Energy and Environment
Theme	Energy & Power
Centre	Climate and Environmental Protection
Course Director	Dr Dawid P Hanak
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Mastership offered as an open and/or closed course?	No
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	1 year Full-Time, 3 years Part-time
Course Start Month(s)	October for Cranfield

Institutions delivering the course

This course is delivered by the School of Water, Energy and Environment, Energy Theme, Centre for Climate and Environmental Protection where the research interests include:

- Computer-aided process engineering for design, operation, simulation and optimisation of low-carbon energy systems and industrial processes, including carbon capture, utilization, energy from waste, negative CO_2 emission technologies;
- Thermodynamic, economic and environmental assessment of process and energy technologies; and
- Development and testing of technologies for clean fuel production, clean energy and industrial materials production, and emission control.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course at Cranfield is currently accredited by the Institution of Mechanical Engineers (IMechE) until August 2026 and by the Energy Institute until 2025.

2. What are the aims of the course?

Advanced Process Engineering (APE) MSc integrates applied learning experience with internationally-recognised research of the Advanced Process Engineering team, professional development, mentoring and teamwork to transform the engineering and applied science graduates into engineering leaders who will solve global challenges.

The APE MSc content comprises engineering 'know-how' related to design, operation and control of a wide range of process plants, including those in chemical, pharmaceutical, water, food and drink, oil and gas, petrochemical and power industries. A strong emphasis is placed on economic and environmental aspects of process engineering, as well as on risk and reliability throughout the process lifetime (from design to decommissioning). The curriculum of the APE MSc also aims to develop employability and 21st century skills through research-based and applied learning, staff and peer-to-peer mentoring, teamwork, and employment of state-of-the-art computer-aided engineering methods. The course participants also become members of the Advanced Process Engineering team and, through their applied assignments and project, contribute towards solving global challenges.

The course builds on the legacy of the Process Systems Engineering MSc that has evolved over the past 10 years as a result of discussions with Industrial Advisory Panels, employers, sponsors and previous students. The innovation in assessment and delivery has been developed through the review exercise (Sustainability and Innovation Leaders) at SWEE. As a result, the content of the programme of study is updated regularly to reflect changes arising from technical advances, economic factors and changes in legislation, regulations and standards, as well as to meet the requirements of the target audiences.

This programme is intended for the following range of students:

- Engineering and applied science graduates and practicing engineers wishing to pursue a technical management and leadership career in the strongly growing process industry sector.
- Engineering and applied science graduates aiming to develop their start-ups to deliver disruptive solutions in decarbonisation of the process industry.
- Applicants are required to have at least a UK 2nd class honours degree or its equivalent. Applications from candidates with lesser qualifications but with considerable relevant working experience will be considered

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Advanced Process Engineering

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Evaluate the technical, environmental and economic issues involved in the design and operation of process plants and the current practice in process industries.

ILO 2. Create effective and innovative designs, as well as operation, optimisation and control strategies for a broad range of processes via proper methodologies and relevant software.

ILO 3. Design industrial processes, analyse their performance and solve industrial challenges using appropriate theoretical and practical process engineering methods (including risk assessment and management, computer-aided process modelling, economic assessment) to develop well-substantiated recommendations from process feasibility and safety standpoints.

ILO 4. Apply, critically evaluate and reflect on key technical management and leadership principles, including project management, people management, technology marketing, product development and economics, through their own experience

ILO 5. Apply independent learning, especially via the effective use of information retrieval systems and a competent and professional approach to solving problems and optimising the application of existing and emerging technologies.

B. Postgraduate Diploma in Advanced Process Engineering

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO6. Integrate knowledge, skills and behaviours from the taught modules in a real-life situation to address problems faced by industrial clients; creating new problem diagnoses, designs, or system insights; communicating findings in a professional manner in written, oral, and visual

forms; and reflecting on their personal development in a critical and professional manner to enhance self-awareness and identify further development needs.

C. MSc in Advanced Process Engineering

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO7. Define a research question, develop aim(s) and objectives, select and execute a methodology, analyse data, evaluate findings critically and draw justifiable conclusions, demonstrating self-direction and originality of thought.

ILO8: To communicate their individual research via a thesis and in an oral presentation in a style suitable for academic and professional audiences.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- A dedicated electronic VLE site
- One-day workshop in MATLAB training
- Computer-aided process engineering training
  Joining Advanced Process Engineering team
  Arrangement of attendance of relevant modules offered by other MSc programmes

The taught programme is generally delivered from October to December and from January to February. The eight modules are divided into 5 core modules and 3 applied modules. Each module is allocated two weeks on the timetable and will be delivered flexibly during this time, using a combination of online and face to face interactions. The five core modules will be assessed by either an exam or an assignment. The applied modules build on and apply the material taught in the core modules and utilise more interactive teaching methods, such as workshops and practicals. The applied modules are assessed by assignment submitted at the end of the two weeks..

The Group Project is delivered between March and May. Each group will typically include 4-6 students and an academic supervisor will be assigned to each group. Formal project review meetings will be held on a bi-weekly basis at which each student will be required to provide a brief presentation on the work performed to date. The academic supervisor will participate in these project review meetings to record attendance, assess the individual oral presentations and level of contribution to the project and to provide guidance as appropriate. Students taking the group project are required to participate in at least 80% of these review meetings. Additionally, it is expected that students will meet and work on the project outside of the formal meetings. A (student) project co-ordinator will be nominated to ensure that these meetings are used to good effect and appropriate minutes are taken and findings reported to the academic supervisor. Students will be required to attend in person the initial and final project review meetings.

Part-time students have the option to carry out a dissertation project in place of the Group project.

The Individual Research Project is typically delivered between May and September. Each student is allocated a supervisor, who will guide and assess the student work. During the Individual research project period, the supervisor and the student should meet at least every two weeks to review progress made and agree future actions.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction	0
Process Instrumentation and Control Engineering	10
Sustainability and Economic Assessment	10
Process Design and Simulation	10
Advanced Control Systems	10
Computational Fluid Dynamics for Industrial Processes	10
Risk & Reliability Engineering	10
ELECTIVE MODULES:	
N/A	
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction	0
Research Methods and Project Management	10
Sustainability and Economic Assessment	10
Process Design and Simulation	10
Advanced Control Systems	10
Energy Entrepreneurship	10
Risk & Reliability Engineering	10
Process Instrumentation and Control Engineering	10
Computational Fluid Dynamics for Industrial Processes	10
Group Project (Compulsory for Full-Time Students)*	40
ELECTIVE MODULES:	
*Part Time Students: Group Project OR	40

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.
[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

Dissertation	40
TOTAL:	120

C. MSc (at Cranfield)

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	
Induction Research Methods and Project Management Sustainability and Economic Assessment Process Design and Simulation Advanced Control Systems Energy Entrepreneurship Risk & Reliability Engineering Process Instrumentation and Control Engineering Computational Fluid Dynamics for Industrial Processes Group Project (Compulsory for Full-Time Students)* Individual Research Project	0 10 10 10 10 10 10 10 10 40 80
ELECTIVE MODULES:	
Part Time Students: Group Project OR Dissertation	 40 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [5]

[5] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in October) and are expected to complete the course within 12 calendar months.

This course is also offered on a part-time basis. Students would instead attend the required modules of the taught component according to the schedule agreed with the course director. MSc research projects are commonly undertaken in collaboration with the candidate's place of work.

Each module is taught over two weeks, with the second week largely free of structured teaching to allow time for more independent learning and reflection.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) exit routes are provided as exit routes for MSc candidates.

7. Course Level Assessment Strategy[6]

Advanced Process Engineering MSc integrates applied learning experience with professional development, mentoring and teamwork to transform the engineering and applied science graduates into engineering leaders who will solve global challenges. A broad range of assessment tasks, which are designed to stimulate and challenge the students, are incorporated in the modules and projects to enable the students to develop a portfolio of work that demonstrate a full range of skills and attributes. These are aligned with the specific competencies in the UK-SPEC, AHEP3 and designed to incorporate innovative approaches to learning and assessment.

Each module includes both summative and formative assessment, which enable the course team to provide rapid and relevant feedback to the students. The details regarding specific tasks (type, length, requirements) and their classification (formative/summative) are clearly stated in each module descriptor. The module assessments are designed to address the course ILOs 1-6. Considering the variety in backgrounds and experiences of the APE cohorts, the first module (*Risk and Reliability Engineering*) is

Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[6] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

assessed by the closed-book exam. This will enable them to assimilate in the new learning environment and will be the starting point to the transition to more applied learning.

Therefore, in the second (*Computational Fluid Dynamics for Industrial Processes*) and fifth (*Advanced Control Systems*) modules, students will write the technical reports on their modelling and design work with the emphasis placed on discussion of the feasibility of their results. Through this they will learn how to tailor their written communication to the technical and expert audience.

In the third (*Process Design and Simulation*) and fourth (*Sustainability and Economic Assessment*) modules, students will be required to write short essays, which are tailored to a less technical audience, on their analysis of the given case study. This is to help them recognise that writing a more concise report may be more challenging and time consuming. This will also enable students to develop relevant skills to communicate their technical and design work concisely.

In the sixth module (*Energy Entrepreneurship)* students will develop and write a business plan for a venture of their choosing. Understanding of the energy market and business models is crucial for the process engineers to drive change and deploy the innovative net-zero technologies.

In the seventh (*Process Instrumentation and Control Engineering*) module, students will be required to undertake a practical lab work and present their results via group practical (formative) and individual assessment (summative). This will allow them to develop technical communication and presentation skills, essential in work as a process or project engineer.

In the eight module (*Research Methods and Project Management*) students will develop and write the research proposal that will enable them to develop skills in project management (scoping, planning, resources, risk assessment), literature review and design of research methodology that are not only required to complete their group and individual projects successfully, but also to develop as project managers and leaders in process engineering. Ability to concisely describe the considered process, present the assumptions used to develop the models and designs, and accurately discuss the results is crucial for process engineers. Moreover, process engineers and project managers need to be able to prepare reports of varying lengths and containing only key information and message tailored to the target audience. Process engineers need to handle multiple tasks at the same time. Therefore, this assessment task has been designed to enable students to plan their work, prioritise tasks and ensure each task is completed to a satisfactory quality.

Importantly, each module will incorporate opportunities for formative feedback via group discussion, individual presentations, case studies and individual coursework. The students will receive the feedback during or immediately after the formative tasks took place.

The taught modules are followed by the group project (dissertation for PT students), which addresses the course ILO 6, and individual research project, which addresses the ILOs 7-8. The former is assessed by the group report and presentation that simulates the work environment. Students have an opportunity to reflect on their performance during the group project. Their contribution to the project is also assessed by their supervisor. The latter is assessed by the individual thesis and oral presentation. They will also receive formative feedback from their supervisors during the regular progress meetings.

To ensure APE students develop relevant employability skills and different skills relevant to professional practice, they are asked to submit a reflective review (500-750 words) for each module and a group project, in addition to their module assessment. This will enable them to critically reflect on what they have learnt in that particular module and how the knowledge, skills and behaviours will help them to develop their careers. The feedback will be provided by the course director on each reflective review and then on the reflective portfolio as a whole after the completion of group project.

Course modules

The following modules outline all parts of the programme leading to **MSc in Cranfield**. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers [8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments [11](%)	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
3	N-PSE-CETIP Occ A	Computational Fluid Dynamics for Industrial Processes	Patrick Verdin	30		10	Y		21/11/22	2/12/22	50	ICW	100				PT 17/12/22	05/23

[7] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[8] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[9] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[10] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[11] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[12] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[13] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent assessments	Weighting within module of multi-part assessments [1]	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
7	N-RNE-EE	Energy Entrepreneurship	Orsolya Ihasz	28		10	Y		06/02/23	17/02/23	50	GCW	100				PT 04/03/23	05/23
11	I-ENE-DISS Occ A	Dissertation for part time students	Patrick Verdin	10		40	Y		06/03/23	29/09/23	50	IPROJ IPRES	80 20				22/09/23 wc 25/09/23	09/24
12	I-ENE-THESIS Occ A	Energy Individual Research Project	Patrick Verdin	20		80	Y		15/05/23	08/09/23	50 50	OR THESIS	10 90				w/c 28/08/23 04/09/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-PSE-CETIP	Computational Fluid Dynamics for Industrial Processes	Advanced Process Engineering	• Energy Systems and Thermal Processes • Process Systems Engineering (Muscat)
N-RNE-EE	Energy Entrepreneurship	Renewable Energy	• Advanced Digital Energy Systems • Advanced Process Engineering

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students can expect to have 6–8 written examinations, 7 pieces of assessment by submitted work and 4–5 elements of assessment by presentation or viva.

This approach has been adopted in order to:

- Assess the knowledge of the students using methods appropriate to the nature of the subject area
- Help the students to improve their technical writing and oral presentation skills

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate at Cranfield

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3.	ILO 4.	ILO 5.
2	EX		EX	EX	EX
3				ICW	ICW
4		ICW	ICW		
5		ICW	ICW		
6	ICW	ICW			ICW
7				GCW	GCW
8	ICW	ICW	ICW	ICW	ICW

B. Postgraduate Diploma at Cranfield

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3.	ILO 4.	ILO 5.	ILO 6.
9	ICW	ICW	ICW		ICW	
10						GCW GPRES ICW RP
11						IPROJ IPRES

C. MSc at Cranfield

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 7.	ILO 8.
12	THESIS OR	THESIS OR

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6-year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principle means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. <u>What opportunities are graduates likely to have on completing the course?</u>

Graduates of the course have been successful in gaining employment in:

- Engineering consultancies and design practices
- Industries:

    - Oil and gas
    - Petrochemical
    - Chemical
    - Pharmaceutical
    - Water
    - Power
    - Food and drink
- Research organisations
- Academic institutions

COURSE SPECIFICATION

Cranfield University: Course Specifications
Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

COURSE TITLE: MSc in Advanced Water Management

Date of first publication/latest revision: May 2022

1. What is the course?

Course information

Course Title	Advanced Water Management
Course code	MSAWMFTC MSAWMPTC PDAWMFTC PDAWMPTC PCAWMFTC PCAWMPTC
Academic Year	2022/23
Valid entry routes	MSc, PgDip, PgCert,
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield Campus
School(s)	School of Water, Energy and Environment
Theme	Water
Centre	Cranfield Water Sciences Institute
Course Director	Dr Andrea Momblanch
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/a

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Degree apprenticeship integrated or non-integrated?	N/a
Is the Mastership offered as an open and/or closed course?	N/a
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Minimum 2nd class UK honours degree or equivalent or relevant industrial experience. Language proficiency for non UK- students: TOEFL: 237 (computer version), 580 (paper version), or TOEIC: 830, or IELTS: 6.5 minimum, or Cambridge certificate: C or above
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - up to three years, Full-time PgCert - one year, Part-time PgCert - two years, Full-time PgDip - one year, Part-time PgDip - two years
Course Start Month(s)	Full-time: October Part-time: throughout the year (October preferred, other times on a case by case basis)

Institutions delivering the course

This course is delivered by the Cranfield Water Sciences Institute where the research interests include the science, engineering and management of water in municipal, industrial and natural environments, encompassing treatment technologies, engineering, irrigation, socioeconomics and policy. Research across the Department also focuses on soil and water sciences in the context of land management for food, fibre and bio-energy crops, environmental services and biodiversity, using expertise in biophysical and social sciences and agricultural engineering.

The MSc Advanced Water Management has been developed in collaboration with employers in response to the increased demand for water managers with the appropriate blend of skills and creativity to provide solutions to the complex problems of the future. This programme provides the skills and knowledge required to assess, plan, execute and implement strategies for the sustainable management of water in natural, semi-natural and man-made environments. It addresses the common themes pertaining to water and sanitation in all situations.

Cranfield University actively engages external speakers from across the water sector to deliver the Advanced Water Management course, including from:

- The Environment Agency
- The Open University
- Anglian Water

Cranfield University also actively seeks sponsorship and support for individual thesis projects from water sector employers to provide professional experience and development opportunities for students. Thesis sponsors and supporters include:

- The Environment Agency
- Canal and River Trust

- Atkins
- Affinity Water
- RSPB, Regional Wildlife Trusts

Cranfield University has agreements with a number of top quality European higher education institutions through its European Partnership Programme (EPP). Within these agreements students from partner institutions have the opportunity to take a Master of Science (MSc) at Cranfield University as an alternative to the final year of their home university programme. The EPP provides a feeder stream- of European students to Advanced Water Management and in doing so contributes to the diversity of the class.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)
This course is accredited formally by Chartered Institution of Water and Environmental Management (CIWEM) until October 2022

2. What are the aims of the course?

Cranfield University offers this course in order to:

- Provide the appropriate science & technology background to manage water effectively and efficiently in natural, semi-natural and man-made environments

This programme is intended for the following range of students:

- Graduates with science, engineering, geography or related degrees keen to pursue careers in water management
- Graduates currently in employment keen to extend their qualifications or to pursue a career change
- Individuals with other qualifications but who possess considerable relevant experience

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Advanced Water Management

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Identify the principal controls on water quantity, water quality and aquatic ecology, and assess the relative importance of natural and anthropogenic factors.
ILO 2. Interpret and critically evaluate the quality of environmental information, research and data, and determine relevance for application in relation to solving academic and practical problems.
ILO 3. Select and apply appropriate analytical, statistical, modelling or decision-support tools to existing environmental data and interpret the findings in the context of current environmental regulation.
ILO 4. Develop and critically assess appropriate and sustainable solutions to environmental water management problems in natural and man-made environments with due regard to the technical, social and institutional constraints imposed by the surrounding environment.

B. Postgraduate Diploma in Advanced Water Management

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Integrate knowledge, understanding and skills from the taught modules in a real-life situation to address problems faced by industrial clients; creating new problem diagnoses, designs, or system insights; and communicating findings in a professional manner in written, oral and visual forms.

C. MSc in Advanced Water Management

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 6. Define a research question, develop aim(s) and objectives, select and execute a methodology, analyse data, evaluate findings critically and draw justifiable conclusions, demonstrating self-direction and originality of thought.

ILO 7. To communicate their individual research via a thesis and in an oral presentation in a style suitable for academic and professional audiences.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Structured teaching and learning activities in the taught modules (e.g. lectures, workshops, computer practicals) that support students in their completion of the assessments and provide discipline-specific and transferable skills training
- Being provided with the opportunity to undertake externally sponsored or supported thesis project research
- Undertaking field and laboratory work within the context of group and thesis projects to integrate and apply knowledge and skills
- Students are allocated project supervisors for their thesis and group projects who guide the research and provide formative feedback on reports and presentations
- Course Director, Module Convenors, and other academic staff are readily available for informal advice and feedback

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction	0

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

ELECTIVE MODULES:	
Any three of the following modules: Surface and groundwater hydrology: processes, measurement and modelling Good ecological status Managing flood and drought risk Water in cities and catchments	 20 20 20 20
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction Surface and groundwater hydrology: processes, measurement and modelling Good ecological status Managing flood and drought risk Water in cities and catchments Group Project (Full-time students)	0 20 20 20 20 40
ELECTIVE MODULES:	
Part Time Students: Group Project OR Dissertation	 40 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Induction Surface and groundwater hydrology: processes, measurement and modelling Good ecological status Managing flood and drought risk Water in cities and catchments Group Project (Full-time students) Thesis Project	0 20 20 20 20 40 80
ELECTIVE MODULES:	
Part Time Students:	

[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

Group Project OR Dissertation	40 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [5]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Please see the module descriptors and material on the Virtual Learning Environment (Canvas) for details on the individual elements of the course. Each module is taught over four weeks, with the fourth week largely free of structured teaching to allow time for more independent learning and reflection. Some modules use a 'flipped' structure where the independent learning week precedes the structured teaching weeks. The 'flipped' module requires students to prepare material (data analysis, presentations, etc.) for case-study based workshops in the subsequent week. Group projects are located after the taught

[5] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

modules, between February and April. Individual thesis research projects are run from May till the end of August with thesis submission and oral assessment in early September.

Full-time students register for the course in October and are expected to complete the course within 12 calendar months.

All options are also offered on a part-time basis and such students are expected to complete the course within 2 to 3 years. Part-time students are not restricted to starting in October. Instead, they are offered individual guidance on the best sequence of study based on their prior knowledge and availability to attend.

7. Course Level Assessment Strategy[6]

Students on the course will be assessed by a variety of assessments during modules, group project and thesis period. The summative assessment plan for the modules is outlined in the table below. All four modules will be assessed by individual coursework, but they cover a range of styles that a graduate of the course may be expected to write at the early stages of their career. The assessments have been mapped against the course level ILOs to ensure they cover the core learning across the course. Summative assessment will be complemented by on-going formative assessment and feedback within modules. Students should note that anything written beyond the stated word/page limit will not be marked for all summative assessments during the taught phase of the course.

Assessment strategy for Advanced Water Management

Module	***Module Assessment***	***Course Level ILOs***
Surface and Groundwater Hydrology: processes, measurement and modelling	Individual Course Work - Design, implement, evaluate and apply a numerical hydrological model for a local catchment case study to evaluate the impact of future climate and non-climate changes on the catchment and discussing the implications for catchment management. The catchment conceptualisation, model development, analysis and conclusions are presented in an individual technical report (15 pages max, including figures, tables and references).	ILO1, ILO3
Good Ecological Status	Individual Course Work - An independently written scientific report that assesses the spatial and temporal variation in the ecological and chemical quality of a surface waterbody based on field data collected during the module and publicly available data sources, interprets findings based on catchment influences and ecological interactions, and proposes additional variables to include in future studies (15 pages A4 max, including figures, tables and references).	ILO1, ILO2, ILO3
Managing Flood and Drought Risk	Individual Course Work - The student will research and write a paper on one of a selection of topics provided by the module convenor related to the planning for or response to flood or drought events (Max 10 pages, excluding abstract, references and tables).	ILO1, ILO4
Water in Cities and Catchments	Individual Course Work - An individual report that critically evaluates the current environmental, water resource, flood risk and development plans for a case study city/town to identify possible conflicts or unrealised synergies and	ILO1, ILO2, ILO3, ILO4

[6] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

	proposes integrated solutions (15 pages A4 max, including figures, tables and references)	
Group Project	Group and Individual Course Work - The students work in small consultancy teams typically on a client sponsored project for a period of 10 weeks. The students are responsible for interpreting the brief, developing a project plan, selecting and implementing a methodology, deriving results, analysing the results and drawing conclusions in alignment with the aims and objectives. All students participate in a peer review activity providing them with the opportunity to reflect on the practices of their colleagues as well as their own. Peer review feedback is provided individually by an independent member of academic staff. A single group report is produced and the project is presented orally at the concluding Exhibition Day, both elements are summatively assessed by independent markers and a group mark is assigned for each element. Individual assessment is derived from supervisor observation and meeting minute actions and an individual reflective report where the students reflect on the development of three soft skill competencies based on objectives that they set for themselves. The team working competency is mandatory as one of the three skills for each student.	ILO5
Dissertation (Part-time students only)	Individual Course Work - Part time students are not required to complete the Group Project undertaken by the full time registered students on a SWEE MSc course. An alternative assignment takes the form of a dissertation or design project which in most situations will be based around a topic relevant to the work of the part-time student. It is evident that some aspects of the Group Project experience that the work-based dissertation replaces – for example the client interaction and group dynamics components will not directly replicated by undertaking this assignment. It is expected that these experiences would normally be a part of the normal working life of the part-time student. It is expected that the dissertation will normally consist of the following elements: Abstract, Background context, Introduction to the theme(s) addressed within the dissertation, setting out the issues that will be covered, Methodology, In depth analysis/discussion of the topics discussed, Concluding remarks, References, Appendices (if relevant). Two supervisors are allocated to the dissertation and supervision follows the model used for the independent research project. The student will submit a 6,000 word report and will give an oral presentation of their work. Both elements of assessment will be marked by independent assessors.	ILO6, ILO7
Individual Thesis Project	Individual Course Work -The individual research project requires students to further develop problem definition, hypothesis setting, select and execute a methodology, analyse data, and evaluate findings and draw appropriate conclusions in the context of research questions relevant to the course followed by a student. The student is required to communicate their findings successfully via a thesis, written in the style of a scientific paper and an oral presentation based around a poster. The projects are designed to integrate knowledge, the taught modules, and apply understanding and skills from the group project, to deliver a high quality written thesis and oral presentation. The individual research project/thesis is typically delivered	ILO6, ILO7

	through collaboration with an industrial sponsor, or it may be an ‘internal’ project reflecting the research interests of the School.	

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments [11]	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
1	I-WAT-INWK	Induction Week	J MacAdam	24		0	Y	03/10/22	03/10/22	07/10/22	N/A	AO	N/A				N/A	
2	I-AWM-SGH	Surface and Groundwater Hydrology: processes, measurement and modelling	I Holman	60		20	Y	10/10/22	10/10/22	04/11/22	40	ICW	100				FT 05/11/22 PT 19/11/22	May 2023
3	I-AWM-GES	Good ecological status	P Campo Moreno	60		20	Y	07/11/22	07/11/22	02/12/22	40	ICW	100				FT 03/12/22 PT 07/12/22	May 2023

[7] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[8] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[9] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[10] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[11] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[12] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[13] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Module Number	Module code	Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%	Type of Assessment	Weighting within module[10] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[12]	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
4	I-AWM-MFDR	Managing flood and drought risk	J Knox	60		20	Y	05/12/22	05/12/22	20/01/23	40	ICW	100				FT 21/01/23 PT 04/02/23	May 2023
5	I-AWM-WCC	Water in Cities and Catchments	R Grabowski	60		20	Y	23/01/23	23/01/23	17/02/23	40	ICW	100				FT 18/02/23 PT 04/03/23	May 2023
PROJECTS																		
6	I-WAT-GRPP	Group Project	J MacAdam	16		40	Y	20/02/23	20/02/23	05/05/23	50 50	GCW GPRES ICW RP	64 16 10 10				28/04/23 @ 16.00 25/04/23 @ 16.00 05/05/23 @ 16.00 06/05/23 @ 23.59	TBC
7	I-WAT-DISS	Individual Project (PT MSc and PgDip only)	J MacAdam	10		40	Y	20/02/23	20/02/23	22/09/23	50	IPROJ IPRES	80 20				22/09/23 @ 16.00 w/c 25/09/23	Sept 2024
8	I-WAT-THESIS	Individual Research Project	J MacAdam	20		80	Y	08/05/23	08/05/23	08/09/23	50	THESIS OR	90 10				04/09/23 @ 16.00 w/c 28/08/23	Sept 2024

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
I-AWM-SGH	Surface and Groundwater Hydrology: processes, measurement and modelling	Advanced Water Management	Water and Waste Infrastructure Systems Engineered for Resilience (Water-WISER) CDT
I-AWM-GES	Good Ecological Status	Advanced Water Management	Global Environmental Change Water and Waste Infrastructure Systems Engineered for Resilience (Water-WISER) CDT Water Infrastructure and Resilience (WIRe) CDT
I-AWM-MFDR	Managing Flood and Drought Risk	Advanced Water Management	Global Environmental Change Water and Waste Infrastructure Systems Engineered for Resilience (Water-WISER) CDT Water Infrastructure and Resilience (WIRe) CDT
I-AWM-WCC	Water in Cities and Catchments	Advanced Water Management	Water and Waste Infrastructure Systems Engineered for Resilience (Water-WISER) CDT

8. How are the ILOs assessed?

The following assessment types are utilised:

The MSc course is assessed as three elements:

- the taught modules (40%) are assessed by in-module assessment (including coursework, which focuses on application of principles studied and class tests, which support underpinning knowledge);
- group projects (20%) are assessed by means of a written group report and presentations. Individual design projects (PTs) are assessed by means of a written dissertation.
- the research project (40%), is assessed by a thesis and an oral examination.

This approach has been adopted because:

Different types of assessments enable the evaluation of a range of M-level skills. A mixture of both individual and group assessments is important in helping students to develop both individual skill and team work related skills. Group and thesis projects follow the completion of the taught part of the course and at this stage more emphasis is on enquiry based learning and problem solving.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate certificate

Award ILOs Module No.	ILO 1	ILO 2	ILO 3	ILO 4					
1									
2	ICW		ICW						
3	ICW	ICW	ICW						
4	ICW			ICW					
5	ICW	ICW	ICW	ICW					

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs Module No.	ILO 5								
6	GCW GPRES ICW RP								
7	IPROJ IPRES								

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs Module No.	ILO6	ILO 7							
8	THESIS OR	THESIS OR							

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

On completion, graduates have a broader network of global contacts, increased opportunities for individual specialism in their chosen career, and the capability to make an immediate and real contribution to improved water supply and sanitation. Cranfield Advanced Water Management graduates are highly sought after by employers. Typical employers include:

- Environment Agency
- Wildlife Trusts
- Local Government
- Water utilities e.g. Thames Water, Yorkshire Water
- International engineering consultancies (e.g. MWH, Halcrow, Atkins)

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2021

1. What is the course?

Course information

Course Title	MSc in Aerospace Computational Engineering
Course code	MSACNFTC, MSACNPTC, PDACNFTC, PDACNPTC, PCACNFTC, PCACNPTC
Academic Year	2022/2023
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield
School(s)	School of Aerospace, Transport and Manufacturing (SATM)
Theme	Aerospace
Centre	Computational Engineering Sciences
Course Director	Dr. Karl Jenkins
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - three years
Course Start Month(s)	September 2022

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing (SATM), Aerospace Theme, Centre of Computational Engineering Sciences where the research interests include:

- Fluid dynamics of single- and multi-phase and multi-species flows.
- Steady and unsteady aerodynamics for investigating laminar and turbulent flows.
- Transitional flows, classical and advanced turbulence modelling.
- Heat transfer and its application related to complex flow problems.
- Development of advanced numerical methods for a broad range of fluid flow problems.
- Scientific and high performance computing.
- Computational fluid dynamics with the applications in aerospace, automotive, environmental, energy, micro- and nanotechnology, nuclear, bio-medical, chemical and defence sectors.
- Computer vision.
- Vibro-acoustics for condition monitoring.
- Computational engineering for fluids and solids.
- Software Engineering for Technical Computing, Computer Aided Engineering

Cranfield University interacts with the following institutions and in the following ways:

The course has a strong association with a number of academic institutions world-wide that regularly supply students onto MSc courses in the Centre of Computational Engineering Sciences at Cranfield University. Students may follow the course as part of a double degree arrangement with their home institution whereby the final year of their five year programme is replaced with the MSc here at Cranfield. Other students are self-funded.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)
This course is not accredited by any external bodies.

2. What are the aims of the course?

- Provide a comprehensive training programme in Aerospace Computational Engineering (ACE) which will enhance the skills of the graduate student through a detailed introduction to the state-of-the-art computational methods and their applications for digital age aerospace engineering applications.
- Combination of both computational flow physics and computational science to enable the student to understand the current suite of digital techniques for aerospace simulations.
- Access to the university High Performance Computing (HPC) facilities for teaching and research projects and opportunity to work on research projects proposed by industry.
- Provide a unique opportunity to work within a team on a cutting-edge group project based on a digital wind tunnel for aerospace applications through the Cranfield Aerospace Integrated Research Centre (AIRC).

- Provide a unique opportunity for cross-disciplinary education and knowledge transfer in the computational engineering of fluid and solid mechanics for aerospace industrial applications.
- Produce graduate engineers and leaders for the rapidly expanding digital simulation age focusing on fully integrated digital design for aerospace applications to understand and implement numerical methods on various computing platforms for aerospace applications.
- Provide a CPD opportunity through the part-time course option for qualified engineers wishing to extend their knowledge of Aerospace Computational Engineering and incorporate CFD into their practice.
- Equip graduates with the knowledge, understanding and skills required to enable them to meet the demand of an evolving workplace that requires highly qualified engineers possessing core software engineering skills together with competency in mathematical analysis techniques.
- Develop suitably trained and qualified engineers, scientists and mathematicians enabling them to apply the analytical, computational and software skills to the solution of practical engineering IT problems in industrial, commercial and governmental organisations.

This programme is intended for the following range of students:

- UK students with an honour's degree in Engineering, Computer Science, Mathematics, Physics.
- Mature students with at least 5 years relevant industrial experience.
- Students studying at recognised EU Universities with at least 4 years of relevant academic study.
- Recent graduates wishing to extend their knowledge and skills in the above areas.
- Qualified engineers wishing to apply their skills in new areas.
- Qualified engineers working with computational methods in a particular area wishing to extend their knowledge and enhance their practice by knowledge transfer from different application areas.

3. <u>What should students expect to achieve in completing the course?</u>

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Assess and evaluate the selection of computer languages, software tools, and technologies, and apply them to solve practical problems of a computational nature in aerospace engineering solutions.

ILO 2. Distinguish the principles of numerical analysis, concepts of stability, approximation and convergence, and estimate the numerical solution of the system of algebraic equations.

ILO 3. Create original software solutions to aerospace computational engineering problems by using industry standard software libraries, packages and engineering tools.

ILO 4. Assess the state-of-the-art computational methods for incompressible and compressible flows used in aerospace engineering including the understanding of the advantageous features and limitations of these methods to identify the possible sources of uncertainties for aerospace applications.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Compose written reports and prepare and deliver oral presentations that effectively communicate proposals, technical developments, and computational results.

ILO 6. Set up a systematic approach to mesh generation methods and visualisation techniques including their application and interpretation for aerospace engineering problems.

ILO 7. Distinguish between open source and commercial Computational Fluid Dynamics and Finite Element Analysis software packages relevant to aerospace application(s).

ILO 8. Use and select appropriate software packages to practical aerospace computational engineering application(s) and evaluate the outcome.

ILO 9. Critically evaluate a project to include a) computational aerospace engineering methods; b) project outcomes and results; c) one or more aspects of strength and weakness of the selected methods; d) propose appropriate solutions for the investigated aerospace application; e) recommendations for the future work.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 10. Distinguish and assess systematic computational aerospace engineering methods for different industrially relevant fluid flow problems with the focus on planning and implementing assigned projects under time pressure and undertake self-directed learning when necessary.

ILO 11. Assemble a body of relevant technical literature in the field of aerospace computational engineering and discuss and evaluate each work with respect to a technical problem relevant to an industrial application.

ILO 12. Propose, plan and implement an independent research project on a relevant technical topic of aerospace engineering and critically evaluate project results, discuss findings, and relate their contribution to other works in the field.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- A comprehensive set of carefully prepared lecture notes that form the basis for the teaching will be available to students on the VLE. This is perhaps the most valuable resource and reference point for the student starting a new module. Secondly, many lectures are given in PC Labs in conjunction with some form of programming. Students are encouraged, given time and practical assistance to develop their software skills. Part-time students applying to current MScs within the CES centre are primarily coming from industry and contribute to the diverse structure of the centre. Therefore, the learning experience of part-time students will be supported by providing them with course material and support through distance learning techniques. Part-time students will be supported through regular consultations by using e.g. MSTeams and Zoom as a part of their study. For performing simulations, part-time students will have opportunity to access our High-Performance Computing facilities remotely. Regular meetings will be organised for each group when the group design project will be running and part-time students will be able to attend on these meetings either in person or online. Additionally, a Part-Time Student Advisor (PTA) will be appointed from the academic team who can advise on module selection for years 1 and 2 and maintain university and course updates whilst away from Cranfield thus ensuring the part-time student is prepared before attending any modules in Cranfield.
- The library resources and search facilities here at Cranfield. A thorough introduction to these resources and demonstrations of information retrieval skills is provided at the beginning of the course. The library facilities are extensive and there is a good representative selection of books and periodicals relevant to the course. Where an article, book or periodical is not available it can usually be obtained elsewhere via inter-library loans. Books, software and other resources are purchased by the group when it is necessary for one of the projects.
- This course uses assignments, an examination, a group project and an individual thesis project as methods of assessment. This approach has been adopted to prepare the student with the requisite skills for a career in digital engineering, digital engineering management or research. This approach will enable the student to demonstrate an understanding of theory and application at master's level through written technical reports and papers and oral presentations. Since in this course practical application is key to development of understanding and skills acquisition, most taught modules are assessed by individual assignments. By the end of the taught components, students will participate in a group project where they will work in a small group on an aerospace related problem which they will present at the end of the project through a written report and group presentation. Part-time students are not required to participate in group projects

and can instead submit a dissertation which amounts to the same number of credits and which is aligned with the part-time student's work in most cases. The students will then transition into their individual research project where they will work on an academic or industrial-proposed project individually. At the end they will have to submit a written thesis, give a presentation in their individual presentation (viva) and present their work through a poster exhibition.

- A programme of seminars given by external and internal speaker is also provided for the MSc in Aerospace Computational Engineering students. These reflect the course, sponsoring companies and associated research carried out in the group enabling the students to get an appreciation of related work going on in industry and other universities. Part-time students will usually be able to attend on the aforementioned seminars through e.g. MSTeams and Zoom as a part of their study. Furthermore, additional consultation hours and support will be offered by the module leaders between the end of their completed modules and the start of their subsequent modules.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-4 20 credits selected from Modules 5-8	40 20
ELECTIVE MODULES:	
n/a	
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-8 Group Project for full-time students (9) or Individual Dissertation for part-time students (10)	80 40
ELECTIVE MODULES:	
N/A	
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	

Modules 1-8 Group Project for full-time students (9) or Individual Dissertation for part-time students (10) Individual Research Project (11)	80 40 80
ELECTIVE MODULES:	
N/A	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 11 calendar months.

Part-time students register for the course in September and are expected to complete the course within 3 years.

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

Each module is taught over a period of one week. Practical work forms an important part of the teaching and so a significant amount of time is devoted to hands-on sessions with a software package or development environment. This also facilitates independent learning on the part of the student.

7. Course Level Assessment Strategy[4]

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The pre-requisite modules C++ Programming and Computational Methods will introduce students to the fundamentals of numerical modelling of engineering problems and will be assessed through essays and reports. These will be of varying lengths, recognising that writing articles to a short length can be more challenging for some and can develop different skills relevant to professional practice. The length of each assessment task is clearly stated within the module descriptor. Students will write employability relevant policy briefing documents to equip them with the skills they require to succeed in the aeronautical sector and to address the specific award ILOs 1 – 2.
Students then have opportunities to develop their communication skills, as they are required to give a group presentation and individual presentation. The ability to work effectively in groups is a highly desirable skill which has translated into ILOs 9 – 12. Feedback is given immediately after the group presentation. Modules Numerical Modelling for Compressible Flows, Numerical Modelling for Incompressible Flows, Analysis and Visualisation of Big Data System and High Performance Computing, Modelling Approaches for Aerospace Applications, Computational Engineering Structures and Validation and Verification for Aerospace Applications are supported by a number of formative tasks including group discussion, case studies, oral presentations. Formative feedback is given verbally within the classroom following discussions, via a written summary for case studies from the module leader and oral feedback provided by the tutor and peers for presentations. Students will also engage with an interactive learning activity which incorporates formative feedback. For all modules , peer review informs practice and tutorials guide progress, students are generally encouraged to support each other by asking and answering questions via the VLE. The taught components precede the research project, so assessment can be used to develop skills required for the individual research project. Students are generally expected to be more self directed in their learning during this research project and guidance will be provided through supervised meetings and feedback on their progress and approach during intermediate presentations by the students.
The research project addresses ILOs 10 – 12 at a minimum as well as ILOs 1 – 9 depending on the topic and scope of the individual research project and will be assessed through the electronically submitted MSc thesis report.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual elements of	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1		N-CST-CPPI	C++ Programming (Integrated)	Dr Irene Moulitsas	32	0	10	Y	27/09/2022 -	27/09/2022	07/10/2022	50	GCW Integrated Assessment	100				FT 28/11/2022 PT 12/12/2022	At the next available opportunity which may not be until the course runs the following year
2		N-CST-CMI	Computational Methods (Integrated)	Dr Irene Moulitsas	32	0	10	Y	27/09/2022	27/09/2022	07/10/2022								

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual elements of	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3		N-CFD-NMCF	Numerical Modelling for Compressible Flows	Dr Panagiotis Tsoutsanis	20	0	10	Y	23/01/2023	23/01/2023	27/01/2023	40	ICW	100				FT 22/02/2023 PT 08/03/2023	At the next available opportunity which may not be until the course runs the following year
4		N-CFD-NMIF	Numerical Modelling for Incompressible Flows	Dr Laszlo Konozsy	20	0	10	Y	09/01/2023	09/01/2023	13/01/2023	40	ICW	100				FT08/02/2023PT22/02/2023	At the next available opportunity which may not be until the course runs the following year
5		N-ACN-AVBDS	Analysis and Visualisation of Big Data System and High Performance Computing	Dr Tom Teschner	20	0	10	N	17/10/2022	17/10/2022	21/10/2022	40	ICW	100				FT16/11/2022PT30/11/2022	At the next available opportunity which may not be until

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual elements of	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																			the course runs the following year
6		N-ACN-MAAE	Modelling Approaches for Aerospace Applications	Dr Laszlo Konozsy	20	0	10	N	14/11/2022	14/11/2022	18/11/2022	40	ICW	100				FT16/12/2022 PT04/01/2023	At the next available opportunity which may not be until the course runs the following year
7		N-CST-CES	Computational Engineering Structures	Dr Imaan Dayyani	35	0	10	Y	21/11/2022	21/11/2022	30/11/2022	40	EX	100				06/01/2022	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual elements of	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
8		N-ACN-VVAA	Validation and Verification for Aerospace Applications	Dr Laszlo Konozsy	20	0	10	N	31/10/2022	31/10/2022	04/11/2022	40	ICW	100				FT30/11/2022 PT08/12/2022	At the next available opportunity which may not be until the course runs the following year
9		N-ACN-GP	Group Project	Dr Karl Jenkins	40	0	40	N	20/02/2023	20/02/2023	12/05/2023	50	GPROJ GPRES	85 15				10/05/2023 10/05/2023	At the next available opportunity which may not be until the course runs the following year
10		N-ACN-DISS	Individual Dissertation (for Part-Time Students)	Dr Karl Jenkins	40	0	40	N	20/02/2023	20/02/2023	12/05/23	50	ICW	100				12/05/2023	
11		N-ACN-THESIS	Individual Research Project	Dr Karl Jenkins	40	0	80	N	22/05/2023	22/05/2023	04/09/2023	50 50	THESIS IPRES	90 10				04/09/2023 0/09/2023	

* * Group Project Assessment – 100% Multi-part Assessment – RP 20% submission deadline .30/04/21 GPROJ 80% comprises GPROJ (80%), submission deadline 12/04/21 and GPRES (20%), submission deadline . 30/04/21

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-CST-CPPI (NEW CODE)	C++ Programming (Integrated)	Computational and Software Techniques in Engineering	
N-CST-CMI (NEW CODE)	Computational Methods (Integrated)	Computational and Software Techniques in Engineering	
N-CFD-NMCF	Numerical Modelling for Compressible Flows	Computational Fluid Dynamics	
N-CFD-NMIF	Numerical Modelling for Incompressible Flows	Computational Fluid Dynamics	
N-CST-CES	Computational Engineering Structures	Computational and Software Techniques in Engineering	Shared teaching, with N-ALS-FEM

8. How are the ILOs assessed?

The ILOs will be assessed in the following way:

- Taught modules will be assessed through written reports with the exception of Computational Engineering Structures which will be assessed through written examination. These activities will mainly cover ILOs 1 – 8 and equip the students with fundamental tools to solve numerical problems within aerospace applications.
- The group project will create an environment in which students have to solve problems as part of a small group. This will primarily focus on ILO 9 – 12, however, depending on the assigned topic, elements of ILOs 1 – 8 will be covered as well. Students will present their work through a group presentation, a reflective portfolio and a written report at the end of the group project.
- The individual research project will be assessed through the submitted written thesis and the thesis individual presentation.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4
1	GCW			
2	GCW	GCW		GCW
3			ICW	ICW
4			ICW	ICW
5		ICW		
6		ICW		
7				EX
8		ICW	ICW	ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO5	ILO6	ILO7	ILO8	ILO9
9	GPROJ GPRES	GPROJ GPRES	GPROJ GPRES	GPROJ GPRES	GPROJ GPRES
10	ICW RP	ICW RP	ICW RP	ICW RP	ICW RP

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO10	ILO11	ILO12
11	IPRES THESIS	IPRES THESIS	IPRES THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
Two modules with an Integrated Assessment	N-CST-CPPI – C++ Programming (Integrated) N-CST-CMI Computational Methods (Integrated)	ICW	100

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

This Masters course in 'Aerospace Computational Engineering', with its blend of skills-based and subject-specific material equips students with the generic hands-on skills and up-to-date knowledge adaptable to the wide variety of applications in the field of aerospace computational engineering. This will lead to opportunities within the rapidly expanding digital engineering sector and specifically to the aerospace industry where fully integrated digital techniques are used. This approach is widely used in companies such as Airbus, Boeing, Rolls Royce and Siemens.

Typically students seek employment in the computational aerospace engineering market. Enquiries regarding availability of potential employees are received from many quarters, both in the EU and elsewhere. There is considerable demand for personnel with expertise in aerospace engineering software development and for those who have strong technical programming skills in industry standard languages and tools. Graduates of the courses currently within the Centre of Computational Engineering Sciences are in demand by CAD vendors, commercial engineering software developers, aerospace, automotive, and other industries and research organisations. Successful students, have been particularly successful in finding long-term employment.

Some students may go on to register for PhD degrees, many, on the basis of their MSc research project. Thesis topics are most often supplied by individual companies on in-company problems with a view to employment after graduation - an approach that is being actively encouraged by a growing number of industries.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: April 2022

1. What is the course?

Course information

Course Title	MSc in Aerospace Dynamics with options in: Aerodynamics Flight Dynamics
Course code	MSASDFTC, MSASDPTC, PCASDFTC, PCASDPTC
Academic Year	2022-23
Valid entry routes	MSc, PgCert
Additional exit routes	PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Aeronautics
Course Director	Prof SA Prince
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	n/a
Is the Degree apprenticeship integrated or non-integrated?	n/a
Is the Mastership offered as an open and/or closed course?	n/a
Teaching Institution	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - up to three years
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Aeronautics where the research interests include:

- Fluid Mechanics
- Flight Dynamics
- Applied Aerodynamics

Cranfield University interacts with the following institutions and in the following ways:

- We offer APL to students of the Empire Test Pilot School who wish to undertake this course and meet the standard entry requirements of the University.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Royal Aeronautical Society (RAeS) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- equip candidates from backgrounds in engineering or physical science with the knowledge, understanding and skills required to enable them to contribute to the aerospace industry or to aerospace related research;
- develop a candidates' specialist technical skills and to give them an awareness of aerospace sciences so that their specialist skills can be most effectively applied;
- develop the candidates transferable skills for a professional career in the aerospace or related industry.

A Postgraduate Certificate (PGCert) entry route is provided. for candidates who wish to access only parts of the course provided.

This programme is intended for the following range of students:

- Those with undergraduate qualifications in General Engineering, Mathematics or Physics seeking to move into the aerospace sector.

- Those with undergraduate qualifications in Aeronautical Engineering seeking to specialise in a specific branch of Aerospace Dynamics or to broaden their knowledge and understanding of this area.
- Those with the other academic qualifications together with the required number of years industrial experience such that they meet Cranfield University's equivalent entry requirements, who are looking to obtain a formal Masters level qualification in Aerospace Dynamics.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Demonstrate a systematic knowledge and critical evaluation of the key principles of the aerospace disciplines (aerodynamics, control, flight dynamics, etc.) and apply appropriate engineering analysis methodologies.

ILO 2. Demonstrate the ability to critically analyse the engineering aspects of aerospace applications, methodologies, systems and design. Assess limitations and apply theory, simulation or experimentation to mitigate deficiencies.

ILO 3. Demonstrate a critical judgement of their specialist subject area(s) at a level appropriate to new recruits to the aerospace industry such that they are able to contribute directly without significant further training with a knowledge and understanding of the commercial and social context in which the aerospace industry operates

ILO 4. Be able to apply their knowledge and understanding practically to the design and analysis of aerospace projects. Monitoring and adjusting both an individual programme of work and demonstrating the ability to work as an effective team member exercising initiative appropriately.

B. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Identify a research question. Collect and analyse research data investigating new and emerging aerospace applications

ILO 6. Develop project objectives.

ILO 7. Select and justify methodologies appropriate to the task. Selecting engineering analysis methodologies, experimental methodologies and design processes and adapting them where necessary

ILO 8. Plan and execute a work programme with reference to professional project management processes (e.g. time management; risk management; contingency planning; resource allocation; health and safety).

ILO 9. Evaluate and critically analyse literature; analyse data, synthesise a discussion, generate conclusions.

ILO 10. Place the findings of the work into the context of the work of others.

ILO 11. Communicate findings in the form of a thesis, formal presentation and viva.

4. How is the course taught?

Students will be supported in their learning and personal development by:

The Flight Experimental Methods module requires students to undertake a Group Flight Test exercise (20 credits) which is conducted in conjunction with the National Flying Laboratory Centre (NFLC), based within the School of Aerospace, Transport and Manufacturing, Cranfield University. This element of the programme involves flights in the aircraft flying laboratory, together with conventional supporting lectures, laboratory sessions and tutorials.

The taught element of the course (80 credits) is delivered through a combination of lectures, tutorials and hands-on laboratory sessions, computer labs and tutorials.

The course uses the Canvas learning environment with materials delivered in electronic form. In addition to standard learning support facilities (library facilities, IT provision, etc.

The Individual Research Project is supported by regular meetings with an academic supervisor.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

The taught element of the programme (80 credits) involves a considerable degree of choice such that candidates can select the module portfolio to reflect their personal career aspirations and skills. The final MSc option – Aerodynamics or Flight Dynamics, is determined by the choice of Research thesis topic.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Introduction to Aerodynamics (module 1) Flight Experimental Methods (module 2) One of the following options: Control Systems & Modelling of Dynamic Systems, Transonic Aerodynamic Design & Compressible Flows or Fundamentals of Aircraft System Identification	0 20 10 or 20 or 10
ELECTIVE MODULES:	
Taught Component – select modules taken from modules 3 -18 to give an overall value of 60 credits for PgCert	
TOTAL:	60

B. MSc

The accumulation of 200 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Introduction to Aerodynamics (module 1) Flight Experimental Methods (module 2) Individual Research Project (module 19) One of the following options: Control Systems & Modelling of Dynamic Systems, Transonic Aerodynamic Design & Compressible Flows or Fundamentals of Aircraft System Identification	0 20 100 10 or 20 or 10

ELECTIVE MODULES:	
Taught Component – select modules taken from modules 3-18 to give an overall value of 200 credits for MSc	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months.

This course is also offered on a part-time basis. Candidates taking this route would instead register for a 3 years and agree with the Course Director beforehand a programme of work that meets the same minimum requirements as the full time variant, but over the longer period.

Individual modules are taught over a period of one, two or three weeks (usually, but not always arranged consecutively). The duration depends on whether the module contains 10, 20 or 30 hours of lecture contact time. These are normally arranged such that there are two hours of lectures per day, 5 days per

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

week, with additional laboratory and/or tutorial sessions arranged during each week. Two modules would normally be offered during each week.

The formal taught part of the programme is split into two Teaching Periods each of nominally 11 weeks. A period during which formal written examinations can be scheduled follows each Teaching Period. For Masters candidates the remainder of the programme is devoted to the Research Thesis.

7. Course Level Assessment Strategy[4]

Assessments are designed to ensure that the Intended Learning Outcomes are achieved. Assessments for each module are summative, with non-assessed formative feedback provided during the module by a wide variety of mechanisms, including tutorial questions, lab exercises, class discussions, quizzes etc. A variety of summative assessments are used including closed-book examinations, individual course works, group course works, oral examinations, reports and for the IRP, a thesis report and a presentation. The choice of the assessment depends on the nature of the material, with fundamental principles more likely to be tested by examination and applications by assignment, some at a typical level in industry.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	N-ASD-IAA	Introduction to Aerodynamics	Prof Kevin Garry	35		0	N	03/10/22	03/10/22	07/10/22	n/a	AO					n/a	
2	N-ASD-GFTR	Flight Experimental Methods	Dr Simon Place	50		20	N ST	10/10/22	10/10/22	28/10/22	40 40	GPRAC IPRES	80 20				16/12/22 16/12/22	At the next available opportunity which may not be until the course runs the following year

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3	N-ASD-CF	Compressible Flows	Prof Simon Prince	20		10	N	31/10/22	31/10/22	11/11/22	50	EX	100				Exam Week 1	At the next available opportunity which may not be until the course runs the following year
4	N-ASD-VFEI	Viscous Flow and Environmental Impact	Prof Kevin Garry	22		10	N	31/10/22	31/11/22	17/02/23	50	EX	100				Exam Week 4	At the next available opportunity which may not be until the course runs the following year
5	N-ASD-CS	Control Systems	Dr James Whidborne	30		10	Y	07/11/22	07/11/22	18/11/22	50	ICW	100				FT 13/01/23 PT 27/01/23	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
6	N-ASD-FRPS (NEW CODE)	Fundamentals of Rotorcraft Performance, Stability and Control	Dr Linghai Lu	30		**10**	N	06/02/23	06/02/23	10/02/23	50	EX	100				Exam Week 4	At the next available opportunity which may not be until the course runs the following year
7	N-ASD-FDP	Flight Dynamics Principles	Dr Mushfiqul Alam	20		10	N	21/11/22	21/11/22	25/11/22	50	ICW	100				F/t 06/01/23 P/t 20/01/23	At the next available opportunity which may not be until the course runs the following year
8	N-ASD-FQAFC (NEW CODE)	Flying Qualities and Flight Control	Dr Mushfiqul Alam	24		**10**	Y	27/02/23	27/02/23	03/03/23	50	ICW	100				F/t 14/04/23 P/t 28/04/23	At the next available opportunity which may not be until the course runs the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		following year
9	N-ASD-MVCAA	Multivariable Control Systems for Aerospace Applications	Dr James Whidborne	30		10	Y	23/01/23	23/01/23	27/01/23	50	ICW	100				FT 10/03/23 PT 24/03/23	At the next available opportunity which may not be until the course runs the following year
10	N-ASD-AMS	Air-Vehicle Modelling and Simulation	Dr Linghai Lu	28		10	Y	09/01/23	09/01/23	13/01/23	50	ICW	100				FT 24/02/23 PT 10/03/23	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
11	N-ASD-LARA (NEW CODE)	Launch and Re-Entry Aerodynamics	Prof Simon Prince	20		**10**	N	27/02/23	27/03/23	03/03/23	50	EX	100				Exam Week 5	At the next available opportunity which may not be until the course runs the following year
12	N-ASD-POCFD	CFD for Aerospace	Dr Davide Di Pasquale	35		10	N	30/01/23	30/01/23	03/02/23	50	GCW	100				FT 24/03/23 PT 07/04/23	At the next available opportunity which may not be until the course runs the following year
13	N-ASD-EXA	Experimental Aerodynamics	Dr Anderson Proenca	34		10	N	20/02/23	20/02/23	17/03/23	50	GCW	100				FT 28/04/23 PT 12/05/23	At the next available opportunity which may not be until the course runs the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		following year
14	N-ASE-GPS	Aerospace Navigation and Sensors	Dr Stephen Hobbs	24		10	Y	13/02/23	13/02/23	24/02/23	50	ICW	100				FT 30/03/23 PT 13/04/23	At the next available opportunity which may not be until the course runs the following year
15	N-ASD-TAD	Transonic Aerodynamic Design	Prof Simon Prince	20		10	N	16/01/23	16/01/23	20/01/23	50	ICW	100				FT 03/03/23 PT 17/03/23	At the next available opportunity which may not be until the course runs the following year
16	N-ASD-FASD	Fundamentals of Aircraft System Identification	Dr Linghai Lu	30		10	Y	06/03/23	06/03/23	10/03/23	50	EX	100				Exam Week 5	At the next available opportunity which may not be until the course runs the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		following year
17	N-ASD-AOCFD	Introduction to CFD	Dr Davide Di Pasquale	24		10	N	28/11/22	28/11/22	02/12/22	50	GCW	100				FT 14/01/23 PT 28/01/23	At the next available opportunity which may not be until the course runs the following year
18	N-ASD-MDS	Modelling of Dynamic Systems	Dr James Whidborne	13		0	Y	24/10/22	24/10/22	04/11/22	N/A	AO	N/A				N/A	N/A
19	N-ASD-THESIS	Individual Research Project	Prof Simon Prince	0		100	N	Occ A (FT) 27/03/23 OCC B (PT) 03/10/22	Occ A (FT) 27/03/23 Occ B (PT) 03/10/22	Occ A (FT) 28/08/23 Occ B (PT) 28/08/23	50 50	THESIS IPRES	85 15				Occ A (FT) 18/08/23 04/09/23 Occ B (PT) 18/08/23 04/09/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-ASD-CS	Control Systems	Aerospace Dynamics	Aerospace Vehicle Design
N-ASD-FQFC	Flying Qualities and Flight Control	Aerospace Dynamics	Flight Test and Flight Dynamics
N-ASD-MVCAA	Multivariable Control Systems for Aerospace Applications	Aerospace Dynamics	Flight Test and Flight Dynamics
N-ASD-AMS	Air Vehicle Modelling and Simulation	Aerospace Dynamics	Flight Test and Flight Dynamics
N-ASD-LRA	Launch and Re-Entry Aerodynamics	Aerospace Dynamics	Shared teaching with N-ASE-LRE Astronautics and Space Engineering
N-ASE-GPS	Aerospace Navigation and Sensors	Astronautics and Space Engineering	Astronautics and Space Engineering, Flight Test and Flight Dynamics
N-ASD-FASD	Fundamentals of Aircraft System Identification	Aerospace Dynamics	Flight Test and Flight Dynamics
N-ASD-MDS	Modelling of Dynamic Systems	Aerospace Dynamics	Aerospace Vehicle Design, Astronautics and Space Engineering
N-ASD-EXA	Experimental Aerodynamics	Aerospace Dynamics	Shared Teaching with CFD N-CFD-REDAO
N-ASD-FDP	Flight Dynamics Principles	Aerospace Dynamics	Shared teaching with N-FD-FDP, Flight Dynamics Principles for Flight Test

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Candidates following the Masters programme can expect to have 6 - 10 written examinations, 4 - 8 pieces of assessment by submitted work, either individual or group coursework, and 1 - 3 elements of assessment by presentation or viva. (The range in each case depends on the modules selected within the two options available). This approach has been adopted in order to assess as broad a range as possible of a candidates' skills and abilities.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4
2.	GPRAC IPRES	GPRAC IPRES	GPRAC IPRES	GPRAC IPRES
3.	EX			
4.	EX			
5.	ICW	ICW		ICW
6.	EX	EX	EX	EX
7.	ICW	ICW		ICW
8.	ICW	ICW	ICW	ICW
9.	ICW			
10.	ICW	ICW	ICW	ICW
11.	EX			
12.	GCW	GCW	GCW	GCW
13.	GCW	GCW		
14.	ICW	ICW	ICW	
15.	ICW	ICW	ICW	ICW
16.	EX	EX	EX	EX
17.	GCW	GCW	GCW	GCW

B. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 5	ILO 6	ILO 7	ILO 8	ILO 9	ILO 10	ILO 11
2.			GPRAC, IPRES		GPRAC, IPRES	GPRAC, IPRES	GPRAC
12.			GCW			GCW	
13			GCW	GCW	GCW	GCW	GCW
18.			AO		AO	AO	
19	THESIS, IPRES	THESIS, IPRES	THESIS, IPRES	THESIS, IPRES	THESIS, IPRES	THESIS, IPRES	THESIS, IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Aerospace Dynamics graduates obtain employment in a wide range of industrial organisations both within Europe and worldwide. Employment is predominantly within the Aerospace Industry but increasingly graduates are in demand from the Energy, Environment and Automotive sectors.

A significant proportion of graduates go on to undertake higher degrees both in the UK and overseas.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Aerospace Manufacturing
Course code	MSAMFFTC, MSAMFPTC, PDAMFFTC, PDAMFPTC, PCAMFFTC, PCAMFPTC MSAMSFTC, PCAMSFTC, PDAMSFTC
Academic Year	2022-2023
Valid entry routes	MSc, PgDip, PgCert, MSc (SINO UK)
Additional exit routes	PgDip (SINO UK), PgCert (SINO UK)
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Manufacturing
Centre	Sustainable Manufacturing Systems Centre
Course Director	Dr Konstantinos Georgarakis
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No
Is the Mastership offered as an open and/or closed course?	No
Teaching Institution	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one-year, Part-time MSc - up to three years, Full-time PgDip - one year, Part-time PgDip - two years, Full-time PgCert - one year, Part-time PgCert – two years SINO UK – 18 months.
Course Start Month(s)	Full-time: September and March. Part-time: throughout the year SINO UK - March

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Manufacturing Theme, Sustainable Manufacturing Systems Centre where the research interests include:

- Operations Management
- Manufacturing Systems Engineering
- Product-Service Systems
- Supply Chain Management
- Simulation and Modelling

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This MSc course is accredited by the Institution of Engineering and Technology (IET) on behalf of the Engineering Council as further learning for CEng until August 2025, by The Institution of Mechanical Engineers (IMechE) on behalf of the Engineering Council as further learning for CEng until August 2026 and by the Royal Aeronautical Society (RAeS) on behalf of the Engineering Council as further learning for CEnguntil August 2026. Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

Please note the SINO delivery in China is not accredited.

2. What are the aims of the course?

Cranfield University offers this course in order to prepare and develop future aerospace manufacturing engineers and managers/ leaders who will be able to manage major implementation programmes or instigate interventions that deliver improvements to the performance of their aerospace manufacturing businesses.

The objectives of the course have been set to:

- Equip students with the skills necessary for aerospace manufacturing/production systems and their supply chain.
- Develop student's awareness and understanding of manufacturing strategy and operations management to address aerospace manufacturing industry problems.
- Provide students with an appreciation of manufacturing technologies, concepts and tools relevant to the aerospace manufacturing sectors.
- Develop students' transferable skills such as analytical and interpersonal skills needed for the creative and effective application of knowledge to address aerospace manufacturing issues.

This programme is intended for the following range of students:

- Talented UK students with a high grade BSc level.
- Ambitious high quality students with an international background.
- Mid-career professionals who want to boost their career.
- Those wishing to work nationally or internationally with aerospace manufacturing companies that need to address manufacturing systems problems.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Demonstrate a systematic understanding of *aerospace manufacturing functions* including manufacturing systems, supply chain management and manufacturing strategy development.
ILO 2. Analyse different methods and techniques needed for credible aerospace manufacturing system design and improvement projects.
ILO 3. Develop original and in-depth knowledge of aerospace manufacturing operations and critically evaluate the appropriate applications of methodologies to support them.
ILO 4. Critically evaluate theories for the analysis and design tools and their application to (a) solve aerospace manufacturing problems in terms of technology and/or organisations and (b) increase the effectiveness of aerospace manufacturing systems.
ILO 5. Demonstrate comprehensive knowledge of aerospace materials including metals, ceramics and composites, aerospace structures, advanced joining techniques and precision machining.
ILO 6. Analyse and re-design aircraft assembly processes.
ILO 7. Analyse different assessment techniques to fracture mechanics.

In completing this course, and achieving the associated award, a diligent student should be able to:

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 8. Demonstrate the ability to apply practical and rigorous approaches to formulate projects, develop engineering solutions and evaluate their effectiveness.
ILO 9. Asses some key project management techniques, and at the same time, demonstrate awareness of the less science-dependent aspects of technology.
ILO 10. Demonstrate transferable skills including, personal responsibility, complex decision making and independence for further learning.
ILO 11. Demonstrate ability to provide technical and additionally commercial leadership through planning industrial/research projects (budgets, people, tasks) and contributing to teams delivering under time pressures individually and as a team member.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 12. Synthesise a sound theoretical approach to critically evaluate data and information, undertaking a critical appraisal of technical and/or commercial literature.
ILO 13. Propose and bring about improvements to appropriate business standards.

4. How is the course taught?

The teaching methods include lectures, case studies, group exercises, field visits, seminar and computer-based demonstrations and exercises. All students attend a week of introductory lectures (given during the first week of the course). Within this induction week, students will be introduced to personal development planning and asked to reflect on their transferable skills and to take ownership of their personal development during the course. Induction is followed by 8 weeks of assessed modules.

All MSc students will undertake a Group Project (full time students) or produce a Dissertation (part time students). The Group projects are group-based activities typically undertaken for 12 weeks between February and April (for September intake) or between August and October (for March intake). The projects are designed to integrate knowledge, understanding and skills from the taught modules in a real-life situation. The Group Project will typically involve a team of students between 5 and 8, working to investigate a manufacturing opportunity or solve a manufacturing problem. Part-time students are encouraged to take part in a part-time Group Project. Where this is not possible, this ca be replaced with an individual Dissertation. The topic is to be agreed between the University and the student.

All MSc students will undertake a research projects (thesis project) under the supervision of a member of academic staff. For the individual research project, each student is allocated a supervisor. Guidance sessions are provided as to what is required from the thesis and oral presentation.

In addition to the teaching methods outlined in section 3 above, students will be supported in their learning and personal development by:

- The use of Virtual Learning Environment
- On-demand tutorials
- Coaching throughout group project periods

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

FULL TIME STUDENTS

Description	**Credits**
COMPULSORY MODULES:	
Modules 2-6 Introduction	50 **0**
ELECTIVE MODULES:	
Modules 7-10 (Select 1) NOTE: for the March intake some electives may not be available	10

PART TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 2-6 Introduction	50 0

ELECTIVE MODULES:	
Modules 7, or 8, (Select 1)	10
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

FULL TIME STUDENTS

Description	**Credits**
COMPULSORY MODULES:	
Modules 2-6 Group Project (12a) Introduction	50 40 0
ELECTIVE MODULES:	
Modules 7-11 (Select 3) NOTE: for the March intake some electives may not be available	30
TOTAL:	120

PART TIME STUDENTS

Description	**Credits**
COMPULSORY MODULES:	
Modules 2-6 Introduction	50 0
ELECTIVE MODULES:	
Modules 7-11 (Select 3) Group Project (12a) or Dissertation (12b). NOTE: for the March intake some electives may not be available	30 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

FULL TIME STUDENTS

Description	**Credits**
COMPULSORY MODULES:	
Modules 2-6 Group Project (12a) Individual Research Project (13) Introduction	50 40 80 0
ELECTIVE MODULES:	
Modules 7-11 (Select 3) NOTE: for the March intake some electives may not be available	30
TOTAL:	200

FULL TIME SINO UK STUDENTS

Description	**Credits**

COMPULSORY MODULES:	
Modules 2-8, and 11 Group Project (12a) Individual Research Project (13) Introduction	80 40 80 0
TOTAL:	200

PART TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 2-6 Individual Research Project (13) Introduction	50 80 0
ELECTIVE MODULES:	
Modules 7-11 (Select 3) Group Project (12a) or Dissertation (12b). NOTE: for the March intake some electives may not be available	30 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment.
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September or March and are expected to complete the course within 12 calendar months. MSc students must successfully complete 5 core modules and 3 elective ones, the Group Project and an Individual Research Project.

This course is also offered on a part-time basis. In such a situation, students typically complete the various components of the course over two or three years. Typical case is to complete four taught modules plus a Group Project/Dissertation in year 1 and the remainder of the modules plus the Thesis in year two and/or year 3.

SINO/UK students will complete the course over 18 months starting with first 3 modules in March to June of the first academic year, in China, and the remaining 5 modules, group project and thesis will be completed at Cranfield in the second academic year.

7. Course Level Assessment Strategy[4]

The course assessment strategy involves a variety of assessment methods, including exams and assignments for summative assessment and a range of in-module activities for formative assessment. The course entails 10 taught modules (5 compulsory and 5 electives from which the students need to choose 3), a group project and an Individual Research Project, which are all designed to equip the MSc students with a full set of relevant knowledge, confidence and competence in the domain of Aerospace Manufacturing.

The assessment strategy for the course is well aligned to the Intended Learning Outcomes (ILOs) for each module and include written closed book exams (Operations Management, Operations Analysis and Advanced Welding) and a blend of individual and group coursework assignments for the rest of the taught modules.

The assessment of the group project includes a group report, a group presentation and individual written reflections from each student.

The Individual Research Project (Master Thesis) is assessed through a written thesis report and a marked oral presentation.

The course is structured in such a way that the learners build their own learning through relevant learning activities which take place before, during, and after the modules as well as during the learner's engagement with group and individual projects work.

The learning activities are directly relevant to the Intended Learning Outcomes (ILOs) and challenge the students to develop and demonstrate the full range of skills and knowledge required to succeed in their professional careers as management and information systems specialists, as specified at the individual modules and are aligned with the course-level ILOs.

Each taught module incorporates formative assessment and feedback opportunities throughout the week-long content delivery, which prioritises interactive engagement with the topic, through case studies, live presentations, group work and hands-on simulations on authentic and novel thematic scenarios.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

This is in line with the design of the course aiming for a balanced and varied assessment provision that enables the students to actively engage with the specific content of the ILOs and explore the introduced concepts and methods in a safe learning environment where they can receive constructive feedback from the academic tutors and their peers.

The summative assessment rubrics and relationship to the ILOs are introduced and discussed during the start and end of each module delivery week and are followed up with assessment “clinics” (face to face and online) where students can question, clarify and demonstrate any of their queries with regards to the scope and mechanics of the summative assessment element of each module.

Timing expectations for marking and feedback are set early and communicated to the students for each module. The relevant communications are stated in the electronic Learning Management System for ease of reference and clarity.

Course modules

The following modules outline all parts of the programme leading to an **MSc.** Other awards associated with the course include some or all of these modules.

September (Full-time + Part-time) Intake

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	I-MAT-INWK	Introduction	Dr Sue Impey	39		0	Y	28/09/22	03/10/22 Occ A	07/10/22	N/A	AO	N/A				N/A	
2	I-MNU-A1034	Operations Management	Dr Mohamed Afy-Shararah	32		10	Y	10/10/2022	10/10/2022 Occ A	14/10/2022	50	EX	100				12/12/22	Manufacturing resit exams will be during week commencing

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		15/05/23
3	I-MNU-A1027	Manufacturing Systems Engineering	Dr Maryam Farsi	32		10	Y	07/11/22	07/11/22 Occ A	11/11/22	50	GCW	100				09/01/23	Re-assessment date to be set by agreement of Module Leader as/when required.
4	I-MNU-A1038	Supply Chain Management	Mr John Patsavellas	32		10	Y	09/01/23	09/01/23 Occ A	13/01/23	50	GCW	100				06/02/23	Re-assessment date to be set by agreement of Module Leader as/when required.
5	I-MNU-A1019	Manufacturing Strategy	Dr Patrick McLaughlin	35		10	Y	16/01/23	23/01/23 Occ A	27/01/23	50	ICW	100				20/02/23	Re-assessment date to be set by agreement of Module Leader as/when required.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
6	I-MNU-A1047	Aircraft Assembly	Prof Phil Webb	34		10	N	16/01/23	16/01/23 Occ A	20/01/23	50	ICW	100				13/02/23	Re-assessment date to be set by agreement of Module Leader as/when required.
7	I-MAT-A1011	Additive and Subtractive Manufacturing Technologies	Dr Claudiu Giusca	30	0	10	Y	17/10/22	17/10/22	21/10/22	50	ICW	100				14/11/22	Re-assessment date to be set by agreement of Module Leader as/when required.
8	I-MAT-A1013 B22	Composites Manufacturing for High Performance Structures	Andrew Mills	30		10	Y	28/11/22	05/12/22	09/12/22	50	ICW	100				16 /01/23	Re-assessment date to be set by agreement of Module Leader as/when required.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
9	I-MAT-A1015	Failure of Materials and Structures	Dr Muhammad Khan	32		10	Y	31/10/22	31/10/22	04/11/22	50	EX	100				15/12/22	Manufacturing resit exams will be during week commencing 15/05/2023
10	I-WEE-A1110	Advanced Welding Processes	Dr Wojciech Suder	27		10	Y	21/11/22	21/11/22	25/11/22	50	EX	100				04/01/23	Manufacturing resit exams will be during week commencing 15/05/2023
11	I-MNU-A1029	Operations Analysis	Dr John Patsavellas	32	8	10	Y	31/10/22	31/10/22	04/11/22	50	EX	100				15/12/22	Manufacturing resit exams will be during week commencing 15/05/2023
12a	I-MAT-GRPP	Group Project	Dr David Ayre	20		40	Y	30/01/23	30/01/23 Occ A FT	25/04/23 FT	50	GPRES GCW ICW IPRAC	16 64 10 10				25/04/23 02/05/23 02/05/23 02/05/23	
									30/01/23 Occ B PT	25/08/23 PT	50	GPRES GPROJ ICW	16 64 10				25/07/23 01/08/23 01/08/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
												IPRAC	10				01/08/23	
12b	I-MAT-DISS	Dissertation for Part Time Students	Dr Muhammad Khan	20		40	Y	06/02/23	06/02/23	25/08/23	50	ICW ICW	90 10				25/08/23 25/08/23	
13	I-MNU-THESIS	Individual Research Project	Dr Muhammad Khan	20		80	Y	06/02/22	Occ A = PT 06/02/23	PT 25/08/23	50	THESIS IPRES	90 10				25/08/23 29/08/23	
			Dr Muhammad Khan					28/04/22	Occ B = FT 06/04/23	FT 25/08/23	50	THESIS IPRES	90 10				25/08/23 29/08/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

March (Full-time) Intake

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers[13]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	' Residential' Start Date	' Residential' End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part[17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
1	I-MAT-INWK	Induction	Dr Sue Impey	22		0	Y	02/03/23	02/03/23 Occ B	03/03/23	N/A	AO	N/A				N/A	
2	I-MNU-A1034	Operations Management	Dr Mohamed Afy-Shararah	32		10	Y	06/03/2023	06/03/23 Occ B	10/03/23	50	EX	100				15/05/23	Resit exams will be with 2023/24 cohort in December 2023
3	I-MNU-A1027	Manufacturing Systems Engineering	Dr Maryam Farsi	32		10	Y	27/03/23	27/03/23 OCC B	31/03/23	50	GCW	100				24/04/23	Re-assessment date to be set by agreement of Module Leader

[12] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[13] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[14] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[15] For **independent assessments** please record type and weighting of each separate piece of assessment individually.
[16] For **multi-part assessments** please record the overall weighting of module which should be 100%.
[17] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[18] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers[13]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	' Residential' Start Date	' Residential' End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part [17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
																		as/when required.
4	I-MNU-A1038	Supply Chain Management	Dr John Patsavellas	32		10	Y	24/04/23	24/04/23 Occ B	28/04/23	50	GCW	100				30/05/23	Re-assessment date to be set by agreement of Module Leader as/when required.
5	I-MNU-A1019	Manufacturing Strategy	Dr Patrick McLaughlin	35		10	Y	22/05/23	22/05/23	26/05/23	50	ICW	100				26/06/23 16:00pm	Re-assessment date to be set by agreement of Module Leader as/when required.
6	I-MNU-A1047	Aircraft Assembly	Prof Phil Webb	34		10	N	12/06/23	12/06/23 Occ B	16/06/23	50	ICW	100				03/07/23	Re-assessment date to be set by agreement of Module Leader as/when required.
7	I-MAT-A1011	Additive and Subtractive Manufacturing Technologies	Dr Claudiu Giusca	30		10	Y	12/04/23	12/04/23 Occ B	18/04/23	50	ICW	100				09/05/23	Re-assessment date to be set by agreement of Course Director and Module Leader as/when required.
8	I-MAT-A1013	Composites Manufacturing for High Performance	Mr Andrew Mills	30		10	Y	02/05/23	02/05/23 Occ C	05/05/23	50	ICW	100				05/06/23	Re-assessment date to be set by agreement of

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers[13]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	' Residential' Start Date	' Residential' End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part[17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
		Structures																Module Leader as/when required.
9	I-MAT-A1015	Failure of Materials and Structures	Dr David Ayre					Not available for this intake										
10	I-WEE-A1110	Advanced Welding Processes	Dr Wojciech Suder					Not available for this intake										
11	I-MNU-A1029	Operations Analysis	Dr Jelena Milisavljevic Syed	32	8	10	Y	20/03/23	20/03/23 Occ B	24/03/23	50	EX	100				19/05/23	Resit exams will be with 2023/24 cohort in December 2023
12a	I-MAT-GRPP	Group Project	Dr Lampros Litos	20		40	Y	26/06/23	26/06/23 Occ C	29/09/23	50	GPRES GCW ICW IPRAC	16 64 10 10				22/09/23 29/09/23 29/09/23 29/09/23	
12b	I-MAT-DISS	Dissertation for Part Time Students	Dr David Ayre					Not available for this intake										
13	I-MNU-THESIS	Individual Research Project	**Dr Lampros Litos**	20		80	Y	02/10/23	02/10/23 Occ C	12/02/24	50	THESIS IPRES	90 10				09/02/24 12/02/24	

SINO/UK Intake (Full time students only) – March 2023 (3 modules in China will be 'AY 22/23 and modules on Cranfield campus will be 'AY 23/24'

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[19]	Total hours delivered by Visiting Lecturers[20]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Residential' Start Date	Residential' End Date	Minimum Mark[21] - 40% or 50%	Type of Assessment	Weighting within module[22] (%) of Independent assessments	Weighting within module of multi-part assessments[23] (%)	Type of Assessment	Weighting of individual elements of multi-part assessment[24]	Assessment Submission and/or exam date[25]	Assessment / Exam Retake date
1	I-MAT-INWK	Induction	Dr Sue Impey	18		0	Y	23/03/23	23/03/23	24/03/23	N/A	AO	N/A				N/A	
2	I-MNU-A1034	Operations Management	Dr Mohamed Afy-Shararah	32		10	Y	27/03/23	27/03/23 AY 22 Occ C	06/04/23	50	EX	100				24/06/23	Resit exams will be with 2023/24September cohort in December 2023
3	I-MNU-A1027	Manufacturing Systems Engineering	Dr Maryam Farsi	32		10	Y	06/11/23	06/11/23 AY23 Occ A	10/11/23	50	GCW	100				08/01/24	Re-assessment date to be set by agreement of Module Leader as/when

[19] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[20] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[21] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[22] For **independent assessments** please record type and weighting of each separate piece of assessment individually.
[23] For **multi-part assessments** please record the overall weighting of module which should be 100%.
[24] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[25] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[19]	Total hours delivered by Visiting Lecturers [20]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	' Residential' Start Date	' Residential' End Date	Minimum Mark[21] - 40% or 50%	Type of Assessment	Weighting within module22 (%) of Independent assessments	Weighting within module of multi-part assessments [23](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[24]	Assessment Submission and/or exam date[25]	Assessment / Exam Retake date
																		required.
4	I-MNU-A1038	Supply Chain Management	Dr John Patsavellas	32		10	Y	08/01/24	08/01/24 AY23 Occ A	12/01/24	50	GCW	100				05/02/24	Re-assessment date to be set by agreement of Module Leader as/when required.
5	I-MNU-A1019	Manufacturing Strategy	Dr Patrick McLaughlin	35		10	Y	05/06/23	05/06/23 AY22 Occ C	09/06/23	50	ICW	100				03/07/23	Re-assessment date to be set by agreement of Module Leader as/when required.
6	I-MNU-A1047	Aircraft Assembly	Prof Phil Webb	34		10	N	15/01/24	15/01/24 AY 23 Occ A	19/01/24	50	ICW	100				12/02/24	Re-assessment date to be set by agreement of Module Leader as/when required.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[19]	Total hours delivered by Visiting Lecturers [20]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	' Residential' Start Date	' Residential' End Date	Minimum Mark[21] - 40% or 50%	Type of Assessment	Weighting within module22 (%) of Independent assessments	Weighting within module of multi-part assessments [23](90%)	Type of Assessment	Weighting of individual elements of multi-part assessment[24]	Assessment Submission and/or exam date[25]	Assessment / Exam Retake date
7	I-MAT-A1011	Additive and Subtractive Manufacturing Technologies	Dr Claudiu Giusca	30		10	Y	16/10/23	16/10/23 AY 23 Occ A	20/10/23	50	ICW	100				13/11/23	Re-assessment date to be set by agreement of Module Leader as/when required.
8	I-MAT-A1013	Composites Manufacturing for High Performance Structures	Andrew Mills	30		10	Y	27/11/23	04/12/23 AY 23 Occ B	08/12/23	50	ICW	100				15/01/24	Re-assessment date to be set by agreement of Module Leader as/when required.
9	I-MAT-A1015	Failure of Materials and Structures	Dr David Ayre					Not available for this intake										
10	I-WEE-A1110	Advanced Welding Processes	Dr Wojciech Suder					Not available for this intake										

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[19]	Total hours delivered by Visiting Lecturers [20]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	' Residential' Start Date	' Residential' End Date	Minimum Mark[21] - 40% or 50%	Type of Assessment	Weighting within module22 (%) of Independent assessments	Weighting within module of multi-part assessments [23](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[24]	Assessment Submission and/or exam date[25]	Assessment / Exam Retake date
11	I-MNU-A1029	Operations Analysis	Dr Jelena Milisavljevic Syed	32	8	10	Y	24/04/23	24/04/23 AY 22 Occ C	05/05/23	50	EX	100				25/06/23	Resit exams will be with 2023/24SeptemberMS cohort in December 2023
12a	I-MAT-GRPP	Group Project	Dr David Ayre	20		40	Y	29/01/24	29/01/24 AY 23 Occ A	03/05/24	50	GPRES GCW ICW IPRAC	16 64 10 10				26/04/24 03/05/24 03/05/24 03/05/24	
13	I-MNU-THESIS	Individual Research Project	Dr Muhammad Khan	20		80	Y	07/05/24	07/05/24 AY 23 Occ B	23/08/24	50	THESIS IPRES	90 10				23/08/24 28/08/24	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
I-MAT-INWK	Introduction	Advanced Materials	Engineering & Management of Manufacturing Systems, Management and Information Systems, Global Product Development and Management, Maintenance Engineering and Asset Management, Aerospace Materials, Welding Engineering, Metal Additive Manufacturing, Manufacturing Technology and Management
I-MNU-A1034	Operations Management	Engineering and Management of Manufacturing Systems	Manufacturing Technology and Management, Engineering & Management of Manufacturing Systems, Global Product Development and Management, Management and Information Systems, Cyber-Secure Manufacturing, Engineering Competence
I-MNU-A1027	Manufacturing Systems Engineering	Engineering and Management of Manufacturing Systems	Engineering Competence
I-MNU-A1038	Supply Chain Management	Engineering and Management of Manufacturing Systems	Global Product Development and Management, Management and Information Systems
I-MNU-A1019	Manufacturing Strategy	Engineering and Management of Manufacturing Systems	
I-MAT-A1011	Additive and Subtractive Manufacturing Technologies	Advanced Materials	Manufacturing Technology and Management
I-MAT-A1013	Composites Manufacturing for High Performance Structures	Advanced Materials	Manufacturing Technology and Management, Aerospace Materials, Renewable Energy Marine Structures EngD
I-MAT-A1015	Failure of Materials and Structures	Advanced Materials	Aerospace Materials
I-WEE-A1110	Advanced Welding Processes	Welding Engineering	Manufacturing Technology and Management, Welding Engineering, Renewable Energy Marine Structures EngD
I-MNU-A1029	Operations Analysis	Engineering and Management of Manufacturing Systems	Manufacturing Technology and Management
I-MAT-GRPP	Group Project	Advanced Materials	Aerospace Materials,

			Manufacturing Technology & Management, Engineering & Management of Manufacturing Systems, Management and Information Systems, Global Product Development and Management, Welding Engineering, Metal Additive Manufacturing, Maintenance Engineering and Asset Management
I-MAT-DISS	Dissertation for Part Time Students	Advanced Materials	Aerospace Materials, Manufacturing Technology & Management, Engineering & Management of Manufacturing Systems, Management and Information Systems, Global Product Development and Management, Welding Engineering, Metal Additive Manufacturing, Maintenance Engineering and Asset Management
I-MNU-THESIS	Individual Research Project	Aerospace Manufacturing	Engineering & Management of Manufacturing Systems, Management and Information Systems, Global Product Development and Management, Aerospace Materials, Manufacturing Technology & Management, Welding Engineering, Metal Additive Manufacturing, Maintenance Engineering and Asset Management, Advanced Materials

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students can expect to have at least two written examinations, and depending on the elective modules they undertake, between four and seven pieces of assessment by submitted work, one piece of group project work (including an assessment of personal contribution to group work), and one element assessed by a thesis and an oral presentation.

This approach has been adopted in order to perform formative and summative assessments of the students to demonstrate their ability in a range of contexts. Part time students will be assessed by dissertation in place of the group project.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5	ILO 6	ILO 7
1	Non Assessed						
2	EX	EX	EX	EX			
3	GCW	GCW	GCW	GCW			
4	GCW	GCW	GCW	GCW			
5		ICW	ICW	ICW			
6	ICW	ICW	ICW	ICW	ICW	ICW	
7		ICW			ICW	ICW	ICW
8					ICW	ICW	ICW
9					EX		EX
10					EX		EX

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 8	ILO 9	ILO 10	ILO 11
11	EX	EX	EX	EX				
12a					GPRES GCW ICW	GPRES GCW ICW	GPRES GCW ICW	GPRES GCW ICW
12b					ICW	ICW	ICW	ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 12	ILO 13
13	THESIS IPRES	THESIS IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition, students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The intention of the course is to provide students with knowledge and understanding and associated transferrable skills to make a contribution to industry on graduation. Aerospace Manufacturing graduates will typically seek employment in aerospace manufacturing industry, consultancies or research institutions. Common starting roles are manufacturing engineer, industrial engineer, technical analyst, project manager and PhD researcher. With time (quicker for those with background experience) graduates progress to senior positions with significant responsibility for people, budgets and projects.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: Aug 2022

1. What is the course?

Course information

Course Title	MSc in Aerospace Materials
Course code	MSAMRFTC, MSAMRPTC, PDAMRFTC, PDAMRPTC, PCAMRFTC, PCAMRPTC
Academic Year	2022/23
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Manufacturing
Centre	Surface Engineering & Precision Institute
Course Director	Dr Sue Impey
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	**No**
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - up to three years, Full-time PgDip - one year, Part-time PgDip - two years, Full-time PgCert - one year, Part-time PgCert - two years
Course Start Month(s)	Full-time: September. Part-time: September.

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Manufacturing Theme, Surface Engineering & Precision Institute, where the research interests across the theme include:

- Enhanced Composites and Advanced Structures.
- Surface Engineering and Precision Engineering
- Welding Engineering and Laser Processing
- Sustainable Manufacturing Systems
- Life-cycle Engineering and Management
- Digital Engineering and Manufacturing

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the following PSRBs on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng):

- The Institution of Engineering and Technology (IET) until August 2025
- The Institute of Materials, Minerals and Mining (IOM3) until August 2026
- The Institution of Mechanical Engineers (IMechE) until August 2026
- The Royal Aeronautical Society (RAeS) until August 2026

Students completing an accredited degree are deemed to have met part or all of the academic requirements for registration as a Chartered or Incorporated Engineer and are in a strong position to move on to achieve professional engineering status after a period of initial professional development in industry.

2. What are the aims of the course?

AIM
The aim of the course is to provide graduate scientists and engineers with skills to adapt and develop materials for next generation aircraft and future aerospace industry

OBJECTIVES
The objectives of the course are to provide students with opportunities to:

1. evaluate materials development for aerospace and engineering applications
2. analyse materials requirements, with a sustainable approach, for next generation aircraft, spacecraft and future aerospace developments
3. apply a systems approach to identify preferred materials for aerospace and engineering applications and evaluate different manufacturing approaches utilizing these materials
4. work within a research environment, with numerical and practical approaches to problem solving, critical evaluation of data, and use of information technology

5. practice skills required to pursue a successful career in materials engineering in aerospace and other industries.

On successful completion of the course students should be able to:

- Plan, execute and manage materials-related projects addressing requirements, preferred materials and manufacturing methods.
- Operate effectively in a team
- Make effective oral and written presentations of work.

This programme is intended for the following range of students:

- recent graduates wishing to extend their knowledge and skills in aerospace materials engineering
- qualified engineers wishing to apply their skills into new areas.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Evaluate opportunities in materials development for aerospace and engineering applications
ILO 2. Analyse materials requirements, with a sustainable approach, for next generation aircraft, spacecraft and future aerospace developments or alternative applications
ILO 3. Apply a systems approach to identify preferred materials for aerospace and engineering applications and evaluate different manufacturing approaches utilizing these materials
ILO 4. Implement practical and/or numerical approaches to problem solving

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would be expected to:

ILO 5. Plan, execute and manage a materials-related project.
ILO 6. Appraise technical and/or commercial literature
ILO 7. Deliver an effective oral and written presentation of work.
ILO 8. Contribute to and operate effectively in a team.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would be expected to:

ILO 9. Undertake a substantial critical appraisal of technical and/or commercial literature.
ILO 10. Prepare a substantial scientific programme of study.

4. How is the course taught?

Students will be supported in their learning and personal development by:

Comprehensive course materials are provided, as well as a web-site using the Virtual Learning Environment (VLE). Students are guided through the use of interactive exercises, group and individual discussion. Students engage in class activities to practise the techniques taught.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

FULL TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 7	30
ELECTIVE MODULES:	
Three modules from 4-6 and 8, 9 Choose three modules from five	30
TOTAL:	60

PART-TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 7	30
ELECTIVE MODULES:	
Choose three modules from 4 - 6 and 8 -10 (Module 10 requires selection of 4 and 9 as prerequisites)	30
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

FULL TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 1-9 Group Project (11a)	80 40
TOTAL:	120

PART TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 7	30
ELECTIVE MODULES:	
50 credits from modules 4-6, 8-10 (Module 10 requires selection of 4 and 9 as prerequisites) 40 credits from modules 11a or 11b	50 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

FULL TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 1-9 Group Project (11a) Individual Research Project (12)	80 40 80
TOTAL:	200

PART TIME STUDENTS

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 7 Individual Research Project (12)	30 80
ELECTIVE MODULES:	
50 credits from modules 4-6, 8-10 (Module 10 requires selection of 4 and 9 as prerequisites) 40 credits from modules 11a or 11b	50 40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment.
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 11 calendar months.

The course has been structured through discussions with advisors from a range of industries centred on materials. The course comprises an introductory week and eight one week modules which are assessed, and an assessed group project and individual project. The course covers a broad range of materials areas. Specialisation is provided though suitable group and individual projects.

This course is also offered on a part-time basis. In such a situation, students typically complete the various components of the course over two or three years. A typical case is to complete four taught modules plus a Group Project/Dissertation in year 1 and the remainder of the modules plus the Thesis in year two and/or year 3.

Part-time Students are encouraged to take the Group Project component and only in exceptional circumstances, and with approval from the Group Project Co-ordinator, will be permitted to replace the Group Project with an individual dissertation.

Part-time students also have the option to study Design, Durability and Integrity of Composite Aircraft Structures (module 10) as an elective module. If you are interested in this option, please discuss this with the Course Director before selecting your elective options.

7. Course Level Assessment Strategy[4]

The course comprises taught modules (PG certificate, PG diploma, MSc) a group project (PG Diploma, MSc) and an individual research project (MSc). The intended learning outcomes for each module and project component are introduced to the students at the start of each module and project. Students are provided marking scheme information for all summative assessments and opportunities to revise/discuss content and strategies prior to completion of the assessments to ensure students are better informed to deliver.

Each taught module is assessed separately in addition to the assessment of group project work and individual research project work. Activities during the module delivery allow formative feedback to be provided either individually to each student or generally to the student cohort. Such activities include individual student exercises, group exercises, presentation of group work, class discussions, interactive class quizzes, (lab) demonstrations with limited student interaction, software package tutorials and final recap with question and answer session at end of most modules.

The Introduction to Materials Engineering module (module 2) forms the introduction to the course and is assessed by individual course work.

Summative assessments are varied, aligning with module ILOs and being designed specifically for each individual module. Assessments include closed book examinations, written assignments, group and individual oral presentations, use of associated software packages (documented reports) and reflective writing. The taught module ILOs and feedback from assessments (formative and summative) all develop skills that are further assessed in the group project work and individual research project work.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Summative assessment feedback is provided through the Virtual Learning Environment – written course work is marked and feedback provided within the recommended 20 working day period. General feedback on examinations is provided (posted on VLE) based on a sample size of exam question responses.

Assessment of project work (group and individual) is by a combination of observed behaviour, reflective writing, oral presentations (poster and powerpoint) and project reports. Formative feedback is provided during the projects (by supervisors, sponsors, technical staff and peers).

Full-time and part-time students are assessed identically where circumstances allow. The only provision for difference is in the Group Project/Dissertation (module 11a/11b); part-time students can be allowed to undertake a dissertation in place of the group project work where it can be demonstrated that a group project activity is unsuitable due to part-time student working restrictions.

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	I-MAT-INWK	Introduction	Dr Sue Impey	39		0	Y	28/09/22	03/10/22	07/10/22	N/A	AO	N/A				N/A	
2	I-MAT-A1009	Introduction to Materials Engineering	Dr David Ayre	30		10	Y	10/10/22	10/10/22	14/10/22	50	ICW	100				07/11/22	TBC – if required
3	I-MAT-A1005	Sustainable Aerospace Materials	Dr Sue Impey	30		10	N	17/10/22	17/10/22	21/10/22	50	ICW	100				14/11/22	TBC – if required
4	I-MAT-A1015	Failure of Materials and Structures	Dr Muhammed Khan	32		10	Y	31/10/22	31/10/22	04/11/22	50	EX	100				15/12/22	Manufacturing resit exams will be during week

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		commencing: 15/05/23
5	I-MAT-A1007	Functional Materials	Dr Sue Impey	30		10	N	05/12/22	05/12/22	09/12/22	50	ICW	100				16/01/22	TBC – if required
6	I-MAT-A1014	Finite Element Analysis	Dr Muhammad Khan	35		10	Y	07/11/22	07/11/22	11/11/22	50	GCW	100				05/12/22	TBC – if required
7	I-MAT-A1017	Materials Selection	Dr Sue Impey/ Dr David Ayre	34		10	Y	09/01/23	09/01/23	13/01/23	50	ICW	100				06/02/23	TBC – if required
8	I-MAT-A1016	Surface Science and Engineering	Prof John Nicholls	30		10	Y	23/01/23	23/01/23	27/01/23	50	ICW	100				20/02/23	TBC – if required
9	I-MAT-A1013 Occ A	Composites Manufacturing for High Performance Structures	Mr Andrew Mills	30		10	Y	14/11/22	21/11/22	25/11/22	50	ICW	100				04/01/23	TBC – if required
10	N-AW-ICAS Occ B	Design, Durability and Integrity of Composite Aircraft Structures	Dr Yigeng Xu	35	5	10	Y	10/07/23	10/07/23	14/07/23	50	ICW	100				11/09/23	TBC – if required

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
11a	I-MAT-GRPP	Group Project	Dr David Ayre	20		40	Y	30/01/23	30/01/23 Occ A FT	25/04/23 FT	50	GPRES GCW ICW IPRAC	16 64 10 10				25/04/23 02/05/23 02/05/23 02/05/23	
			Dr David Ayre						06/02/23 Occ B PT	01/08/23 PT	50	GPRES GCW ICW IPRAC	16 64 10 10				25/07/23 01/08/23 01/08/23 01/08/23	
11b	I-MAT-DISS	Dissertation for Part Time Students	Dr Sue Impey Dr David Ayre	20		40	Y	06/02/23	06/02/23	25/08/23	50	ICW ICW	90 10				25/08/23 25/08/23	
12	I-MNU-THESIS	Individual Research Project	Dr Muhammad Khan	20		80	Y	06/02/23	Occ A = PT 07/02/22	PT 25/08/23	50	THESIS IPRES	90 10				25/08/23 29/08/23	
			Dr Muhammad Khan					28/04/23	Occ B = FT 28/04/23	FT 25/08/23	50	THESIS IPRES	90 10				25/08/23 29/08/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
I-MAT-INWK	Introduction	Advanced Materials	Manufacturing Technology and Management, Aerospace Manufacturing, Engineering and Management of Manufacturing Systems, Global Product Development and Management, Management and Information Systems, Welding Engineering, Maintenance Engineering and Asset Management, Metal Additive Manufacturing
I-MAT-A1009	Introduction to Materials Engineering	Advanced Materials	Manufacturing Technology and Management
I-MAT-A1015	Failure of Materials & Structures	Advanced Materials	Aerospace Manufacturing Maintenance Engineering and Asset Management
I-MAT-A1014	Finite Element Analysis	Advanced Materials	Manufacturing Technology and Management, Metal Additive Manufacturing
I-MAT-A1017	Materials Selection	Advanced Materials	EngD in Sustainable Manufacturing Systems
I-MAT-A1016	Surface Science and Engineering	Advanced Materials	Manufacturing Technology and Management, Aerospace Materials
I-MAT-A1013	Composites Manufacturing for High Performance Structures	Advanced Materials	Manufacturing Technology and Management, Aerospace Manufacturing,
N-AW-ICAS	Design, Durability and Integrity of Composite Aircraft Structures	Airworthiness	Military Aerospace and Airworthiness, Advanced Materials, Aircraft Engineering
I-MAT-GRPP	Group Project	Advanced Materials	Manufacturing Technology and Management, Aerospace Manufacturing, Engineering and Management of Manufacturing Systems, Global Product Development and Management, Management and Information Systems, Welding Engineering, Metal Additive Manufacturing, Maintenance Engineering and Asset Management,
I-MAT-DISS	Dissertation for Part Time Students	Advanced Materials	Manufacturing Technology and Management, Aerospace Manufacturing, Engineering and Management of Manufacturing Systems, Global Product Development and Management,

			Management and Information Systems, Welding Engineering, Metal Additive Manufacturing, Maintenance Engineering and Asset Management,
I-MNU-THESIS	Individual Research Project	Aerospace Manufacturing	Advanced Materials, Engineering and Management of Manufacturing Systems, Global Product Development and Management, Management and Information Systems, Manufacturing Technology and Management, Welding Engineering, Metal Additive Manufacturing, Maintenance Engineering and Asset Management,

8. How are the ILOs assessed?

The following assessment types are utilised:
Students can expect to have either examinations or assessment by submitted work and elements of assessment by presentation or viva. Each module is assessed and the approach adopted is to perform formative and summative assessments of the students to demonstrate their ability in a range of contexts.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4
2	ICW	ICW		ICW
3	ICW	ICW	ICW	
4		EX		EX
5	ICW	ICW		ICW
6		ICW		ICW
7	ICW	ICW	ICW	ICW
8	ICW	ICW	ICW	ICW
9	ICW	ICW		ICW
10			ICW	ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 5	ILO 6	ILO 7	ILO 8
11a	GCW	GCW	GPRES	ICW IPRAC
11b	ICW	ICW	ICW	ICW ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 9	ILO 10
12	THESIS	THESIS IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The intention of the course is to provide students with knowledge and understanding and associated transferrable skills to make a contribution to industry on graduation. Aerospace Materials graduates will typically seek employment in the aerospace manufacturing industry, consultancies or research institutions related to the aerospace industry. However other related industries such as power generation, space, sports and automotive industries are also relevant. Common starting roles are materials engineer, design and development, project engineer, project manager and PhD researcher. With time (quicker for those with more background experience) graduates progress to senior positions with responsibility for people, budgets and projects.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: June 2022

1. What is the course?

Course information

Course Title	MSc in Aerospace Vehicle Design with options in: Aircraft Design Avionic Systems Design Structural Design (September Intake only)
Course code	MSAVDFTC, MSAV2FTC
Academic Year	2022-2023
Valid entry routes	MSc
Additional exit routes	Not Applicable
Mode of delivery	Full-Time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Aeronautics
Course Director	Mr Jack Stockford (September Intake) Dr Adrian Clarke (March Intake)
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	N/A
Apprenticeship Standard the course is mapped to	N/A

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	March or September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Aeronautics where the research interests include:

- Novel aircraft configurations
- Unmanned air vehicles
- Aeroelasticity
- More electric and green aircraft technologies
- Aircraft structures and systems modelling and simulation
- Flight simulation
- Multidisciplinary design, analysis and optimisation

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Institution of Mechanical Engineers (IMechE) until August 2026 and the Royal Aeronautical Society (RAeS) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng).

2. What are the aims of the course?

The Aerospace Vehicle Design MSc aims to build on knowledge acquired from undergraduate study to develop a comprehensive understanding of aircraft design methods and techniques in the areas of aircraft structures, systems and avionics.

This programme is intended for the following range of students:

- Recent graduates wishing to extend their knowledge and skills in the above areas.
- Qualified engineers wishing to apply their skills into new areas.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. MSc

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Demonstrate a systematic understanding in the knowledge, the principles and the applicable regulatory requirements of Aerospace Vehicle Design.
ILO 2. Apply the current aircraft design methods, tools and techniques used in the aerospace industry onto aircraft design projects in the engineering fields of either aerospace structures, systems or avionics.
ILO 3. Independently undertake research in a relevant field of either aerospace structures, systems or avionics by means of critically analysing and processing current research and generating valuable research outcomes.
ILO 4. Effectively plan, communicate, collaborate and manage tasks individually and within a project team.

4. How is the course taught?

The course is taught using a combination of methods:

- Taught modules (lectures and lab work) are provided over two teaching periods. These are assessed through exams, assignments and in-class exercises through the content of their Group Design Project report.
- The students participate in a comprehensive group design project, which is a strong example of problem-based learning at the postgraduate level providing a virtual industrial environment supported by experienced staff.
- All students must undertake individual research under the guidance of academic staff, which is assessed through a thesis.

In addition to the teaching methods outlined in section 3 above, students will be supported in their learning and personal development by:

- Extensive computer network and IT facilities.
- Library facilities including journals, papers, and numerous databases.
- A dedicated course electronic Canvas.
- Numerous social events to enhance team building.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 7. Courses are structured through the accumulation of credit, where one credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. MSc

The accumulation of 200 credits (or more) through the assessment of taught modules and the successful completion of the Group Design Project and Thesis as detailed below:

Aircraft Design Option

Description	**Credits**
COMPULSORY MODULES - Assessed:	
14 16a 32 – Group Design Project 33 – Individual Research Project	10 10 100 80
COMPULSORY MODULES– Non Assessed:	
7, 9, 15, , 21, 23, 27, 30	0
ELECTIVE MODULES – Non Assessed:	
1, 4, 6, 8, 12, 17, 18a 20, 25, 26, 31,	0
TOTAL:	200

Avionic Systems Design Option

Description	**Credits**
COMPULSORY MODULES - Assessed:	
13 22 32 – Group Design Project 33 – Individual Research Project	10 10 100 80
COMPULSORY MODULES– Non Assessed:	
2, 3, 5, 7, 9, 10, 11, 16b, 19, 21, 24, 28, 29, 30	0
ELECTIVE MODULES – Non Assessed:	
4, 6, 8, 12, 23, 25,	0
TOTAL:	200

Structural Design Option (September Intake only)

Description	**Credits**
COMPULSORY MODULES - Assessed:	
14, 18b, 32 - Group Design Project 33 – Individual Research Project	10 10 100 80
COMPULSORY MODULES – Non Assessed:	

15, 17, 20, 23, 27, 30, 31	**0**
ELECTIVE MODULES – Non Assessed:	
1, 4, 6, 7, 8, 9, 12, 16b, 21, , 26,	0
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee);
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);[3]
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

6. How is the course structured?

Full-time students register for the course in either September or March and are expected to complete the course within 12 calendar months.

The course has three main components, a taught component a group design project component and an individual research project component Timeframes for the delivery of these components is indicated in the table below.

September Intake	**Aircraft Design Option**	**Avionic Systems Design Option**	**Structural Design Option**
Course Start	September	September	September
Taught Component	October to March	October to March	October to March
Examinations	January	January	January
Group Design Project	September to May	September to May	September to May
Group Project Thesis Submission	April	April	April
Group Project Industry Presentation	April	April	April
Individual Research Project	May to August	May to August	May to August
Oral Examination	August/September	August/September	August/September
Thesis Submission	August	August	August
Course End	September	September	September

March Intake	**Aircraft Design Option**	**Avionic Systems Design Option**
Course Start	March	March
Taught Component	March to August	March to August
Examinations	June	June
Group Design Project	March to September	March to September
Group Project Thesis Submission	September	September
Group Project Industry Presentation	October	October
Individual Research Project	November to February	November to February
Oral Examination	February	February
Thesis Submission	February	February
Course End	February	February

7. Course Level Assessment Strategy[4]

The following assessment types are utilised:

The course uses a range of assessment types that are challenging and enable the students to develop and demonstrate a range of skills. Students can expect to have written examinations, individual assessments, individual and group project theses to compose along with individual and group presentations. This approach has been adopted in order to provide the student with a balanced mix of theory, application and development of soft skills. The group design project is applicable for the Aircraft Design and Avionic System Design option only as the Structural Design option students undergo a more substantial, single individual project

Since in this course practical application is key to development of understanding and skills acquisition, in all modules students will engage with an interactive learning activity which incorporates formative feedback. The majority of subjects are assessed by the groups and individual project theses and the assorted presentations.

Students have opportunities to develop their communication skills, as they are required to give group and individual presentations. Formative feedback from members of staff is given immediately after the presentations.

The group project will assess the ability to apply the acquired knowledge from the taught modules to create and execute a design programme in a larger, multi-disciplinary team working environment, as well as the ability to evaluate results and present the outcome.

Further application of the knowledge and its understanding, the ability to assemble a technical literature review and plan and implement a research project, is also assessed through the individual research project. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through face to face or electronically enabled (via teleconferencing) contact with the supervision team.

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

September Intake

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	N-AVD-AE	Aeroelasticity	Prof Shijun Guo	10		0	N		30/01/23	03/02/23	n/a	AO	n/a				n/a	n/a

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education.
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
2	N-AVD-ANCS	Aeronautical Communication Systems	Dr Huamin Jia	10		0	N		16/01/23	17/01/23	n/a	AO	n/a				n/a	n/a
3	N-AVD-ASE	Aerospace Software Engineering and Ada	Dr Yan Xu	20		0	N		28/11/22	02/12/22	n/a	AO	n/a				n/a	n/a
4	N-AVD-ASDL	Aerospace System Development and Life Cycle Model	Prof Tim Mackley	10		0	N		24/10/22	28/10/22	n/a	AO	n/a				n/a	n/a
5	N-AVD-ATC	Avionics Air Traffic Control	Dr Yan Xu	10		0	N		23/01/23	27/01/23	n/a	AO	n/a				n/a	n/a
6	N-AVD-AA	Aircraft Aerodynamics	Dr Amir Zare Shahneh	10		0	N		03/10/22	07/10/22	n/a	AO	n/a				n/a	n/a
7	N-AVD-AP	Aircraft Performance	Dr Craig Lawson	10		0	N		31/10/22	04/11/22	n/a	AO	n/a				n/a	n/a
8	N-AVD-APPI	Aircraft Power Plant Installation	Dr Adrian Clarke	10		0	N		20/02/23	24/02/23	n/a	AO	n/a				n/a	n/a
9	N-AVD-ACSC	Aircraft Stability and Control	Dr Mushfiqul Alam	10		0	N		14/11/22	18/11/22	n/a	AO	n/a				n/a	n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part assessments 9(100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
10	N-AVD-AISI	Avionics Data Networking, Hardware Integration and Testing	Dr Huamin Jia	10		0	N		18/01/23	20/01/23	n/a	AO	n/a				n/a	n/a
11	N-AVD-CE	Cockpit Environment	Dr David Zammit-Mangion	10		0	N		10/10/22	14/10/22	n/a	AO	n/a				n/a	n/a
12	N-AVD-CAD	Computer Aided Design	Dr Adrian Clarke	20		0	N		17/10/22	21/10/22	n/a	AO	n/a				n/a	n/a
13	N-ASD-CS	Control Systems	Dr James Whidborne	30		10	Y		07/11/22	18/11/22	40	ICW	100				27/01/23	06/23
14	N-AVD-FRP	Design and Analysis of Composite Structures	Prof Shijun Guo	20		10	Y		21/11/22	02/12/22	50	EX	100				06/01/23	06/23
15	N-AVD-DMO	Design for Manufacture and Operation	Dr David Judt	10		0	N		05/12/22	09/12/22	n/a	AO	n/a				n/a	n/a
16a	N-AVD-DAS	Design of Airframe Systems	Dr Craig Lawson	23		10	N		10/10/22	21/10/22	50	EX	100				06/01/23	06/23
16b	N-AVD-DASY	Design of Airframe Systems	Dr Craig Lawson	23		0	N		10/10/22	21/10/22	n/a	AO	n/a				n/a	n/a
17	N-AVD-DS	Detail Stressing	Dr Ioannis Giannopoulos	20		0	Y		31/10/22	11/11/22	n/a	AO	n/a				n/a	n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
18a	N-AVD-FFMDT	Fatigue, Fracture Mechanics and Damage Tolerance	Dr Wenli Liu	20		0	Y		21/11/22	02/12/22	n/a	AO	n/a				n/a	n/a
18b	N-AVD-ASC	Fatigue, Fracture Mechanics and Damage Tolerance	Dr Wenli Liu	20		10	Y		21/11/22	02/12/22	50	ICW	100				06/01/23	01/24
19	N-AVD-FTAD	Fault Tolerant Avionics Design	Dr Huamin Jia	10		0	N		13/02/23	17/02/23	n/a	AO	n/a				n/a	n/a
20	N-AVD-FINEA	Finite Element Analysis	Dr Ioannis Giannopoulos	30		0	Y		09/01/23	20/01/23	n/a	AO	n/a				n/a	n/a
21	N-AVD-FEM	Flight Experience	Dr Simon Place	6plus 2 flights		0	N		26/06/23	09/23	n/a	AO	n/a				n/a	n/a
22	N-AVD-N1	Inertial and Satellite Navigation Systems	Dr Toufik Souanef	20		10	N		31/10/22	30/06/23	50	EX	100				06/01/23	
23	N-AVD-IAD	Initial Aircraft Design	Prof Howard Smith	30		0	N		05/12/22 06/02/23	09/12/22 10/02/23 23	n/a	AO	n/a				n/a	n/a
24	N-AVD-N2	Integrated Navigation Systems	TBC	20		0	N		23/01/23	03/02/23	n/a	AO	n/a				n/a	n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
25	N-AVD-IVHM	Integrated Vehicle Health Management	Dr Suresh Perinpanayagam	10		0	N		30/01/23	03/02/23	n/a	AO	n/a				n/a	n/a
26	N-AVD-LGD	Landing Gear Design	Mr Jack Stockford	10		0	N		23/01/23	27/01/23	n/a	AO	n/a				n/a	n/a
27	N-AVD-LA	Loading Actions	Mr Jack Stockford	20		0	N		03/10/22	14/10/22	n/a	AO	n/a				n/a	n/a
28	N-ASD-MDS	Modelling of Dynamic Systems	Dr James Whidborne	13		0	Y		24/10/22	04/11/22	n/a	AO	n/a				n/a	n/a
29	N-AVD-RS	Radio Systems	Dr David Zammit-Mangion	10		0	N		05/12/22	09/12/22	n/a	AO	n/a				n/a	n/a
30	N-AVD-RSAC	Reliability, Safety Assessment and Certification	Mr Jack Stockford	20		0	N		07/11/22	18/11/22	n/a	AO	n/a				n/a	n/a
31	N-AVD-STS	Structural Stability	Dr Wenli Liu	20		0	Y		09/01/23	20/01/23	n/a	AO	n/a				n/a	n/a
32	N-AVD-GP	Group Design Project	Prof Howard Smith	200		100	N		13/10/22	11/04/23	50	THESIS	100				11/04/23	03/23
33	N-AVD-THESIS	Individual Research Project	Various	10		80	N		10/22	09/23	50	THESIS OR	90 10				22/08/23 01/09/23	TBC

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

March Intake

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers[13]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
1	N-AVD-AE Occ B	Aeroelasticity	Prof Shijun Guo	10		0	N				n/a	AO	n/a				n/a	n/a
2	N-AVD-ANCS Occ B	Aeronautical Communication Systems	Dr Huamin Jia	10		0	N				n/a	AO	n/a				n/a	n/a
3	N-AVD-ASE Occ B	Aerospace Software Engineering and Ada	Dr Yan Xu	20		0	N				n/a	AO	n/a				n/a	n/a

[12] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[13] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[14] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[15] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education.
[16] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[17] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[18] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers [13]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
4	N-AVD-ASDL Occ B	Aerospace System Development and Life Cycle Model	Prof Tim Mackley	10		0	N				n/a	AO	n/a				n/a	n/a
5	N-AVD-ATC Occ B	Avionics Air Traffic Control	Dr Yan Xu	10		0	N				n/a	AO	n/a				n/a	n/a
6	N-AVD-AA Occ B	Aircraft Aerodynamics	Dr Amir Zare Shahneh	10		0	N				n/a	AO	n/a				n/a	n/a
7	N-AVD-AP Occ B	Aircraft Performance	Dr Craig Lawson	10		0	N				n/a	AO	n/a				n/a	n/a
8	N-AVD-APPI Occ B	Aircraft Power Plant Installation	Dr Adrian Clarke	10		0	N				n/a	AO	n/a				n/a	n/a
9	N-AVD-ACSC Occ B	Aircraft Stability and Control	Dr Mushfiqul Alam	10		0	N				n/a	AO	n/a				n/a	n/a
10	N-AVD-AISI Occ B	Avionics Data Networking, Hardware Integration and Testing	Dr Huamin Jia	10		0	N				n/a	AO	n/a				n/a	n/a
11	N-AVD-CE Occ B	Cockpit Environment	Dr David Zammit-Mangion	10		0	N				n/a	AO	n/a				n/a	n/a
12	N-AVD-CAD Occ B	Computer Aided Design	Dr Adrian Clarke	20		0	N				n/a	AO	n/a				n/a	n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers [13]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
13	N-ASD-CS Occ B	Control Systems	Dr James Whidborne	30		10	Y				40	ICW	100					
14	N-AVD-FRP Occ B	Design and Analysis of Composite Structures	Prof Shijun Guo	20		10	Y				50	EX	100					
15	N-AVD-DMO Occ B	Design for Manufacture and Operation	Dr David Judt	10		0	N				n/a	AO	n/a				n/a	n/a
16a	N-AVD-DAS Occ B	Design of Airframe Systems	Dr Craig Lawson	23		10	N				50	EX	100					
16b	N-AVD-DASY Occ B	Design of Airframe Systems	Dr Craig Lawson	23		0	N				n/a	AO	n/a				n/a	n/a
17	N-AVD-DS Occ B	Detail Stressing	Dr Ioannis Giannopoulos	20		0	Y				n/a	AO	n/a				n/a	n/a
18a	N-AVD-FFMDT Occ B	Fatigue, Fracture Mechanics and Damage Tolerance	Dr Wenli Liu	20		0	Y				n/a	AO	n/a				n/a	n/a
19	N-AVD-FTAD Occ B	Fault Tolerant Avionics Design	Dr Huamin Jia	10		0	N				n/a	AO	n/a				n/a	n/a
20a	N-AVD-FINEA Occ B	Finite Element Analysis	Dr Ioannis Giannopoulos	30		0	Y				n/a	AO	n/a				n/a	n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers [13]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
21	N-AVD-FEM Occ B	Flight Experience	Dr Simon Place	6 plus 2 flights		0	N				n/a	AO	n/a				n/a	n/a
22	N-AVD-N1 Occ B	Inertial and Satellite Navigation Systems	Dr Lejun Chen	20		10	N				50	EX	100					
23	N-AVD-IAD Occ B	Initial Aircraft Design	Prof Howard Smith	30		0	N				n/a	AO	n/a				n/a	n/a
24	N-AVD-N2 Occ B	Integrated Navigation Systems	Dr Huamin Jia	20		0	N				n/a	AO	n/a				n/a	n/a
25	N-AVD-IVHM Occ B	Integrated Vehicle Health Management	Dr Suresh Perinpanayagam	10		0	N				n/a	AO	n/a				n/a	n/a
26	N-AVD-LGD Occ B	Landing Gear Design	Mr Jack Stockford	10		0	N				n/a	AO	n/a				n/a	n/a
27	N-AVD-LA Occ B	Loading Actions	Mr Jack Stockford	20		0	N				n/a	AO	n/a				n/a	n/a
28	N-AVD-MDS Occ B	Modelling of Dynamic Systems	Dr James Whidborne	13		0	Y				n/a	AO	n/a				n/a	n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[12]	Total hours delivered by Visiting Lecturers [13]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[14] - 40% or 50%	Type of Assessment	Weighting within module15 (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[17]	Assessment Submission and/or exam date[18]	Assessment / Exam Retake date
29	N-AVD-RS Occ B	Radio Systems	Dr David Zammit-Mangion	10		0	N				n/a	AO	n/a				n/a	n/a
30	N-AVD-RSAC Occ B	Reliability, Safety Assessment and Certification	Mr Jack Stockford	20		0	N				n/a	AO	n/a				n/a	n/a
31	N-AVD-STS Occ B	Structural Stability	Dr Wenli Liu	20		0	Y				n/a	AO	n/a				n/a	n/a
32	N-AVD-GP Occ B	Group Design Project	Prof Howard Smith	200		100	N				50	THESIS	100					
33	N-AVD-THESIS Occ B	Individual Research Project	Various	10		80	N				50	THESIS OR	90 10					

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-ASD-CS	Control Systems	Aerospace Dynamics	Aerospace Vehicle Design, Aerospace Dynamics, Astronautics and Space Engineering
N-AVD-DS/DSTR	Detail Stressing	Aerospace Vehicle Design	Aircraft Engineering
N-AVD-ASC (assessed)	Fatigue, Fracture Mechanics and Damage Tolerance	Aerospace Vehicle Design	Aircraft Engineering
N-AVD-FEA (assessed)	Finite Element Analysis	Aerospace Vehicle Design	Aircraft Engineering
N-AVD-MDS	Modelling of Dynamic Systems	Aerospace Dynamics	Astronautics and Space Engineering, Aerospace Dynamics, Aerospace Vehicle Design

8. How are the ILOs assessed?

The course assessment strategy must be consistent with its teaching and learning strategy. The assessments therefore are designed around problem based learning and problem solving skills. Hence much more emphasis is placed on the thesis assessment rather than knowledge recall assessment such as examinations.

The following assessment types are utilised:

- The course uses a range of assessment types. The taught component of the course is assessed by a combination of both examinations and/or assignments, and also by the application of the knowledge gained to the group design project and the individual research project, which are both examined by a thesis.

- Students can expect to have two taught module assessment (written examinations and/or assignments). All students participate in the group design project which is assessed by a thesis. The group design project is an example of problem based learning. The individual research project requires students to be assessed on their written and oral presentation skills, through a submitted thesis and oral examination.

This approach has been adopted to ensure that students demonstrate their understanding through a range of learning techniques and are therefore not disadvantaged through any one approach.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. MSc

Award ILOs / **Module No.**	*ILO 1.*	*ILO 2.*	*ILO 3.*	*ILO 4.*	.
13	ICW	ICW			
14	EX	EX			
16a	EX	EX			
18b	ICW	ICW			
22	EX	EX			
32	GPROJ	GPROJ	GPROJ	GPROJ	.
33	THESIS, OR	THESIS, OR	THESIS, OR		

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
Group Design Project	All modules except IRP	Thesis	100
Individual Research Project	All modules except GDP	Thesis	90
		Oral Exam	10

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Cranfield University has been at the forefront of postgraduate education in aerospace engineering since 1946. Aircraft design at Cranfield was one of the original foundation courses of the College of Aeronautics, which has evolved over the years, and more recently broadened in content, into the Aerospace Vehicle Design course that we have today.

Cranfield has a global reputation for advanced postgraduate education and extensive applied research. 94% of Cranfield graduates secure employment within 6 months. The Aerospace Vehicle Design course is valued and respected by employers worldwide.

The aerospace industry has a continuing need to recruit structural designers, stress engineers, systems design engineers and avionics design engineers. Graduates from the MSc in Aerospace Vehicle Design can therefore look forward to a varied choice of challenging career opportunities in the above disciplines. Many of the graduates occupy very senior positions in their organisations, making valuable contributions to the international aerospace industry.

POSTGRADUATE AWARD BEARING COURSE SPECIFICATION

Cranfield University: Postgraduate Award Bearing Course Specifications
Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: September 2022

1. What is the course?

Course information

Course Title	Aerosystems
Course code	MSAYSPTR PDAYSPTR PCAYSPTR
Academic Year	2022
Valid entry routes	MSc
Additional exit routes	PGCert, PGDip
Mode of delivery	Part-time, face-to-face with online by exception
Location(s)[1] of Study	Shrivenham
School(s)	Cranfield Defence and Security
Theme	Defence and Security
Centre	Centre for Defence Engineering
Course Director	John Economou
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	Yes
Is this course offered as an Apprenticeship?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Apprenticeship offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	In order to attend the course there are two consecutive application stages: **(a)** Military relevance and suitability of the candidate to the course; (b) Academic application to attend the course For stage (a): the preselection process (prior to submitting an academic application) for the Aerosystems Course which is met via a Selection Board that comprises RAF (Air & Space Warfare Centre, Defence Academy), Royal Navy and Cranfield University personnel (Course Director), reviewing a comprehensive application form that contains academic and work experience, relevant interests and courses, a personal narrative and a 1st and 2nd Reporting Officer recommendations. Based on successfully satisfying stage (a) then the candidates are encouraged to apply for a University place to study the Aerosystems course. Regarding stage (b) of the process the minimum entry requirements are: • A UK first or second class honours degree in a relevant subject area; or • An equivalent international qualification (find out whether your qualification meets our requirements by visiting our International Student page); or • Relevant work experience in combination with a degree below second-class honours If you do not meet our formal entry requirements, but still feel you can demonstrate the ability to complete the course successfully, you may still be accepted onto a course. Each application will be considered on its merits and a case will be made by the Course Director. All students accepted onto the course, are required to complete the pre-sessional 10-day Shrivenham course in August (8th-19th) prior to attending the award studies in September. The pre-sessional studies comprise refreshers studies in maths and technical topics that enable levelling the background knowledge that can be assumed by lecturers in the award course. All students are required to study the pre-sessional studies to ensure fresh knowledge of topics which students have not studied and probably not used recently.
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	5-years maximum
Course Start Month(s)	September *(pre-sessional studies starting in August)*

Institutions delivering the course

This course is delivered by CDS/Defence and Security/Centre for Defence Engineering where the research interests include:

Military aviation, military electronic systems and airborne weapon systems.

Cranfield University interacts with the following institutions and in the following ways:

This course will be taught solely by Cranfield University under AP Contract conditions for MOD. Students in this course will all be studying an MOD Aerosystems qualification which includes but is larger than the award course provided by the University. The additional studies, not part of the award course, include military topics and site visits arranged by MOD and taught by MOD arranged personnel. In addition, students of this course will study a small number of not for credit short course modules taught by Cranfield University. Commercial arrangements for the Cranfield University provided not for credit short courses will be arranged separately. The design of the course described in this courses specification has been developed in cognisance of the additional study load borne by the students as a result of the MOD Aerosystems course requirements.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2. What are the aims of the course?

This course is designed as an MSc award that provides for the academic needs of the sponsor, whilst linking with additional military education/training to advance graduates into a recognised profession in Aerosystems. To achieve this, the course offers a range of technical modules and topics that are integrated together to enhance the performance and analysis of an air system across all operational domains (land, sea and air).

The technical topics include the following: Sensors: (radar, Electro-Optics and Infra-Red), Communications (information networks), signal processing, Platforms: Uninhabited Aircraft Systems / Remotely Operated Aircraft Systems (UAS/RPAS), guided weapons, electronic warfare, foundations of modelling and simulation, the application of simulation to areas such as military training, operational analysis, rapid prototyping, doctrine development and mission planning.

The PGDip exit point is provided to recognise students who have completed all 12 modules and assessments components of the academic studies.

The PGCert exit point is provided to recognise students who have successfully completed the six modules of the course but who are unable to complete further course requirements.

The availability of the earlier exit points enables recognition of individuals who have been able to complete a recognised package of studies, enabling posting decisions based on holding the earlier exit point qualifications. This also provides value to the sponsors

The MSc exit point in addition to the PgDip modules, the students are also required to complete an 80-credit Thesis..

This programme is intended for the following range of students:

The Aerosystems graduate will have opportunities to progress into roles within Test and Evaluation squadrons, Capability Acquisition and Requirements Management.

This course is designed to provide candidates selected by MOD, and partners who send students through the AP route, with whole of system technical knowledge concerning Aerosystems.
This course is closed to AP students only.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Aerosystems

In completing this course, and achieving the associated award, a diligent student should be able to: **enter text here**

ILO 1. Critically evaluate remote sensor options and performance within a defence context including radar, electro-optics and infrared systems.
ILO 2. Critically identify and analyse the signal processing methods encountered in sensor and communication and electronic warfare systems with an aim to enhance detection by such systems.
ILO 3. Evaluate the suitability of electronic technologies and signal processing within the aerosystems context.

B. Postgraduate Diploma in Aerosystems

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Relate theoretical concepts and principles for telecommunications, and information systems to networks in a modern military system.
ILO 5. Apply critical analysis of aerosystems networks to support information processing in the defence context to enhance network performance characteristics.
ILO 6. Critically analyse the wider opportunities afforded by Modelling and Simulation in support of Defence needs.
ILO 7. Critically evaluate threats to and methods for protecting Electro-optics/infra-red and Radar in defence.
ILO 8. Analyse the application of Uninhabited Aircraft System (UAS) platforms and Guided Weapons (GW) systems in the aerosystems environment.

C. Master of Science (Aerosystems)

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Propose and research a relevant project topic in aerosystems and identify the context with suitable in-depth critical evaluation.
ILO 10. Plan a research project with a well-defined and realisable timeframe, with suitable risk assessment and contingency planning with suitable demonstration of engagement in academic and professional experts.
ILO 11. Provide an analysis of your critical assessment of factual, conceptual, theoretical knowledge and relate, when applicable, to existing aerosystem technologies and place the outputs within the wider context of aerosystems.

4. How is the course taught?

Students will be supported in their learning and personal development using a mix of formal instruction, discussion periods and hands-on exercises and demonstrations (pre-recorded and live); as well as presentations by external speakers with extensive practical experience.

All the modules of this course are selected from modules provided in existing Academic Provider courses.

The Aerosystems students, to the greatest extent possible, will study these modules in the existing classes offered providing the benefit of mixing with students enrolled in other courses. There may be some cases where either timetabling issues may exist. In such cases, where there are necessary adjustments, arrangements will need to be managed through the AP commercial process. In any event, the teaching methods used will be the teaching methods used in the module in its owning course.

The students will be assigned a personal tutor when they commence their studies in August. The tutor's responsibility is to support the students' learning during their time at the Defence Academy. At some

point, they will be arranging for a general chat to make sure they are on track. In case their students are facing difficulty the Course Director and SAS lead will be informed to support further and guide on where and how to seek further support.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Electro-magnetic Propagation & Devices (Includes Induction) Electro-optics and Infrared Systems 1	10 10
Four MODULES from the following:	
Communication Principles Foundations of Modelling and Simulation Radar Principles Signal Processing, Statistics & Analysis Communication Systems Electro-optics and Infrared Systems 2 Guided Weapons Information Networks Radar Electronic Warfare Uninhabited Aircraft Systems/Remotely Piloted Aircraft Systems	40
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120[4] credits through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Electro-magnetic Propagation & Devices (Includes Induction) Communication Principles Electro-optics and Infrared Systems 1 Foundations of Modelling and Simulation Radar Principles Signal Processing, Statistics & Analysis Communication Systems Electro-optics and Infrared Systems 2 Guided Weapons Information Networks Radar Electronic Warfare Uninhabited Aircraft Systems/Remotely Piloted Aircraft Systems	10 10 10 10 10 10 10 10 10 10 10 10

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

ELECTIVE MODULES:	
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	
Electro-magnetic Propagation & Devices (Includes Induction)	10
Communication Principles	10
Electro-optics and Infrared Systems 1	10
Foundations of Modelling and Simulation	10
Radar Principles	10
Signal Processing, Statistics & Analysis	10
Communication Systems	10
Electro-optics and Infrared Systems 2	10
Guided Weapons	10
Information Networks	10
Radar Electronic Warfare	10
Uninhabited Aircraft Systems/Remotely Piloted Aircraft Systems	10
Thesis	80
ELECTIVE MODULES:	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [5]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:

[5] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than or equal to 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
- if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
- it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.

- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

For those students undertaking an apprenticeship, confirmation of the award, graduate certificate and transcript will be released once all elements of the apprenticeship training programme have been successfully completed, including the End Point Assessment

6. How is the course structured?

Part-time students commence pre-sessional studies in August and award studies from September. Students are expected to complete the course within 5 years.

All students being given a University place in the award course are required to commence their studies with pre-sessional induction studies (normally in August) to provide refresher knowledge in foundational areas of study. The pre-sessional studies are specifically designed for those coming to study at Shrivenham, particularly after a long break from academic studies. By taking this course, the student will be able to refresh their knowledge and skills which will prepare them for an MSc. The programme normally includes social or cultural visits. The course is of ten-day duration with a mixture of lectures, practical exercises, diagnostics tests, and the use of the virtual learning environment.

Regular study for the award commences at the normal commencement of AP courses in September. It is possible for students to attend all taught modules in their first year of study, forming the PgDip award. The thesis is conducted as a part-time thesis.

7. Course Level Assessment Strategy[6]

The Aerosystems course is multidisciplinary, covering the areas of uninhabited aircraft systems, guided weapons, electro-optics, communications, radar, electronic warfare and information networks. The course covers the key concepts, fundamental principles, and considerations of design and critical thinking associated with the above mentioned areas.

All modules require the submission of a written piece of work as a technical report or an essay. The module descriptors provide the detail in relation to the formative, and summative assessments. This allows the students to develop their critical thinking and presentation of arguments in a written mode, as well as developing their practice at presenting information in a practical and scientific way demonstrating suitable engineering skills.

[6] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

The students have the opportunity to demonstrate their comprehension and progress as part of this formative assessment process. For formative-based discussions the academic team will provide immediate feedback and advice and for written work normally feedback would be provided in writing.

It is expected that the students will continue to use as appropriate a combination of face-to-face and teleconferencing tools and interact in addition to the scheduled timetabled sessions and exchange ideas and address the specific award ILO relating to demonstrating knowledge and critical understanding and the ability to share and explain this to the academic team and their peers.

In addition to the taught modules MSc students are required to undertake a research project the output of which takes the form of a Thesis (80%) and an oral (20%). During this phase the students will be expected to have build-up skills enabling a self-directive approach. It is expected to formulate a project which utilises the learning from the taught phase and demonstrates the skill of integrating this knowledge from an Aerosystems perspective. The viva process will provide the student the opportunity to defend their work and provide suitable clarifications to the examiners (supervisor and internal independent examiner)

Course modules

The following modules outline all parts of the award programme leading to MSc in AeroSystems. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Module Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment[9]				
												Independent Assessment		Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[10] - 40% or 50%[11]	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
1	R-MES-EPD	Electromagnetic Propagation & Devices (Includes Induction) A22	Dr Ivor Morrow	32	0	10	Y	05/09/22	05/09/22	16/09/22	50	ICW	100	14/10/22	TBC
2	R-MES-SPSA	Signal Processing, Statistics & Analysis A22	Dr Peter Barker	30	0	10	Y	03/10/22	03/10/22	07/10/22	50	ICW	100	04/11/22	TBC

[7] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[8] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[9] For courses accredited by Professional Engineering Institutes licensed to accredit academic programmes by the Engineering Council it should be noted that condonement of modules is not allowed.
[10] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[11] For courses accredited by Professional Engineering Institutes licensed to accredit academic programmes by the Engineering Council it should be noted that a maximum of 20 credits may be compensated in a Masters degree.
[12] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education. Further guidance can be found under Section 7.1.2 of the Sente Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx
[13] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; TCA – Time-Compressed Assignment

Module Number	Module code	Module Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment[9]				
												Independent Assessment		Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[10] - 40% or 50%[11]	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
3	R-MES-EOIS1	Electro-optics and Infrared Systems 1 A22	Dr David James	32	0	10	Y	17/10/22	17/10/22	21/10/22	50	ICW	100	18/11/22	TBC
4	R-MES-CP	Communication Principles A22	Dr Peter Barker	30	0	10	Y	31/10/22	31/10/22	04/11/22	50	ICW	100	02/12/22	TBC
5	R-MES-RP	Radar Principles A22	Dr Alessio Balleri	30	0	10	Y	14/11/22	14/11/22	18/11/22	50	ICW	100	16/12/22	TBC
6	R-MES-CS	Communication Systems A22	Dr Peter Barker	30	0	10	Y	28/11/22	28/11/22	02/12/22	50	ICW	100	06/01/23	TBC
7	R-MES-EOIS2	Electro-optics and Infrared Systems 2 A22	Dr David James	32	0	10	Y	09/01/23	09/01/23	13/01/23	50	ICW	100	10/02/23	TBC
8	R-MES-REW	Radar Electronic Warfare A22	Ioannis Vagias	30	0	10	Y	30/01/23	30/01/23	03/02/23	50	ICW	100	03/03/23	TBC
9	R-AMOR-FMS	Foundations of Modelling and Simulation C22	John Hoggard	32	0	10	Y	06/03/23	06/03/23	10/03/23	50	ICW	100	19/04/23	TBC
10	R-MES-IN	Information Networks A22	Dr Philip Nobles	30	0	10	Y	13/03/23	13/03/23	17/03/23	50	ICW	100	21/04/23	TBC
11	R-MAA-GW	Guided Weapons B22	Dr David Galvao Wall	32	0	10	Y	02/05/23	02/05/23	05/05/23	50	ICW	100	23/06/23	TBC
12	R-MAA-UAS	Uninhabited Aircraft Systems/Remotely	Dr John Economou	35	0	10	Y	15/05/23	15/05/23	19/05/23	50	GCW	100	14/07/23	TBC

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; TCA – Time-Compressed Assignment

Module Number	Module code	Module Title	Module Leader	Contact hours[7]	Total hours delivered by Visiting Lecturers[8]	Credits	Is the module shared? Y/N	Calendar			Assessment[9]				
												Independent Assessment		Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[10] - 40% or 50%[11]	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Assessment Submission and/or exam date[13]	Assessment / Exam Retake date
		Piloted Aircraft Systems (UAS/RPAS) A22													
13	R-AER-THESIS	Thesis A22	Dr John Economou / Dr Tim Ferris	40	10	80	N		05/06/23	01/07/24	50	Thesis Oral	80 20	01/07/24	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; TCA – Time-Compressed Assignment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
R-MES-EPD	Electromagnetic Propagation & Devices (Includes Induction)	Military Electronic Systems Engineering (MESE)	Military Electronic Systems Engineering foundations PgCert (MESEF), Communications Electronic Warfare PgCert (CEW), Sensors Electronic Warfare PgCert (SEW)
R-MES-CP	Communication Principles	MESE	MESEF, CEW
R-MES-EOIS1	Electro-optics and Infrared Systems 1	MESE	MESEF, SEW, Guided Weapon Systems (GWS)
R-AMOR-FMS	Foundations of Modelling and Simulation	Defence Simulation and Modelling (DSM)	MESE, Defence and Security Programme (DSP)
R-MES-RP	Radar Principles	MESE	MESEF, SEW, GWS
R-MES-SPSA	Signal Processing, Statistics & Analysis	MESE	MESEF, CEW, SEW, GWS
R-MES-CS	Communication Systems	MESE	MESEF, CEW
R-MES-EOIS2	Electro-optics and Infrared Systems 2	MESE	SEW, GWS
R-MAA-GW	Guided Weapons	Military Aerospace and Airworthiness (MAA)	Weapon and Vehicle Systems Programme (WVSP), DSP
R-MES-IN	Information Networks	MESE	CEW
R-MES-REW	Radar Electronic Warfare	MESE	SEW, GWS
R-MAA-UAS	Uninhabited Aircraft Systems/Remotely Piloted Aircraft Systems	MAA	DSP(AS)

8. How are the ILOs assessed?

The following assessment types are utilised:

The Aerosystems course consists of primarily individual coursework summative assessments and in one instance a student group coursework. This approach provides therefore an opportunity, to work both as an individual or in a group. The coursework would require the submission of a technical report which may be an essay and/or the use of suitable numerical simulation software-based computer tools. The formative assessment provides the building blocks in the form of quizzes, worked-out examples, and tutorials with the academics providing feedback to the students.

The students, after finishing their 12 award-bearing modules, are encouraged to engage with the academic team and the project module lead and discuss their interests and ideas for projects. The ILOs relating to the research project are 8-10 and successful completion of this will result in being awarded 80-credits. The project is expected to be assessed by the supervisor and an independent assessor. It is expected that the students will be more self-directed and pro-active with consultation with their supervisor during this process.

This approach has been adopted because:

The approach for the award-bearing modules has been used in this course because of legacy inheritance of existing modules from other award courses.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate in Aerosystems

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3
01	ICW		ICW
02		ICW	ICW
03	ICW	ICW	
04		ICW	ICW
05	ICW		
06		ICW	
07	ICW		ICW
08	ICW	ICW	
09			
10			ICW
11			
12			GCW

B. Postgraduate Diploma in Aerosystems

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs Module No.	ILO 4	ILO 5	ILO 6	ILO 7	ILO 8
01	ICW				
02	ICW				
03					
04	ICW				
05					
06	ICW	ICW			
07				ICW	
08				ICW	
09			ICW		
10	ICW	ICW			
11					ICW
12					GCW

C. MSc (Aerosystems)

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award / ILOs / Module No.	ILO 9	ILO 10	ILO 11
13	ORAL THESIS	ORAL THESIS	ORAL THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal trained in course validations. The Panel may also include members of professional staff trained in course validations. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course module changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course, in-depth Senate Periodic Course Reviews to ensure that all taught award-bearing provision is formally reviewed at least once every ten years, Senate Partnership Reviews and a 6 year Senate review of each School's (total) educational provision.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual Early Experience Survey along with the annual national Postgraduate Taught Experience Survey (PTES). The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review the partnership must be reviewed at least once every six years through a formal in depth Senate Partnership Review. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

All students entering the course are sponsored by MOD, or an MOD partner, where the sponsor has chosen to sponsor the student as part of a career development program. All students are studying this course as part of a career development program.

Graduates, after leaving military service for which they were sponsored may find related openings in MOD civil service or in the defence industry

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: June 2022

1) What is the course?

Course information

Course Title	MSc in Air Transport Management (Executive)
Course code	MSATRPTC– MSc in Air Transport Management (Executive) PDATRPTC – PgDip in Air Transport Management PCAVMPTC - PgCert in Aviation Management
Academic Year	2022/23
Valid entry routes	MSc in Air Transport Management (Executive) PgDip in Air Transport Management PgCert in Aviation Management
Additional exit routes	PgDip in Air Transport Management PgCert in Aviation Management
Mode of delivery	Part-time, Distance
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Centre for Air Transport Management
Course Director	Dr Robert Mayer
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Mastership offered as an open and/or closed course?	No
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	1st or upper 2nd class UK honours degree or equivalent in any relevant discipline. A recognised professional qualification plus a number of years relevant working experience may be accepted as equivalent. For applicants whose first language is not English there is a requirement to achieve the level of 7.0 on IELTS and equivalent grades on other English language qualifications recognised by the University.
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Part-time MSc – up to three years, Part-time PgDip – two years, Part-time PgCert – two years
Course Start Month(s)	June/July or November

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Centre for Air Transport Management where the research interests include:

- Air Transport Management
- Airline and Airport Planning and Operations
- Safety and Air Accident Investigation

enter text here
Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2) What are the aims of the course?

Cranfield University offers this course in order to:

- Provide a part-time masters-level programme of learning for individuals either working in the air transport, airport or related industries to develop and enhance their skills in air transport management offering a mode of study that enables them to combine study with work commitments;
- Provide a part-time masters-level programme of learning to meet the management training needs of existing air transport companies, airport operators, suppliers, aviation and planning consultants and government regulators offering a mode of study that allows their employees to combine study with work commitment.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) entrance routes are provided.

This programme is intended for the following range of students:

- Practitioners in the air transport industry, particularly at middle management level, who are seeking to expand their knowledge and skills in air transport management in order to further develop their careers.

- Practitioners in the related sectors who are seeking to gain an in-depth understanding of the air transport industry.
- Practitioners seeking to pursue doctoral research in air transport management.

Please note that the modules on this course differ from the full-time MSc in Air Transport Management variant also offered.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Aviation Management

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Describe and critique the regulatory frame that defines the air transport industry, detail the fundamental elements (and the application to current problems in) airline and airport business management and air transport economics and financial management;

ILO 2. Make critical appraisal of literature pertaining to the technical, operational and commercial aspects of the air transport industry, and identify, evaluate and apply appropriate statistical and research strategies in industrial and academic research and analysis;

ILO 3. Summarise and critically analyse the concepts of personal/professional development and leadership and demonstrate their application to self and work;

B. Postgraduate Diploma in Air Transport Management

In addition to the intended learning outcomes outlined for the Postgraduate Certificate, a diligent student would also be expected to:

ILO 4. Analyse critically practical problems in the air transport and related industries to provide timely solutions, having regard to technical, regulatory, commercial, political, social and environmental constraints;

ILO 5. Evaluate the complex interrelationships of technical and operational aspects of the air transport industry with the commercial pressures and realities facing its management;

ILO 6. Undertake group research on a subject relevant to technical, operational or commercial aspects of the air transport or related industries, including a review of relevant literature, methodological planning, data collection, data analysis, presentation of results, and evaluation and discussion of the results, and the contribution made.

C. Executive MSc in Air Transport Management

In addition to the intended learning outcomes outlined for the Postgraduate Diploma, a diligent student would also be expected to:

ILO 7. Formulate research questions, develop aims and objectives for completing the research task. Conduct a literature review and present it in an appropriate style. Critically assess different methodologies and select an appropriate one to test hypotheses, collecting primary and/or secondary data and using appropriate analytical techniques, whilst understanding potential biases that may influence researchers and methods to limit such occurrences;

ILO 8. Prepare a scientific thesis and present results based upon the techniques listed above.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Lectures and workshops (face-to-face and online) delivered by Cranfield staff and guest speakers from industry, demonstrating the application of theory to various examples and case studies;

- Training on how to use the library's online resources and bibliographical software undertaken by a Cranfield University librarian;
- Workshops on thesis development and progression.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate in Aviation Management

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-6	60
ELECTIVE MODULES:	
None	
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-6 Group Project (20)	60 20
ELECTIVE MODULES:	
40 credits from Modules 7-19	40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

MSc in Air Transport Management (Executive)

Description	Credits
COMPULSORY MODULES:	
Modules 1-6 Group Project (20) Individual Research Project (21)	60 20 80

ELECTIVE MODULES:	
40 credits from Modules 7-19	40
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Part-time students register for the course in July or November in Cranfield and are expected to complete the course within 3 years.

Students need to undertake six compulsory modules, as well as four optional modules as part of the taught element of the course.

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

In addition to the optional modules, PgDip students are required to complete a 20 credit supervised group project. This element has consistently proved to be a source of positive feedback (from our students, external examiners and industrial advisory boards) in the full-time version of this course and we want it to be a similarly successful addition to this executive course. The group project will be launched early at the end of the core modules to give students plenty of time to develop and discuss their plans and to carry out background research in advance of coming to Cranfield for a week of intensive group work.

As for the PgDip route, in addition, MSc students are required to complete a supervised thesis on a subject of their choice within the field of air transport management. The research is expected to go into much greater depth than that required for the PgDip.

The following modules are delivered by Distance Learning (for Cranfield students only);

·

· - Regional Aviation

- Digital Airline Management

7. Course Level Assessment Strategy[4]

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The different modules and will be assessed through a range of different forms of assessments. Written coursework will be of varying lengths, recognising that writing coursework to a short length can be more challenging for some and can develop different skills relevant to professional practice. The length of each assessment task is usually stated within the module descriptor. Students then have opportunities to develop their communication and group working skills, as they are required to give group presentations. Feedback for all assessments is given in a timely fashion, dependent on the type of assessment, but always within 20 working days. All modules are supported by a number of formative tasks including group discussion, case studies, oral presentations. Formative feedback is usually given verbally within the classroom or individual meetings as well as online. The taught components precede the research project, so assessment can be used to develop skills required for the individual research project. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through meetings with their research project supervisor.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

MSc in Air Transport Management (Executive)

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	N-AEX-TALB Occ A21	The Airline Business	Dr Darren Ellis	25		10	N	29/06/22	29/06/22	01/07/22	40	ICW	100				05/09/22	At the next available opportunity which may not be until the course runs the following year
	N-AEX-TALB Occ A22	The Airline Business	Dr Darren Ellis	25		10		26/06/23	26/06/23	28/06/23	40	ICW	100				29/08/23	

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%..
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
2	N-AEX-TAPB Occ A22	The Airport Business	Dr Romano Pagliari	18		10	N	30/11/22	30/11/22	02/12/22	40	ICW	100				13/02/23	At the next available opportunity which may not be until the course runs the following year
3	N-AEX-SFS Occ A22	Air Transport Strategies	Dr Robert Mayer	20		10	N	27/02/23	27/02/23	01/03/23	40	ICW	100				02/05/23	At the next available opportunity which may not be until the course runs the following year
4	N-AEX-PPD Occ A21	Professional and Personal Development	Graham Clark	18		10	N	27/06/22	27/06/22	29/06/22	40	ICW	100				30/08/22	At the next available opportunity which may not be until the course runs the following year
	N-AEX-PPD Occ A22	Professional and Personal Development	Graham Clark	18		10	N	28/06/23	28/06/23	30/06/23	40	ICW	100				29/08/23	
5	N-AEX-ATEFM Occ A22	Air Transport Economics and Financial Management	Dr Robert Mayer	20		10	N	28/11/22	28/11/22	30/11/22	40	ICW	100				13/02/23	At the next available opportunity which may not be until the course runs the following year

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
6	N-AEX-RM Occ A22	Research Methods	Dr Edgar Jimenez Perez	20		10	N	01/03/23	01/03/23	03/03/23	40	ICW	100				02/05/23	At the next available opportunity which may not be until the course runs the following year
7	N-APM-RMF10 Occ A22	Air Transport Market Analysis and Forecasting	Gary Doy	25		10	Y	13/03/23	13/03/23	24/03/23	40	ICW	100				PT 08/05/23	At the next available opportunity which may not be until the course runs the following year
8	N-SAI-CMBC Occ A22	Crisis Management and Business Continuity	David Barry	24		10	Y	14/11/22	14/11/22	18/11/22	40	ICW	100				30/01/23	At the next available opportunity which may not be until the course runs the following year
9	N-ATF-ATM10 Occ A22	Air Transport Marketing	Professor Keith Mason	25		10	Y	23/01/23	23/01/23	27/01/23	40	ICW	100				13/03/23	At the next available opportunity which may not be until the course runs the following year
10	N-ATF-AFP10 Occ A22	Airline Fleet Planning	Andy Foste	25		10	Y	27/02/23	27/02/23	03/03/23	40	ICW	100				17/04/23	At the next available opportunity

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		which may not be until the course runs the following year
11	N-ATF-RPA10 Occ A22	Geopolitics and International Aviation	Dr Darren Ellis	30		10	Y	21/11/22	21/11/22	02/12/22	40	EX (online)	100				PT 02/12/22	At the next available opportunity which may not be until the course runs the following year
12	N-AW-ATEMO Occ A22	Air Transport Engineering – Maintenance Operations	Cengiz Turkoglu	30		10	Y	13/02/23	13/02/23	17/02/23	40	ICW	100				/04/23	At the next available opportunity which may not be until the course runs the following year
13	N-APM-APO10 Occ A22	Airport Operations	Richard Moxon	30		10	Y	07/11/22	07/11/22	11/11/22	40	ICW	100				PT 09/01/23	At the next available opportunity which may not be until the course runs the following year
14	N-APM-AEP10 Occ A22	Air Transport Environmental Planning	Dr Thomas Budd	24.5		10	Y	09/01/23	09/01/23	113/01/23	40	ICW	100				PT 27/02/23	At the next available opportunity which may not be until the

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		course runs the following year
15	N-APM-ASP10 Occ A22	Airport Strategic Planning	Dr Pere Suau-Sanchez	28.45		10	Y	16/01/23	16/01/23	20/01/23	40	ICW	100				PT 06/03/23	At the next available opportunity which may not be until the course runs the following year
16	N-SAI-ISMS Occ C22	Aviation Safety Management	Dr David Barry/ Dr Simon Mitchell	30		10	Y	06/02/23	06/02/23	10/02/23	40	ICW	100				27/03/23	At the next available opportunity which may not be until the course runs the following year
17	N-APM-ADE10 Occ A22	Airport Design	Henrik Rothe	25		10	Y	20/02/23	20/02/23	24/02/23	40	ICW	100				PT 11/04/23	At the next available opportunity which may not be until the course runs the following year
18	N-AEX-ATRR Occ B22	Regional Aviation	Dr Romano Pagliari	20		10	Y	06/02/23	06/02/23	04/08/23	40	ICW	100				08/08/23	At the next available opportunity which may not be until the course runs the following year

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
19	N-AEX-DAM Occ B22	Digital Airline Management	Dr Robert Mayer	20		10	Y	06/02/23	06/02/23	04/08/23	40	ICW	100				08/08/23	At the next available opportunity which may not be until the course runs the following year
20	N-AEX-GP Occ A22	Group Project	Andy Foste	10		20	N	05/06/23	05/06//23	14/07/23	40 40	GCW GPRES	50 50				11/09/23 14/07/23	At the next available opportunity which may not be until the course runs the following year
21	N-AEX-THES10 Occ A22	Individual Research Project	Dr Romano Pagliari	20		80	N	03/05/23	03/05/23	31/05/24	50	THESIS	100				31/05/24	

Module Type for The Aviation Management Programme

Module number	Module Code	MSc & PgDip Air Transport Management (Executive)		PgCert Aviation Management		Shared module?
1	N-AEX-TALB	C		C		N
2	N-AEX-TAPB	C		C		N
3	N-AEX-SFS	C		C		N
4	N-AEX-PPD	C		C		N
5	N-AEX-ATEFM	C		C		N
6	N-AEX-RM	C		C		N
7	N-APM-RMF10	E		-		Y
8	N-SAI-CMBC	E		-		Y
9	N-ATF-ATM10	E		-		Y
10	N-ATF-AFP10	E		-		Y
11	N-ATF-RPA10	E		-		Y
12	N-AW-ATEMO	E		-		Y
13	N-APM-APO10	E		-		Y
14	N-APM-AEP10	E		-		Y
15	N-APM-ASP10	E		-		Y
16	N-SAI-ISMS	E		-		Y
17	N-APM-ADE10	E		-		Y
18	N-AEX-ATRR	E		-		N

19	N-AEX-DAM	E		-		N
20	N-AEX-GP	C		-		N
21	N-AEX-THES10	C (MSc)		-		N

C - Compulsory; E – Elective

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-APM-RMF10	Air Transport Market Analysis and Forecasting	Airport Planning and Management	F-T Air Transport Management Air Transport Management (Executive)
N-SAI-CMBC	Crisis Management and Business Continuity	Safety and Accident Investigation	Air Transport Management (Executive)
N-ATF-ATM10	Air Transport Marketing	F-T Air Transport Management	Air Transport Management (Executive)
N-ATF-AFP10	Airline Fleet Planning	F-T Air Transport Management	Air Transport Management (Executive)
N-ATF-RPA10	Geopolitics and International Aviation	F-T Air Transport Management	Airport Planning and Management

			Air Transport Management (Executive)
N-SAI-ISMS	Aviation Safety Management	Safety and Accident Investigation	Airworthiness Military Aerospace and Airworthiness Air Transport Management (Executive) F-T Air Transport Management Safety and Human Factors in Aviation Defence and Security (Engineering)
N-AW-ATEMO	Air Transport Engineering – Maintenance Operations	Airworthiness	Air Transport Management (Executive) F-T Air Transport Management Military Aerospace and Airworthiness Safety and Human Factors in Aviation
N-APM-APO10	Airport Operations	F-T Airport Planning and Management	Air Transport Management (Executive)

N-APM-ASP10	Airport Strategic Planning	F-T Airport Planning and Management	Air Transport Management (Executive)
N-APM-AEP10	Air Transport Environmental Planning	F-T Airport Planning and Management	F-T Air Transport Management Air Transport Management (Executive)
N-APM-ADE10	Airport Design	F-T Airport Planning and Management	Air Transport Management (Executive)

8. How are the ILOs assessed?

The course uses a range of assessment types. Overall, the programme has **three** distinct but interrelated elements: the taught modules, a group project, and an individual research project.

The group project is assessed by a group oral presentation and a written report.

The individual research project is assessed by consideration of the written thesis submitted. .

Taught modules will include assessment by coursework and examination.

Module assignments are set to be challenging and to encourage the student to study the module topic areas in more depth. The objectives of the assignments are for the students to:

- Acquire the skill to efficiently search literature
- Acquire an in-depth knowledge of contemporary air transport management issues
- Apply skills and knowledge to solve specific problems
- Develop the capability to critically analyse data
- Compile succinct and informative reports to a high standard
- Formulate responses to specific questions against a time limit

This approach has been adopted in order to facilitate the completion of the course by part-time students, often from abroad, without the need to return only for examinations. However, one optional module will be examined at Cranfield. For those continuing to MSc level, a thesis based on the individual research

project has to be presented at the end of the registration period and must demonstrate competency in literature review, methodology, data analysis, conclusion forming and presentation.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

(nb – common to MSc Air Transport Management (Executive) (excluding Modules 20-23))

Award ILOs / **Module No.**	ILO1	ILO2	ILO3
1) N-AEX-TALB	ICW		
2) N-AEX-TAPB	ICW		
3) N-AEX-SFS	ICW	ICW	
4) N-AEX-PPD			ICW
5) N-AEX-ATEFM	ICW	ICW	
6) N-AEX-RM		ICW	

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

(nb – common to MSc Air Transport Management (Executive) (excluding Modules 20-23))

Award ILOs / Module No.	ILO4	ILO5	ILO6
7) N-APM-RMF10	ICW		
8) N-SAI-CMBC	ICW	ICW	
9) N-ATF-ATM10	ICW	ICW	
10) N-ATF-AFP10	ICW	ICW	
11) N-ATF-RPA10	EX		
12) N-AW-ATEMO		ICW	
13) N-APM-APO10	ICW	ICW	
14) N-APM-AEP10	ICW	ICW	
15) N-APM-ASP10	ICW	ICW	
16) N-SAI-ISMS	ICW	ICW	
17) N-APM-ADE10	ICW	ICW	
18) N-AEX-ATRR	ICW	ICW	
19) N-AEX-DAM	ICW	ICW	
20) N-AEX-GP	GCW GPRES	GCW GPRES	GCW GPRES

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

nb – common to MSc Air Transport Management (Executive)

Award ILOs / Module No.	ILO7	ILO8
21) N-ATF-THES10	THESIS	THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Students taking the Air Transport Management course will be equipped with the skills required to either enhance their present career or to allow them to pursue a new career path with airlines, airport authorities, civil aviation departments, air transport consultancies or aerospace companies.

Cranfield students are also well prepared to undertake research leading to the award of a PhD.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: June 2022

1. What is the course?

Course information

Course Title	MSc in Air Transport Management
Course code	MSATRFTC, PDATRFTC
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	PgDip
Mode of delivery	Full-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Centre for Air Transport Management
Course Director	Dr Darren Ellis
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No
Is the Mastership offered as an open and/or closed course?	No
Teaching Institution	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Admissions body	Cranfield University
Entry requirements	1st or upper 2nd class UK honours degree or equivalent in any relevant discipline. A lower qualification plus a number of year's relevant working experience may be accepted as equivalent. For applicants whose first language is not English there is a requirement to achieve the level of 7.0 on IELTS and equivalent grades on other English language qualifications recognised by the University.
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Centre for Air Transport Management where the research interests include:

- Air Transport Economics
- Airline and Airport Planning and Operations
- Safety and Air Accident Investigation.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- provide a masters-level programme of learning for existing air transport managers to enhance their knowledge and skills;
- provide a masters-level programme of learning for graduates seeking to pursue a career in air transport management;
- provide the foundation necessary for graduates to go on to undertake doctoral research in air transport management.

This programme is intended for the following range of students:

- New graduates seeking to pursue a career in the air transport industry
- Practitioners in the sector, particularly at junior and middle management levels, who are seeking to expand their knowledge and skills in air transport management in order to further develop their careers.
- Practitioners who are not employed in the sector, who are seeking a career in the air transport industry.
- Both practitioners and new graduates seeking to pursue doctoral research in the area of air transport.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Diploma in Air Transport Management

In completing this course, and achieving the associated award, a diligent student should be able to:

- ILO 1. Demonstrate and apply an in-depth understanding of economics and financial management relevant to air transport, air transport commercial practice and air transport operations (as they relate to both aircraft and infrastructure);
- ILO 2. Assess the regulatory framework and political context that underpin the air transport industry;
- ILO 3. Use mathematical modelling relevant to air transport management problems;
- ILO 4. Investigate and detail the complex interrelationships of technical and operational aspects of the air transport industry with the commercial pressures and realities facing its management;
- ILO 5. Analyse critically practical problems in the air transport and related industries to provide timely solutions, having regard to technical, regulatory, commercial, political, social and environmental constraints;

B. **MSc Air Transport Management**

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to: :

- ILO 6. Demonstrate originality in data collection;
- ILO 7. Undertake research on a subject relevant to technical, operational or commercial aspects of the air transport or related industries, including a review of relevant literature, and evaluate and discuss key results;
- ILO 8. Assess and distinguish between information and data sources for quality, reliability and accuracy. ;
- ILO 9. Find and synthesize core literature and data pertaining to the technical, operational and commercial aspects of the air transport industry;
- ILO 10. Select and use appropriate analytical and decision making approaches to research and investigative air transport management problems;
- ILO 11. Make effective oral and written presentations of their work;
- ILO 12. Build time management skills centred on devising and meeting deadlines, and to produce outcomes based on specified standards in a timely manner;
- ILO 13. Work effectively within teams and apply an understanding and appreciation of the contributions made by other specialists;
- ILO 14. Successfully complete a substantial programme of research independently, designing and applying robust methods of data collection and analysis, and communicating the findings coherently.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- lectures and workshops delivered by industry practitioners, demonstrating the application of theory to various examples and case studies;
- training on how to use the library's on-campus and on-line resources undertaken by a Cranfield University librarian;
- training on how to use the OAG airline schedule database.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 4, 5, 6, 7 Group Project (15)	70 20
ELECTIVE MODULES:	
Modules 8, 9, 10, 11, 12, 13, 14 (Choose Three)	30
TOTAL:	120

B. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 4, 5, 6, 7 Group Project (15) Individual Research Project (16)	70 20 80
ELECTIVE MODULES:	
Modules 8, 9, 10, 11, 12, 13, 14 (Choose Three)	30
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of

your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 11 calendar months.

Teaching is delivered in mostly one week modules, with several taking up to two weeks. In the first teaching period, students will have completed five modules. During teaching period two students complete the remaining modules. Students complete a group project which starts mid-April and concludes just in early May. Students are required to submit a thesis proposal by the end of January. The thesis is handed-in at the beginning of August.

Students are typically granted four weeks to complete course work. Exams are scheduled in December (before Christmas). Students are required to contribute to a report for their group projects and to participate in a group presentation. Once students have handed in their thesis, students must deliver a presentation summarising their thesis and be cross-examined on this presentation as part of their thesis viva.

7. Course Level Assessment Strategy[4]

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The different modules and will be assessed through a range of different forms of assessments. Written coursework will be of varying lengths, recognising that writing coursework to a short length can be more challenging for some and can develop different skills relevant to professional practice. The length of each assessment task is usually stated within the module descriptor. Students then have opportunities to develop their communication and group working skills, as they are required to give group presentations. Feedback for all assessments is given in a timely fashion, dependent on the type of assessment, but always within 20 working days. All modules are supported by a number of formative tasks including group discussion, case studies, oral presentations. Formative feedback is usually given verbally within the

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

classroom or individual meetings as well as online. The taught components precede the research project, so assessment can be used to develop skills required for the individual research project. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through meetings with their thesis supervisor.

Course modules

The following modules outline all parts of the programme leading to **MSc**. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	N-ATF-IATAO Occ A22	Introduction to the Air Transport Industry	Dr Edgar Jimenez Perez	22		0	Y	10/10/22	10/10/22	14/10/22	0	AO						
2	N-ATF-TEF10 Occ A22	Air Transport Economics and Finance	Dr Robert Mayer	50		20	N	17/10/22	17/10/22	28/10/22	40 40	ICW 1 (Finance)	50 50				21/11/22 05/12/22	15/05/23

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
												ICW 2 (Economics)						
3	N-ATF-RPA10 Occ A22	Geopolitics and International Aviation	Dr Darren Ellis	30		10	Y	21/11/22	21/11/22	02/12/22	40	EX (online)	100				FT 02/12/22	Exam Week 6, 15/05/23
4	N-APM-RMF10 Occ A22	Air Transport Market Analysis and Forecasting	Gary Doy	25		10	Y	13/03/23	13/03/23	24/03/23	40	ICW	100				FT 24/04/23	FT 15/05/23
5	N-ATF-ATO10 Occ A22	Air Transport Operations	Andy Foster	25		10	N	07/11/22	07/11/22	11/11/22	40	ICW	100				12/12/22	15/05/23
6	N-APM-AEP10 Occ A22	Air Transport Environmental Planning	Dr Tom Budd	24.5		10	Y	09/01/23	09/01/23	13/01/23	40	ICW	100				FT 13/02/23	FT 15/05/23
7	N-ATF-ATS10 Occ A22	Airline Strategic Management	Dr Robert Mayer	25		10	Y	30/01/23	30/01/23	03/02/23	40	ICW	100				FT 06/03/23	FT 15/05/23
8	N-SAI-ISMS Occ C22	Aviation Safety Management	Dr David Barry / Dr	30		10	Y	06/02/23	06/02/23	10/02/23	40	ICW	100				FT 13/03/23	FT 15/05/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
			Simon Mitchell																
9	N-AW-ATEMO Occ A22	Air Transport Engineering – Maintenance Operations	Cengiz Turkoglu	30		10	Y	13/02/23	13/02/23	17/02/23	40	ICW	100				FT 20/03/23	FT 15/05/23	
10	N-ATF-AFP10 Occ A22	Airline Fleet Planning	Andy Foster	25		10	Y	27/02/23	27/02/23	03/03/23	40	ICW	100				FT 03/04/23	FT 15/05/23	
11	N-ATF-ATM10 Occ A22	Air Transport Marketing	Professor Keith Mason	25		10	Y	23/01/23	23/01/23	27/01/23	40	ICW	100				FT 27/02/23	FT 15/05/23	
12	N-APM-ASP10 Occ A22	Airport Strategic Planning	Dr Pere Suau-Sanchez	28.45		10	Y	16/01/23	16/01/23	20/01/23	40	ICW	100				FT 20/02/23	FT 15/05/23	
13	N-AEX-DAM Occ A22	Digital Airline Management	Dr Robert Mayer	20		10	Y	09/01/23	09/01/23	03/04/23	40	ICW	100				FT 03/04/23	FT 15/05/23	
14	N-AEX-ATRR Occ A22	Regional Aviation	Dr Romano Pagliari	20		10	Y	09/12/22	09/12/22	10/03/23	40	ICW	100				FT 03/04/23	FT 15/05/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
15	N-ATF-GP20 Occ A22	Group Project	Andy Foster	25		20	N	17/04/23	17/04/23	05/05/23	40 40	GCW GPRES	50 50				FT 08/05/23 FT 05/05/23	At the next available opportunity which may not be until the course runs the following year
16	N-ATF-THES10 Occ A22	Individual Research Project	Dr Romano Pagliari	40		80	Y	05/12/22	05/12/22	14/08/23	50 50	THESIS ICW	90 10				14/08/23 09/01/23	15/05/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-ATF-IATAO	Introduction to Air Transport Industry	Air Transport Management	Airport Planning and Management
N-ATF-RPA10	Geopolitics and International Aviation	Air Transport Management	Airport Planning and Management Air Transport Management (Executive)
N-APM-RMF10	Air Transport Market Analysis and Forecasting	Airport Planning and Management	Air Transport Management Air Transport Management (Executive)
N-ATF-ATM10	Air Transport Marketing	Air Transport Management	Airport Planning and Management Air Transport Management (Executive)
N-AW-ATEMO	Air Transport Engineering – Maintenance Operations	Airworthiness	Air Transport Management Air Transport Management (Executive) Military Aerospace and Airworthiness Safety and Human Factors in Aviation
N-APM-AEP10	Air Transport Environmental Planning	Airport Planning and Management	Air Transport Management (Executive) Air Transport Management
N-SAI-ISMS	Aviation Safety Management	Safety & Accident Investigation	Air Transport Management Air Transport Management (Executive) Military Aerospace and Airworthiness Safety and Human Factors in Aviation Safety and Accident Investigation Defence and Security (Engineering)
N-ATF-AFP10	Airline Fleet Planning	Air Transport Management	Air Transport Management (Executive)
N-APM-ASP10	Airport Strategic Planning	Airport Planning and Management	Air Transport Management Air Transport Management (Executive)
N-AEX-DAM	Digital Airline Management	Air Transport Management (Executive)	Air Transport Management

			Airport Planning and Management
N-AEX-ATRR	Regional Aviation	Air Transport Management (Executive)	Air Transport Management Airport Planning and Management
N-ATF-ATS10	Airline Strategic Management	Air Transport Management	Airport Planning and Management
N-ATF-THES10	Individual Research Project	Air Transport Management	Airport Planning and Management

8. How are the ILOs assessed?

The course uses a range of assessment types. Students can expect to have two written examinations, ten pieces of assessment by submitted work and two elements of assessment by presentation or viva.

Students are subject to two forms of assessment with regard to the group project. Firstly, they must submit group coursework and secondly, their group project oral presentation is also assessed. In the latter form of assessment, each presentation is judged on how well their presentation is organised, the quality of their individual presentations and visual aids and how well they are able to answer questions from the audience. Both forms of assessment have an equal weighting with regard to the module mark.

The thesis is assessed using a combination of their written work and an oral presentation. The oral presentation provides an opportunity for each student to present their thesis to members of staff. These oral presentations are judged on the basis of the quality of the presentation in terms of content and visual aids, how well the key findings and other important elements of the research been communicated and how well the student has responded to questions from the audience.

This approach has been adopted in order to ensure that students achieve the intended learning outcomes

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. PgDip

Award ILOs Module No.	ILO1	ILO2	ILO3	ILO4	ILO5							
1		ICW			ICW							
2	EX				EX							
3		EX			EX							
4			ICW									
5			ICW									
6	ICW			ICW	ICW							
7					ICW							
8	ICW											
9		ICW		ICW								
10				ICW								

11	ICW				ICW							
12					ICW							
13					ICW							
14					ICW							
15	GCW				GCW							

B. MSc

Award ILOs Module No.						ILO6	ILO7	ILO8	ILO9	ILO10	ILO11	ILO12	ILO13	ILO14						
1								ICW												
2								ICW			ICW									
3								EX												
4							ICW	ICW												
5							ICW	ICW												
6								ICW	ICW											
7								ICW												
8								ICW												
9								ICW												
10								ICW	ICW											
11								ICW												
12								ICW												
13									ICW											
14								ICW												
15						GCW		GCW			GPRES		GCW							
16						THESIS		THESIS	THESIS	THESIS	IPRES	THESIS		THESIS						

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Graduates from this course will be well prepared for employment in the field of air transport management. The MSc Air Transport Management is designed to equip students with the skills required to pursue a successful career in various sectors of the air transport industry, including, but not restricted to, airlines, airport companies and authorities, civil aviation departments, air transport consultancies and aerospace companies. Cranfield students are also well prepared to undertake research leading to the award of a PhD.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: April 2022

1. What is the course?

Course information

Course Title	MSc in Aircraft Engineering
Course code	MSAENPTC, PDAENPTC, PCAENPTC
Academic Year	2022/2023
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	Not Applicable
Mode of delivery	Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Aeronautics
Course Director	Dr Craig Lawson
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Is the Mastership offered as an open and/or closed course?	No
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Part-time MSc - up to three years, Part-time PgDip - two years, Part-time PgCert - two years
Course Start Month(s)	February

Institutions delivering the course
This course is delivered by School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Aeronautics where the research interests include:

- A wide range of aerospace design topics, from conceptual to detail design of civil, military and Uninhabited Aerial Vehicles. It is also leading research into advanced technologies, such as laminar flow, avionics, more electric aircraft and advanced metallic and composite airframe structures.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Institution of Mechanical Engineers (IMechE) until August 2026 and the Royal Aeronautical Society (RAeS) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- To educate and train engineers to acquire and then exercise a broad range of design and manufacturing skills, knowledge and business awareness of the aircraft design cycle.
- To apply the knowledge that has been acquired to a group project, and to develop team working and management skills through the project work.
- To develop research skills and independent learning through the individual research project.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) exit routes are provided.

This programme is intended for the following range of students:

- Aerospace Engineers working in the aerospace industry who wish to broaden their knowledge of aircraft engineering for career development in technical, leadership and integration roles.
- Aerospace Engineers working towards chartered engineer status.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Demonstrate a systematic understanding of the aircraft development lifecycle and the major disciplines of aircraft engineering

ILO 2. Apply current design methods, tools and techniques used in the aerospace industry aircraft engineering and adapt them as necessary to solve real world aircraft design and manufacturing problems and critically evaluate the results.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 3. Effectively plan, communicate and collaborate to undertake a complex multi-disciplinary design task as part of a project team and judge their results in the context of the whole project .

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Independently undertake research in a relevant field of either aerospace structures, systems or avionics by means of critically analysing current research, generate new research output and appraise the results.

4. How is the course taught?

The course is taught using a combination of methods:

- Taught modules (lectures and lab work) are provided in week-long modules. These are assessed through a mixture of exams, and post-module assignments.
- The students participate in a comprehensive group design project, which is a strong example of problem-based learning at the postgraduate level providing a virtual industrial environment supported by experienced staff.
- All students must undertake individual research under the guidance of academic staff, which is assessed through a thesis.

In addition to the teaching methods outlined above, students will be supported in their learning and personal development by:

- Extensive computer network and IT facilities.
- Library facilities including journals, papers, and numerous databases.

- Informal and pastoral support from the Course Director.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 7. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules: 1-3	30
ELECTIVE MODULES:	
Any three modules chosen from: 4-17	30
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules: 1-3 Group Design Project: 18	30 60
ELECTIVE MODULES:	
Any three modules chosen from: 4-17	30
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Description	Credits
COMPULSORY MODULES:	
Modules:1-5 Group Design Project: 18 Individual Research Project: 19	50 60 70
ELECTIVE MODULES:	
Any two modules chosen from: 6-17	20
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee);[3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

6. How is the course structured?

Part-time students register for the course in February and are expected to complete the course within 3 years for MSc, 24 months for PgDip and 18 months for PgCert.

The majority of the modules are taught over one week residential at Cranfield University. Some modules are taught over two weeks.

Modules can be taken flexibly in each of the three years, but tend to be more heavily loaded in the first two years where the mandatory modules are usually taken. The Group Design Project and Individual Research Project run in months 13 to 24 and 25 to 36, respectively.

7. Course Level Assessment Strategy[4]

The course uses a range of assessment types. Students can expect to have one written examination, up to six post module assignments, two elements of assessment by presentation or viva and two written theses (group design project and individual research project). This approach has been adopted in order to challenge and enable students to demonstrate a full range of skills and attributes.

The taught modules are assessed by continuous assessments including project reports and assignments, or formal written examination (closed book or open book). The type of assessment for each module is clearly stated within the module descriptor. Students equip themselves with the skills they require to succeed in further career development and to address the specific award ILO1 (demonstrate a systematic understanding of the aircraft development lifecycle and the major disciplines of aircraft engineering) and ILO2 (apply current design methods, tools and techniques used in the aerospace industry aircraft engineering and adapt them as necessary to solve real world aircraft design and manufacturing problems and critically evaluate the results). The compulsory modules of 1, 2 and 4 (MSc only) are supported by several formative tasks including group discussion, case studies, and oral presentations. Formative feedback is given verbally within the classroom following discussions, via a written summary for case studies from the module leader and oral feedback provided by the tutor and peers for presentations. Students will also engage with an interactive learning activity which incorporates formative feedback.

Students (except PGCert) will be expected to participate in the Group Design Project meetings and present their work to other students on the course, as well as the project chairmen and external examiners. Each student must make an assessed presentation as part of the GDP (worth 10% of the GDP marks). Students then have opportunities to develop their communication skills, as they are required to give a group presentation and individual presentation. The ability to work effectively in groups is a highly desirable skill which is reflected in ILO 3 (effectively plan, communicate and collaborate and to execute undertake a complex multi-disciplinary design task as part of a project team and judge their results in the context of the whole project). Feedback is given immediately after the group presentation.

The taught components precede the research project, so assessment can be used to develop skills required for the individual research project. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses
https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

meetings with their project supervisors. The research project addresses ILO4 (Independently undertake research in a relevant field of either aerospace structures, systems or avionics by means of critically analysing current research, generate new research output and appraise the results).

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part [9](%)	Type of Assessment	Weighting of individual	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	N-AEN-IAVD	Introduction and Initial Aerospace Vehicle Design	Prof Howard Smith	40		10	N	06/02/23	06/02/23	17/02/23	50	ICW	100				03/04/23	At the next available opportunity which may not be until the course runs the following year
2	N-AEN-TIPD	Tools for Integrated Product Development	Dr Adrian Clarke	25		10	N	19/09/22	19/09/22	23/09/22	50	ICW	100				07/11/22	At the next available opportunity which may not be until the

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education.
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		course runs the following year
3	N-AEN-MCDSL	Major Component Design and Manufacture	Dr Ioannis Giannopoulos	20		10	N ST	05/12/22	05/12/22	09/12/22	50	ICW	100				30/01/23	At the next available opportunity which may not be until the course runs the following year
4	N-AEN-MIPD	Methodologies for Integrated Product Development	Dr Atif Riaz	29		10	N	06/02/23	06/2/23	10/2/23	50	EX	100				Week 4	At the next available opportunity which may not be until the course runs the following year
5	N-AEN-M	Manufacturing	Dr Jafar Jamshidi	25		10	Y	31/10/22	31/10/22	04/11/22	50	ICW	100				03/01/23	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
6	N-AEN-ALAA	Aircraft Loading Actions and Aeroelasticity	Prof Howard Smith / Prof Shijun Guo	20		10	N	03/07/23	03/07/23	07/07/23	50	ICW	100				01/08/23	At the next available opportunity which may not be until the course runs the following year
7	N-AEN-APA	Aircraft Performance for Aircraft Engineering	Dr Simon Place	40		10	N ST	10/10/22	10/10/22	21/10/22	50	ICW	100				16/01/23	At the next available opportunity which may not be until the course runs the following year
8	N-AEN-AMS	Design and Development of Airframe Systems	Dr Craig Lawson	32		10	Y	12/06/23	12/06/23	16/6/23	50	ICW	100				14/08/23	At the next available opportunity which may not be until the course runs the following year
9	N-AEN-ASC	Introduction to Aircraft Structural Crashworthiness	Dr Hessam Ghasemnejad	20		10	Y	20/02/23	20/02/23	24/02/23	50	ICW	100				24/04/23	At the next available opportunity which may not

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		be until the course runs the following year
10	N-AVD-DSTR	Detail Stressing	Dr Ioannis Giannopoulos	20		10	Y	31/10/22	31/10/22	11/11/22	50	ICW	100				09/01/23	At the next available opportunity which may not be until the course runs the following year
11	N-AVD-ASC B21	Fatigue, Fracture Mechanics and Damage Tolerance	Dr Wenli Liu	20		10	Y	12/06/23	12/06/23	16/06/23	50	ICW	100				31/07/23	At the next available opportunity which may not be until the course runs the following year
12	N-AW-ICAS	Design, Durability and Integrity of Composite Aircraft Structures	Dr Yigeng Xu	35		10	Y	10/07/23	10/07/23	14/7/23	50	ICW	100				11/09/23	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
13	N-AEN-FEA	Finite Element Analysis	Dr Ioannis Giannopoulos	35		10	N ST	09/01/23	09/01/23	20/01/23	50	ICW	100				06/03/23	At the next available opportunity which may not be until the course runs the following year
14	N-AEN-FDP	Flight Dynamics Principles for Aircraft Engineering	Dr Mushfiqul Alam	28		10	N ST	21/11//22	21/11/22	25/11/22	50	ICW	100				30/01/23	At the next available opportunity which may not be until the course runs the following year
15	N-AW-IA	Introduction to Avionics	Dr D Zammit-Mangion	30		10	Y	17/04/23	17/04/23	21/04/23	50	ICW	100				19/06/23	At the next available opportunity which may not be until the course runs the following year
16	N-AEN-IAS	Introduction to Autonomous Systems	Dr James Whidborne/Dr Huamin Jia	20		10	N	Not running 2022-23			50	ICW	100					At the next available opportunity which may not

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module8 (%) of Independent	Weighting within module of multi-part	Type of Assessment	Weighting of individual	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		be until the course runs the following year
17	I-TLS-A1525	Through-life System Effectiveness	Dr Maryam Farsi	10		10	Y	30/01/23	30/01/23	03/02/23	50	ICW	100				13/03/23	At the next available opportunity which may not be until the course runs the following year
18	N-AEN-GP	Group Design Project	Prof Howard Smith	100		60	N	10/02/23	10/02/23	06/02/24	50 50 50	IPRES ICW THESIS	10 10 80				10/01/24 24/02/24 24/02/24	At the next available opportunity which may not be until the course runs the following year
19	N-AEN-THES (new code)	Individual Research Project	Dr Craig Lawson	50		70	N	07/02/23	07/02/23	08/02/24	50 50	IPRES THESIS	10 90				10/01/24 8/02/24	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS - thesis

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-AEN-M	Manufacturing	Aircraft Engineering	Airworthiness Manufacturing Technology and Management
N-AEN-AMS	Design and Development of Airframe Systems	Aircraft Engineering	Airworthiness
N-AEN-ASC	Introduction to Aircraft Structural Crashworthiness	Aircraft Engineering	Military Aerospace and Airworthiness Airworthiness Safety and Accident Investigation Shared teaching with N-ALS-CRASH, Advanced Lightweight and Composite Structures
N-AVD-DSTR	Detail Stressing	Aerospace Vehicle Design	Airworthiness
N-AVD-ASC (assessed) N-AVD-FFMDT (non-assessed)	Fatigue, Fracture Mechanics and Damage Tolerance	Aerospace Vehicle Design	
N-AW-IA	Introduction to Avionics	Airworthiness	
N-AW-ICAS	Design, Durability and Integrity of Composite Aircraft Structures	Airworthiness	Military Aerospace and Airworthiness Advanced Materials Aerospace Materials
N-AEN-FEA	Finite Element Analysis	Aircraft Engineering	Astronautics and Space Engineering Shared teaching with N-AVD-FEA, Finite Element Analysis
I-TLS-A1525	Through-life System Effectiveness	Through-life System Sustainment	
N-AEN-IAVD	Introduction and Initial Aerospace Vehicle Design	Aircraft Engineering	Shared teaching with Aerospace Vehicle Design (N-AVD-IAD)
N-AEN-MCDSL	Major Component Design and Manufacture	Aircraft Engineering	Shared teaching with Aerospace Vehicle Design (N-AVD-DMO)

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

N-AEN-APA	Aircraft Performance for Aircraft Engineering	Aircraft Engineering	Shared Teaching with Aerospace Dynamics (N-ASD-GFTR)
N-AEN-FDP	Flight Dynamics Principles for Aircraft Engineering	Aircraft Engineering	Shared Teaching with Aerospace Dynamics (N-ASD-FDP)

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. All students can expect to have one written examination, up to six post module assignments. Additionally, PG Diploma students have one elements of assessment by presentation or viva, and one written thesis (group design project). MSc students have an additional assessed presentation and individual research project thesis. This approach has been adopted in order to challenge and enable students to demonstrate a full range of skills and attributes.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)
CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4
	PGCert		PGDip	MSc
1	ICW	ICW		
2	ICW	ICW		
3	ICW	ICW		
4	EX	EX		
5	ICW	ICW		
6	ICW	ICW		
7	ICW	ICW		
8	ICW	ICW		
9	ICW	ICW		
10	ICW	ICW		
11	ICW	ICW		
12	ICW	ICW		
13	ICW	ICW		
14	ICW	ICW		
15	ICW	ICW		
16	ICW	ICW		
17	ICW	ICW		
18			ICW/IPRES/ THESIS	
19				IPRES/THESIS

9. How will the University assure the quality of the provision?

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a

high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Most delegates on the course are already working in the Aerospace industry when they join the course. The course can aid career progression into technical, integration and leadership roles, and support career change to aerospace from other engineering/ physical science disciplines.

Annex A: EAB Mapping

COURSES	SM7M	SM8M	SM9M	EA 6M	EA 5m	EA 7M	D9M	D10M	D11M	EL 8M	EL 9M	EL 10M	EL 11M	EL 12M	EL 13M	P12M	P9m	P10m	P11m	G1	G2	G3m	G4
Introduction and Initial Aerospace Vehicle Design (N-AEN-IAVD)			✓			✓	✓	✓			✓		✓						✓	✓			✓
Tools for Integrated Product Development (N-AEN-TIPD)			✓				✓	✓	✓								✓	✓	✓	✓	✓		
Major Component Design and Manufacture (N-AEN-MCDSL)	✓		✓	✓			✓	✓	✓									✓					
Methodologies for Integrated Product Development (N-AEN-MIPD)			✓				✓		✓			✓					✓						
Manufacturing (N-AEN-M)		✓	✓	✓			✓			✓	✓		✓		✓			✓		✓			
N-AEN-GP Group Design Project			✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
N-AEN-THESIS Individual Research Project	✓	✓			✓	✓	✓										✓			✓	✓	✓	✓
Aircraft Loading Actions and Aeroelasticity (N-AEN-ALAA)	✓	✓	✓	✓	✓	✓	✓	✓	✓								✓						
Aircraft Performance for Aircraft Engineering (N-AEN-APA)	✓			✓		✓	✓					✓					✓		✓	✓		✓	✓

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Design and Development of Airframe Systems (N-AEN-AMS)		✓		✓	✓		✓		✓					✓			✓						
Introduction to Aircraft Structural Crashworthiness (N-AEN-ASC)		✓	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓		✓	✓	
Detail Stressing (N-AVD-DSTR)	✓		✓	✓										✓									
Fatigue, Fracture Mechanics and Damage Tolerance (N-AVD-ASC)	✓	✓				✓	✓		✓					✓		✓		✓		✓			
Design, Durability and Integrity of Composite Aircraft Structures (N-AW-ICAS)	✓	✓	✓		✓	✓			✓	✓	✓			✓	✓			✓		✓	✓		
Finite Element Analysis (N-AEN-FEA)	✓	✓	✓	✓	✓			✓															
Flight Dynamics Principles for Aircraft Engineering (N-AEN-FDP)	✓			✓			✓												✓	✓		✓	✓
Introduction to Avionics (N-AW-IA)	✓	✓	✓	✓	✓				✓					✓	✓		✓	✓		✓			✓
Introduction to Autonomous Systems (N-AEN-IAS)	✓				✓				✓								✓						
Through-life System Effectiveness (I-TLS-A1525)		✓	✓						✓		✓	✓		✓						✓			

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: June 2022

1. What is the course?

Course information

Course Title	MSc in Airport Planning and Management
Course code	MSAPMFTC PDAPMFTC
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	PgDip
Mode of delivery	Full-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Centre for Air Transport Management
Course Director	Dr Edgar Jimenez Perez
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	No
Is the Degree apprenticeship integrated or non-integrated?	No
Is the Mastership offered as an open and/or closed course?	No
Teaching Institution	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Admissions body	Cranfield University
Entry requirements	1st or upper 2nd class UK honours degree (or non-UK equivalent) in any discipline. A recognised professional qualification plus a number of years' relevant working experience may be accepted as equivalent. For applicants whose first language is not English there is a requirement to achieve the level of 7.0 on IELTS and equivalent grades on other English language qualifications recognised by the University.
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Centre for Air Transport Management where the research interests include:

- Air Transport Economics
- Airline and Airport Planning and Operations
- Safety and Air Accident Investigation

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not currently accredited by any PSRBs.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- provide a masters-level programme of learning for existing airport managers to enhance their skills in airport planning and management;
- provide a masters-level programme of learning for graduates seeking to pursue a career in airport planning and management;
- provide a masters-level programme of learning to meet the management training needs of existing airport operators and planning consultants;
- provide the foundation necessary for graduates to undertake doctoral research in airport planning and management.

This programme is intended for the following range of students:

- New graduates seeking to pursue a career in airport planning and management;
- Practitioners in the sector, particularly at junior and middle management levels, who are seeking to expand their knowledge and skills in airport planning and management in order to further develop their careers;
- Practitioners who are not employed in the airport or related sector, who are seeking a career in airport planning and management;
- Both practitioners and new graduates seeking to pursue doctoral research in airport planning and management.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. PGDip

ILO 1. Demonstrate a systematic understanding of relevant international and national regulations and explain their effects on airport business, planning, design, operations and safety management decisions;

ILO 2. Demonstrate a critical awareness of the key issues that affect users of airport facilities (e.g. airlines and retailers) and explain how their commercial pressures, strategic decisions and priorities impact on airport business, planning, design, operations and safety management decisions;

ILO 3. Identify, analyse and design solutions in order to address a given research problem within the context of airport planning and management, having regard to regulatory constraints and commercial and environmental imperatives;

ILO 4. Collaborate and contribute effectively to a group project, and communicating the findings of this exercise coherently to academics and other practitioners;

ILO 5. Collect information from a variety of electronic (internet) and hard copy sources to support a research project;

ILO 6. Appraise and critique the work of other practitioners and specialists;

ILO 7. Communicate effectively, both orally and in written form, research work produced to both practitioner and academic audiences;

ILO 8. Develop skills in efficient time management, working to set deadlines and targets, creative thinking and critical reflection on your own performance;

B. MSc

In addition to the intended learning outcomes outline above, a diligent student should be able to:

ILO9. Undertake and successfully complete a substantial programme of research independently, applying robust methods of data collection and analysis, and communicating the findings coherently.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- lectures and workshops delivered by the academic faculty and industry practitioners, demonstrating the application of theory to various examples and case studies
- training on how to use the library's on-campus and on-line resources undertaken by a Cranfield University librarian;
- training on how to use the OAG airline schedule database and other key data resources and online tools;
- a four-day workshop designed to enable students to develop a working competency in the use of CAST airport passenger terminal design software;
- Site visits to UK airports

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	**Credits**
COMPULSORY MODULES:	
Modules 1 to 8 Group project (14)	80 20
ELECTIVE MODULES:	
Modules 9 to 13	20
TOTAL:	120

B. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	
Modules 1 to 8 Group project (14) Individual Research Project (15)	80 20 80
ELECTIVE MODULES:	
Modules 9 to 13	20
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 11 calendar months.

Teaching is generally delivered in one week modules (with the exception of and Airport Finance and Business Management which is taught over two weeks). Students then complete a three-week group project after all taught modules have been completed. The Group Project usually takes places around the Easter break in the Spring. . The individual research project (IRP) is handed-in during the month of August.

Students are typically granted four weeks to complete individual coursework. For the Group Project, students are required to contribute to a group report and to participate in a group presentation.

7. Course Level Assessment Strategy[4]

The assessment tasks in the course are deliberately varied, and designed to be complementary to the other assessments on the course and the varied learning styles of students on the course. The assessments are challenging in that they address various technical aspects covered in the course, but also in that they seek to prepare students for 'real-word' challenges, particularly around working to deadlines and as part of a group. The main form of assessment are written individual reports, but there are also formal written exams, and group presentations. These purposefully target the assessment of different expertise and skills. The expected content and length of each assessment are clearly stated in the respective module descriptors. As well as summative feedback, formative feedback (usually in verbal form) is provided where applicable, and in a timely fashion to aid with any subsequent summative assessments. The variety of assessments allows students to develop a variety of important written and communication skills. The substantive group project and individual research project components are scheduled towards the end of the academic year, after all the other taught elements of the course have been completed. This gives the students the best grounding and understanding in a broad range of topics before tackling these assessments. Students are also expected to conduct more self-directed learning during the group project and IRP (albeit with regular scheduled supervision), which also fits from a pedagogical perspective.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [5]	Credits	Is the module shared? Y/N	Calendar			Assessment							
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[6] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module[7]	Weighting	Type of Assessment	Weighting of	Assessment Submission and/or exam date[10]	Assessment / Exam Retake date
1	N-ATF-IATAO Occ A22	Introduction to the Air Transport Industry	Dr Edgar Jimenez Perez	22		0	Y	10/10/22	10/10/22	14/10/22	0							
2	N-APM-APO10 Occ A22	Airport Operations	Richard Moxon	30		10	Y	07/11/22	07/11/22	11/11/22	40	ICW	100				FT 12/12/22	FT 15/05/23
3	N-APM-FBM10 Occ A22	Airport Finance and Business Management	Dr Romano Pagliari	48		20	N	17/10/22	17/10/22	28/10/22	40 40	EX (Online) ICW	40 60				FT 14/12/22 28/11/22	FT 15/05/23 15/05/23
4	N-ATF-RPA10 Occ A22	Geopolitics and International Aviation	Dr Darren Ellis	30		10	Y	21/11/22	21/11/22	02/12/22	40	EX (online)	100				FT 02/12/22	FT Exam Week 6, 15/05/23
5	N-APM-RMF10	Air Transport Market	Gary Doy	25		10	Y	13/03/23	13/03/23	24/03/23	40	ICW	100				FT	FT 15/05/23

[5] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[6] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [5]	Credits	Is the module shared? Y/N	Calendar			Assessment							
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[6] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module[7] (%) of	Weighting	Type of Assessment	Weighting of	Assessment Submission and/or exam date[10]	Assessment / Exam Retake date
	Occ A22	Analysis and Forecasting															24/04/23	
6	N-APM-ASP10 Occ A22	Airport Strategic Planning	Dr Pere Suau-Sanchez	28.5		10	Y	16/01/23	16/01/23	20/01/23	40	ICW	100				FT 20/02/23	FT 15/05/23
7	N-APM-AEP10 Occ A22	Air Transport Environmental Planning	Dr Thomas Budd	24.5		10	Y	09/01/23	09/01/23	13/01/23	40	ICW	100				FT 13/02/23	FT 15/05/23
8	N-APM-ADE10 Occ A22	Airport Design	Henrik Rothe	25		10	Y	20/02/23	20/02/23	03/03/23	40	ICW	100				FT 03/04/23	FT 15/05/23

[7] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education

[8] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.

[9] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.

[10] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [5]	Credits	Is the module shared? Y/N	Calendar			Assessment							
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[6] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module[7]	Weighting	Type of Assessment	Weighting of	Assessment Submission and/or exam date[10]	Assessment / Exam Retake date
9	N-SAI-ISMS Occ C22	Aviation Safety Management	Dr David Barry / Dr Simon Mitchell	30		10	Y	06/02/23	06/02/23	10/02/23	40	ICW	100				FT 13/03/23	FT 15/05/23
10	N-AEX-DAM Occ A22	Digital Airline Management	Dr Robert Mayer	20		10	Y	09/01/23	09/01/23	03/04/23	40	ICW	100				03/04/23	
11	N-AEX-ATRR Occ A22	Regional Aviation	Dr Romano Pagliari	20		10	Y	09/12/22	09/12/22	10/03/23	40	ICW	100				03/04//23	FT 15/05/23
12	N-ATF-ATM10 Occ A22	Air Transport Marketing	Professor Keith Mason	25		10	Y	23/01/23	23/01/23	27/01/23	40	ICW	100				FT 27/02/23	FT 15/05/23
13	N-ATF-ATS10 Occ A22	Airline Strategic Management	Dr Robert Mayer	25		10	Y	30/01/23	30/01/23	03/02/23	40	ICW	100				06/03/23	FT 15/05/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [5]	Credits	Is the module shared? Y/N	Calendar			Assessment							
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[6] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
												Type of Assessment	Weighting within module[7] (%) of	Weighting	Type of Assessment	Weighting of	Assessment Submission and/or exam date[10]	Assessment / Exam Retake date
14	N-APM-GP20 Occ A22	Group Project	Dr Thomas Budd	10.5		20	N	17/04/23	17/04/23	05/05/23	40 40	GCW GPRES	50 50				FT 08/05/23 FT 05/05/23	At the next available opportunity which may not be until the course runs the following year
15	N-ATF-THES10 Occ A22	Individual Research Project	Dr Romano Pagliari	40		80	Y	05/12/22	05/12/22	14/08/23	50 50	THESIS ICW	90 10				FT 14/08/23 09/01/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-ATF-IATAO	Introduction to the Air Transport Industry	Air Transport Management	Airport Planning and Management
N-APM-APO10	Airport Operations	Airport Planning and Management	Air Transport Management (Executive)
N-APM-ASP10	Airport Strategic Planning	Airport Planning and Management	Air Transport Management (Executive)
N-ATF-RPA10	Geopolitics and International Aviation	Air Transport Management	Airport Planning and Management Air Transport Management (Executive)
N-APM-RMF10	Air Transport Market Analysis and Forecasting	Airport Planning and Management	Air Transport Management Air Transport Management (Executive)
N-APM-AEP10	Air Transport Environmental Planning	Airport Planning and Management	Air Transport Management Air Transport Management (Executive)
N-APM-ADE10	Airport Design	Airport Planning and Management	Air Transport Management (Executive)
N-SAI-ISMS	Aviation Safety Management	Safety & Accident Investigation	Air Transport Management Air Transport Management (Executive) Military Aerospace and Airworthiness Safety and Human Factors in Aviation Safety and Accident Investigation Defence and Security (Engineering)
N-AEX-DAM	Digital Airline Management	Air Transport Management (Executive)	Air Transport Management Airport Planning and Management
N-AEX-ATRR	Regional Aviation	Air Transport Management (Executive)	Air Transport Management Airport Planning and Management
N-ATF-ATM10	Air Transport Marketing	Air Transport Management	Airport Planning and Management Air Transport Management (Executive)
N-ATF-ATS10	Airline Strategic Management	Air Transport Management	Airport Planning and Management

N-ATF-THES10	Individual Research Project	Air Transport Management	Airport Planning and Management Air Transport Management (Executive)

8. How are the ILOs assessed?

The following assessment types are utilised:

There are ten taught modules, two of which are elective. Nine of the taught modules have one point of assessment (seven modules assessed by Individual Coursework and one by Examination). The remaining module is assessed by a mix of Individual Coursework and Examination.

Students are subject to two forms of assessment with regard to the Group Project. Firstly, they must submit group coursework and secondly, their group project oral presentation is also assessed. In the latter form of assessment, each presentation is judged on the extent to which the work met the assignment brief, the quality of the presentation, and the ability of students to answer questions about their work. Both forms of assessment have an equal weighting with regard to the module mark.

The Individual Research Project is assessed first by an Individual Coursework considering the IRP proposal and then by consideration of a written thesis.

This approach has been adopted in order to ensure that students achieve the intended learning outcomes set out in Section 3.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO4	ILO 5	ILO 6	ILO 7	ILO 8	ILO 9
1	ICW					ICW		ICW	
2	ICW	ICW				ICW		ICW	
3	EX ICW	EX ICW	EX ICW			EX ICW		EX ICW	
4	EX							EX	
5		ICW			ICW			ICW	
6	ICW	ICW				ICW		ICW	
7	ICW		ICW			ICW		ICW	
8	ICW	ICW	ICW			ICW		ICW	
9	ICW	ICW						ICW	

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO4	ILO 5	ILO 6	ILO 7	ILO 8	ILO 9
10		ICW						ICW	
11	ICW	ICW						ICW	
12	ICW							ICW	
13	ICW	ICW	ICW					ICW	
14	GCW GPRES			GCW GPRES		GCW GPRES	GPRES	CGW GPRES	
15	ICW	ICW	ICW		THESIS	THESIS ICW	THESIS	THESIS	THESIS

B. PGDip

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO4	ILO 5	ILO 6	ILO 7	ILO 8
1	ICW					ICW		ICW
2	ICW	ICW				ICW		ICW
3	EX ICW	EX ICW	EX ICW			EX ICW		EX ICW
4	EX							EX
5		ICW			ICW			ICW
6	ICW	ICW				ICW		ICW
7	ICW		ICW			ICW		ICW
8	ICW	ICW	ICW			ICW		ICW
9	ICW	ICW						ICW

10		ICW						ICW
11	ICW	ICW						ICW
12	ICW							ICW
13	ICW	ICW	ICW					ICW
14	GCW GPRES			GCW GPRES		GCW GPRES	GPRES	CGW GPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition, students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5-year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Graduates from this course will be well prepared for employment in the field of airport planning and management. Opportunities for employment will exist in the planning departments of airport authorities or as a planner in one of airport management and planning consultancies that are involved in various airport development projects worldwide. Opportunities are also possible within regulatory organisations both in the UK and worldwide as well as with various other suppliers that have B2B relationships with the airport sector such as IT companies, airlines and aircraft manufacturers. Cranfield students are also well prepared to undertake research leading to the award of a PhD.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: May 2022

1. What is the course?

Course information

Course Title	MSc in Airworthiness
Course code	MSAWOPTC, PDAWOPTC, PCAWOPTC
Academic Year	2022-2023
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	
Mode of delivery	Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Centre for Safety and Accident Investigation
Course Director	Cengiz Turkoglu
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Part-time MSc - up to three years, Part-time PgDip - up to three years, Part-time PgCert - two years,
Course Start Month(s)	September or February[3]

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Centre for Safety and Accident Investigation where the research interests include:

- Aviation Safety
- Reliability
- Aircraft Maintenance
- Risk Management

Industrial visits and technical experts from external institutions play a large part in the course.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Institution of Mechanical Engineers (IMechE) until August 2026 and the Royal Aeronautical Society (RAeS) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to provide a wide spectrum of technical knowledge in the context of the related regulatory and safety issues. This is a background that managers in today's aerospace industry must possess. A detailed knowledge of airworthiness issues early in the development stage of a product's design, modification, repair or process helps the downstream business operation and enables a better balance to be struck between cost and safety. Specifically, the course aims to:

- Provide a globally unique course that relates the regulatory background to the technology concerned in the design, production and maintenance of aircraft – the airworthiness issues.
- Establish a centre of excellence that delivers a high technology Masters programme in airworthiness.
- Promote relevant research and development activity in airworthiness within Cranfield University, industry and government agencies.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) entry and exit routes are provided. It is suggested that these two qualifications may be more appropriate for engineers in the aviation industry who have no need for a separate individual research project.

This programme is intended for the following range of students:

- Graduate engineers from airlines

[3] In exceptional cases, the applicants may start the course by attending another module other than September or February and this will be agreed at the Course and Programme Director's discretion

- Licensed engineers in aviation industry (PgCert / PgDip possibly extending to MSc)
- Airworthiness engineers working in manufacturing, maintenance and/or operations

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Demonstrate an understanding of major issues surrounding the design and performance of complex aircraft, engine, their components and associated equipment used in aviation at a level appropriate to airworthiness requirements;

ILO 2. Describe and detail the organisation and nature of airworthiness requirements covering aircraft design,manufacture and maintenance;

ILO 3. Develop an awareness of the analytical, diagnostic and practical skills required for safe operation of aircraft, engines and their components;

ILO 4. Work both independently and as a member of a team towards the solution of complex safety related engineering problems;

ILO 5. Use transferable skills developed through team work, communication and problem-solving to enhance their careers in engineering and technical management;

ILO 6. Understand the roles and significance of compliance, substantiation, validation, certification and approval in the demonstration of airworthiness;

ILO 7. Be cognisant of the application of the studied technologies in other fields besides aerospace.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 8. Access and apply the relevant specific requirements in an appropriate way within the technology areas covered by the course and relate the technology to the requirements in such a way that sound engineering judgements can be made.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Undertake independent research on a topic relevant to airworthness and safety in aircraft or engine design, manufacture or maintenance utilising the techniques of literature review, data gathering, analysis, results evaluation, and presentation both written and oral.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Access to library resources;
- Use of class exercises (e.g. group work in Safety Assessment of Aircraft Systems) to help develop knowledge and techniques;
- Conducting an individual research project in a commercial or research organisation.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course.. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules: 1*, 3, 10 and 14	40
ELECTIVE MODULES:	
20 credits selected from Modules: 2, 4-9, 12-13, 15-17	20
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules: 1, 2, 3, 4, 10, 14, 15 AWD Airworthiness Dossier: 18	70 20
ELECTIVE MODULES:	
30 credits selected from Modules: 5-9, 11-13, 16-17	30
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules: 1, 2, 3, 4, 10, 14, 15 AWD Airworthiness Dossier: 18 Individual Research Project: 19	 70 20 80
ELECTIVE MODULES:	
Any other modules selected from Modules: 5-9, 11-13, 16-17 to the value of 30 credits	30
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [4]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

This course is offered on a part-time basis. Students typically register and start the course in September and are expected to complete the course within three years. The taught phase of a 10 credit module lasts one week, two weeks for a 20 credit module. Most modules are held once a year.

All MSc and PgDip students must complete the following mandatory modules as part of the course. Students must accumulate an additional 30 credits through the selection of optional modules in line with their interests.

Module number	Mandatory Modules
1	Airworthiness Fundamentals
2	Aircraft Fatigue & Damage Tolerance
3	Safety Assessment of Aircraft Systems
4	Gas Turbine Fundamentals
10	Air Transport Engineering - Maintenance Operations
14	Aviation Safety Management
15	Airframe Systems
18	Airworthiness Dossier
19	Individual Research Project - MSc only

Module Number	Elective Modules

[4] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

5	Mechanical Integrity of Gas Turbines
6	Practical Reliability
7	Aircraft Accident Investigation & Response
8	Fundamentals of Aircraft Engine Control
9	Manufacturing
11	Flight Experimental Methods (Airworthiness)
12	Design, Durability & Integrity of Composite Aircraft Structures
13	Introduction to Avionics
16	Introduction to Aircraft Structural Crashworthiness
17	Human Factors in Aviation Maintenance

PgCert students must complete Modules 1, 3, 10 and 14 and further 20 credits from those modules permitted in the table from Section 5A to make up 20 credits. There is no requirement to complete mandatory modules before taking optional modules.

7. Course Level Assessment Strategy[5]

The assessment tasks ensure that students demonstrate a full range of skills and attributes and they are designed at postgraduate level. When necessary, pre-requisite modules ensure that the students have the required level knowledge before they can attend certain modules. Essays and reports are the most common assessment method used across the modules and they vary in lengths and nature but they aim to ensure that that the students demonstrate they achieved the module level ILOs. The Course Dossier aims to assess the student's ability to reflect on their learning experience on each module and then conduct further research in relation to challenges the industry is facing. Finally the individual research project expects the students to be much more self-directed in their learning even though guidance is provided through supervision. The individual research project addresses ILO 9 and takes the form of a written report and presentation.

[5] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
1		N-AW-AW	Airworthiness Fundamentals	Cengiz Turkoglu	30	10	10	N	19/09/22	19/09/22	23/09/22	50	ICW	100				21/11/22	At the next available opportunity which may not be until the module runs the following year

[6] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[7] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[8] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[9] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[10] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[11] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[12] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or [illegible]	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
2		N-AW-AFDT	Aircraft Fatigue and Damage Tolerance	Dr Wenli Liu	30	10	10	Y	12/06/23	12/06/23	16/06/23	40	ICW	100				14/08/23	At the next available opportunity which may not be until the module runs the following year
3		N-AW-SAAS	Safety Assessment of Aircraft Systems	Jeremy Turner	35	15	10	Y	07/11/22 Occ A	07/11/22	11/11/22	40	ICW	100				23/01/23 Occ A	At the next available opportunity which may not be until the module runs the following year
									19/06/23 Occ B	19/06/23	23/06/23	40	ICW	100				21/08/23 Occ B	
4		N-AW-GTF	Gas Turbine Fundamentals	Prof Vassilios Pachidis	30	0	10	N	20/03/23	20/03/23	24/03/23	50	ICW	100				22/05/23	At the next available opportunity which may not be until the module runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
5		N-AW-MIGT	Mechanical Integrity of Gas Turbines NOT CURRENTLY OFFERED	Dr Panos Laskaridis															At the next available opportunity which may not be until the module runs the following year
6		N-AW-RA	Practical Reliability	Dr Simon Place	30	0	10	Y	16/01/23	16/01/23	20/01/23	50	ICW	100				20/03/23	At the next available opportunity which may not be until the module runs the following year
7		N-HFS-AAI	Aircraft Accident Investigation and Response	Alan Parmenter	30	0	10	Y	17/04/23	17/04/23	21/04/23	50	ICW	100				19/06/23	At the next available opportunity which may not be until the module runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
8		N-AW-FAEC	Fundamentals of Aircraft Engine Control	Dr Ioannis Goulos	30	0	10	Y	06/03/23	06/03/23	10/03/23	50	ICW	100				08/05/23	At the next available opportunity which may not be until the module runs the following year
9		N-AEN-M	Manufacturing	Dr Jafar Jamshidi	25	0	10	Y	31/10/22	31/10/22	04/11/22	50	ICW	100				03/01/23	At the next available opportunity which may not be until the module runs the following year
10		N-AW-ATEMO	Air Transport Engineering – Maintenance Operations	Cengiz Turkoglu	30	0	10	Y	13/02/23	13/02/23	17/02/23	50	ICW	100				17/04/23	At the next available opportunity which may not be until the module runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
11		N-AW-FEM	Flight Experimental Methods (Airworthiness)	Dr Simon Place	40	0	20	N	10/10/22	10/10/22	21/10/22	50	ICW	100				16/01/23	At the next available opportunity which may not be until the module runs the following year
12		N-AW-ICAS	Design, Durability and Integrity of Composite Aircraft Structures	Dr Yigeng Xu	35	5	10	Y	10/07/23	10/07/23	14/07/23	50	ICW	100				11/09/23	At the next available opportunity which may not be until the module runs the following year
13		N-AW-IA	Introduction to Avionics	Dr David Zammit-Mangion	30	0	10	Y	17/04/23	17/04/23	21/04/23	50	ICW	100				19/06/23	At the next available opportunity which may not be until the module runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
14		N-SAI-ISMS	Aviation Safety Management	Dr Simon Mitchell/ Dr David Barry	30	10	10	Y	12/09/22 Occ A	12/09/22	16/09/22	50	ICW	100				14/11/22 Occ A	At the next available opportunity which may not be until the module runs the following year
									27/03/23 Occ B	27/03/23	31/03/23	50	ICW	100				30/05/23 Occ B	
15		N-AEN-AMS	Design and Development of Airframe Systems	Dr Craig Lawson	25	0	10	Y	12/06/23	12/06/23	16/06/23	50	ICW	100				14/08/23	At the next available opportunity which may not be until the module runs the following year
16		N-AEN-ASC	Introduction to Aircraft Structural Crashworthiness	Dr Hessam Ghasemnejad	20	10	10	Y	20/02/23	20/02/23	24/02/23	50	ICW	100				24/04/23	At the next available opportunity which may not be until the module runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
17		N-HFS-HFAM	Human Factors in Aviation Maintenance	Cengiz Turkoglu	30	0	10	Y	27/03/23	27/03/23	31/03/23	50	ICW	100				30/05/23	At the next available opportunity which may not be until the module runs the following year
18		N-AW-CD	Airworthiness Dossier	Cengiz Turkoglu	10	0	20	N	05/09/22 Occ A22	05/09/22 Occ A22	05/09/23 Occ A22	50	RP	100				05/09/23	
									29/03/23 Occ B22	29/03/23 Occ B22	29/03/24 Occ B22	50	RP	100				29/03/24	
19		N-AW-RP	Individual Research Project	Cengiz Turkoglu	20	0	80	N	08/08/22 Occ A22	08/08/22 Occ A22	08/08/23 Occ A22	50 50	THESIS IPRES	80 20				08/08/23 05/09/23 Occ A22	
									01/03/23 Occ B22	01/03/23 Occ B22	01/03/24 Occ B22	50 50	THESIS IPRES	80 20				01/03/24 29/03/24 Occ B22	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-AW-AFDT	Aircraft Fatigue and Damage Tolerance	Airworthiness	Military Aerospace and Airworthiness
N-AW-SAAS	Safety Assessment of Aircraft Systems	Airworthiness	Military Aerospace and Airworthiness Safety and Accident Investigation
N-AW-MIGT	Mechanical Integrity of Gas Turbines	Airworthiness	Military Aerospace and Airworthiness Defence and Security (Engineering)
N-AW-RA	Practical Reliability	Airworthiness	Military Aerospace and Airworthiness Defence and Security (Engineering)
N-HFS-AAI	Aircraft Accident Investigation and Response	Safety and Human Factors in Aviation	Airworthiness Forensic Engineering and Science Military Aerospace and Airworthiness
N-AW-FAEC	Fundamentals of Aircraft Engine Control	Airworthiness	Military Aerospace and Airworthiness Shared teaching with N-THP-JEC
N-AEN-M	Manufacturing	Aircraft Engineering	Airworthiness
N-AW-ATEMO	Air Transport Engineering – Maintenance Operations	Airworthiness	FT Air Transport Management Executive Air Transport Management Military Aerospace and Airworthiness
N-AW-ICAS	Design, Durability and Integrity of Composite Aircraft Structures	Airworthiness	Military Aerospace and Airworthiness Advanced Materials

			Aerospace Materials Aircraft Engineering
N-AW-IA	Introduction to Avionics	Airworthiness	Aircraft Engineering
N-SAI-ISMS	Aviation Safety Management (Occ A and B)	Safety and Accident Investigation	Military Aerospace and Airworthiness FT Air Transport Management Safety and Human Factors in Aviation Airworthiness Safety and Accident Investigation Defence and Security (Engineering)
N-AEN-AMS	Airframe Systems	Aircraft Engineering	Airworthiness
N-AEN-ASC	Introduction to Aircraft Structural Crashworthiness	Aircraft Engineering	Airworthiness Military Aerospace and Airworthiness Safety and Accident Investigation Shared teaching with N-ALS-CRASH Advanced lightweight and Composite Structures
N-HFS-HFAM	Human Factors in Aviation Maintenance	Safety and Human Factors in Aviation	Airworthiness Military Aerospace and Airworthiness Safety and Accident Investigation Safety and Accident Investigation (Air Transport)
N-AW-FEM	Flight Experimental Methods	Airworthiness	Shared teaching with Aerospace Dynamics (N-ASD-GFTR) and Aircraft Engineering N-AEN-APA (wk 1 only)

8. How are the ILOs assessed?

The following assessment types are utilised:

The MSc in Airworthiness has **two** distinct but interrelated elements: the taught modules (which includes the Course Dossier) and the Individual Research Project. All modules are assessed by written assignments. The Individual Research Project is assessed by Thesis and an individual presentation ..

The post-module assignments are set to be challenging and to promote the study of the module topic areas in more depth, in particular the relationship of the regulations to the technology issues. The objectives of the assignments are for the students to:

- Acquire the skill to efficiently search literature
- Acquire an in-depth knowledge of Airworthiness regulations
- Apply skills and knowledge to assess the regulatory aspects of a particular technology
- Develop the power to critically analyse data
- Compile succinct and informative reports to a high standard

Formulate responses to specific questions
The assignments are designed to enable students to demonstrate achievement of learning outcomes as detailed on pages 18 and 19.

Over the duration of the course each MSc/PgDip student will complete an Airworthiness Dossier, containing a range of documentation related to each module taken. The dossier is an “Integrative Assessment”, which brings together the airworthiness theme of the course, over all taught modules.

This will include relevant airworthiness regulatory and guidance material, published papers, case studies etc. Its preparation will lead students to research each module topic in more depth, building both on the information taught in formal lectures and the material gleaned from the pre-module reading and post-module assignments. The objectives of the dossier are for the students to:

- Obtain and retain an in-depth knowledge of airworthiness regulations and guidance material
- Acquire skills in data gathering and literature searching
- Demonstrate an overall knowledge of the technology of the modules taken
- Demonstrate information organisational and presentational skills

The dossier is to provide a summary of the whole course with a focus on airworthiness and technology issues, showing the linkage between the two. It is up to each student to decide which lectures are fundamental to their interests and airworthiness/safety and select them for inclusion. This will vary from module to module but should cover a representative number of lectures in addition to key references found in background reading and assignment work.

Assessment of the Course Dossier will be undertaken when all taught modules have been completed. However, students should take the opportunity to review it with a course supervisor at an early stage, and also mid-way through the course.

This approach has been adopted because this is the best means to assess the wide-ranging set of subjects.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5	ILO 6	ILO 7
1	ICW	ICW				ICW	ICW
2	ICW	ICW	ICW		ICW	ICW	
3	ICW	ICW	ICW	ICW	ICW	ICW	
4	ICW	ICW	ICW	ICW	ICW	ICW	
5	ICW		ICW	ICW	ICW	ICW	
6	ICW	ICW	ICW	ICW	ICW		
7	ICW	ICW		ICW	ICW	ICW	
8	ICW	ICW		ICW	ICW	ICW	
9	ICW	ICW		ICW	ICW	ICW	ICW
10	ICW	ICW	ICW	ICW	ICW		ICW
12	ICW			ICW	ICW	ICW	
13	ICW			ICW	ICW	ICW	
14	ICW	ICW		ICW	ICW		ICW
15	ICW	ICW	ICW	ICW	ICW	ICW	
16	ICW	ICW		ICW	ICW	ICW	
17	ICW		ICW	ICW	ICW	ICW	ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5	ILO 6	ILO 7	ILO 8
11	ICW		ICW	ICW	ICW	ICW		
18	RP	RP	RP	RP	RP	RP	RP	RP

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5	ILO 6	ILO 7	ILO 8	ILO 9
19	IPRES THESIS	IPRES THESIS	IPRES THESIS	IPRES THESIS	IPRES THESIS	IPRES THESIS	IPRES THESIS	IPRES THESIS	IPRES THESIS

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. <u>What opportunities are graduates likely to have on completing the course?</u>

All students are part-time and therefore most are in full-time employment. However the MSc prepares them for a higher level of responsibility in the airworthiness field. This is often a legal requirement so that they can fulfil customer's obligation as an Approved organisation.

An example is the sponsoring of six students by the MOD to undertake the MSc Airworthiness. They were then appointed to the Airworthiness "Centre of excellence" which advised MOD on matters relating to aircraft safety and regulation. Other course members are part of the Military Aviation Authority, which was set up in 2010.

COURSE SPECIFICATION

Cranfield University: Course Specifications
Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: April 2022

1. What is the course?

Course information

Course Title	MSc in Applied Artificial Intelligence
Course code	MSAAIFTC, MSAAIPTC, PCAAIFTC, PCAAIPTC, PDAAIFTC, PDAAIPTC
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	SATM
Theme	Aerospace
Centre	Centre for Autonomous and Cyberphysical Systems
Course Director	Dr Yang Xing
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University Entry Requirements
UK Qualifications Framework Level	QAA FHEQ level 7
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc: 1year; Part-time MSc: up to 3 years.
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Autonomous and Cyberphysical Systems where the research interests include:

Data analytics and visualization
Artificial Intelligence/Machine learning for Computer vision
Multi-agent and collaborative systems
Autonomous systems
Automation in Aerospace Engineering
Time-series analysis/Hidden-Markov Models
Explainable AI
Human-Machine Interface

Cranfield University interacts with the following institutions and in the following ways:

Industrial Advisory board composed at 20/02/2019 by the following members: BAE Systems, Lockheed Martin, Boeing, QinetiQ, Airbus D&S, Plextek, Northrop Grumman, Spirent Communications, Bombardier, Barnard Microsystems Ltd, Overview Ltd, BioCarbon Engineering. The board proposes suitable topic for the Individual Research Projects.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not currently accredited by any PSRBs.

2. What are the aims of the course?

The course aims at training engineers in AI architectures and algorithms in order to leverage the power of AI in any engineering area. Particular attention is going to be given to real world problems, so that scalability and complexity of techniques is taken into account in the design of any architecture.

The course is targeted at both fresh graduates of STEM disciplines or to engineers currently working in the industrial sector wishing to train in AI in order to improve their career perspectives and bring benefits to their employers.

In more details, the specific aims of the course are:

- To provide the students a relevant theoretical knowledge of Artificial Intelligence methods.
- To provide the students a formation that will allow them to apply the AI knowledge to real world problems.
- To form students that are going to be able to analyse new real world AI problems, to critically evaluate different solutions and to create and design new AI applications.
- To meet the increasing demand of "AI practitioners" having a solid knowledge in AI.
- To support Cranfield University's mission to offer a comprehensive teaching offer in the aerospace sector.

This programme is intended for the following range of students:

- Engineers wishing to train/reskill in the area of AI.
- Graduates in Engineering disciplines, Computer Science or STEM area.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Differentiate intelligent architectures or machine learning algorithms, locate their role in complex systems and identify the appropriate applications.

ILO 2. Appraise the use of a range of professional coding practices to build reliable, reusable, scalable AI productions and services to time, quality and budget.

ILO 3. Design AI algorithms, techniques and methodologies by using appropriate statistical methods for sampling, distribution assessment, bias and error.

ILO 4. Identify and manage the technical, ethical, social and regulatory implications in the design and use of data and artificial intelligence methods.

ILO 5. Synthesise and critically compose appropriate medium to visualise AI based outputs and to prepare actionable stories relevant for business goals.

Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 6. Design artificial intelligence architectures/solutions, debate and solve their integration into more complex systems and critically assess their performance.

ILO 7. Appraise the use of experimental design, exploratory modelling and hypothesis testing to reach robust conclusions, by applying rigorous scientific methodologies in the AI area.

ILO 8. Critically judge the capability of AI solutions to be applied at scale to achieve business objectives.

B. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Define a research question, develop aims and objectives, critically evaluate the existing literature, develop or execute an appropriate methodology on a subject relevant to the area of applied artificial intelligence.

ILO 10. Be able to communicate their results via a thesis and in an oral presentation in a style suitable for academic and professional audiences.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Lectures.
- Computer labs and practical sessions.
- Online contents on Virtual Learning Environment (Blackboard).
- Group Design Projects.
- Individual Research Projects.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction 3 and 8	0 20
ELECTIVE MODULES:	
Any four from 2,4,5,6,7,9	40
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction Modules 2-9 Group Design Project or Individual Dissertation (part-time)	0 80 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Induction Modules 2-9 Group Design Project or Individual Dissertation Project (part-time) Individual Research Project	0 80 40 80
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 11 calendar months.

Part-time students register for the course in September and are expected to complete the course within 3 years.

The taught modules are typically delivered over 1 week, with lectures in the morning and laboratory, practical sessions or case studies in the afternoon.
Full-time students go through the course as recommended in the table.
Part-time students are recommended to complete 4 modules on the first year (suggested modules are: Systems Engineering, Intelligent and Cyber Physical Systems, Logic and Automated Reasoning and Ethical, Regulatory and Social Aspects of AI) and 4 modules, plus the Group Design Project on the second year (suggested modules are: Statistical Learning Methods, Search and Optimisation, Data Analytics and Visualization, Deep Learning). In the case of part-time students the Group Design Project can be replaced by an Individual Dissertation during the second year. The final year is expected to be focused on the Individual Research Project.

7. Course Level Assessment Strategy[4]

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The pre-requisite induction module will introduce the students to the course, the life on campus and some basic concepts of programming. This is an attendance-only module, hence is not going to be assessed. Modules 2-9 are introducing various practical aspects of applied AI and will be assessed through essays and reports. These will be of varying lengths, recognising that writing articles to a short length can be more challenging for some and can develop different skills relevant to professional practice. The length of each assessment task is clearly stated within the module descriptor. Students will write employability relevant policy briefing documents to equip them with the skills they require to succeed in the area of Applied Artificial Intelligence, Machine Learning or Data Science and to address the specific award ILOs 1-5. The ability to work effectively in groups is a highly desirable skill, which has translated into ILOs 6-8. Feedback is given immediately after the group presentation. A number of formative tasks including group discussion, case studies and oral presentations supports the modules 2-9 and the group project. Formative feedback is given verbally within the classroom following discussions, via a written summary for case studies from the module leader and oral feedback provided by the tutor and peers for presentations. Students will also engage with an interactive learning activity, which incorporates formative feedback. The taught components precede the individual research project, so assessment can be used to develop skills required for this final research project. The course industrial advisory board proposes the topics of the individual research projects. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through a pair of academic supervisors. The research project addresses ILOs 9 and 10 and takes the form of a Thesis. Finally, a further, unassessed, occasion for dissemination and receiving formative feedback is through the final poster session to which all members of the industrial advisory boards are invited.

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment						Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Independent Assessment: Type of Assessment	Independent Assessment: Weighting within module (%)[8]	Weighting within mdule of multi-part assessments[9](100%)		Weighting of individual elements of multi-part	Assessment and/or Submission exam date[11]	Assessment / Exam Retake date
1		N-AAI-IDW	Induction week	Dr Yang Xing	12	0	0	N	03/10/22	03/10/22	06/10/22	N/A	AO					N/A	N/A
2		N-AAI-SLM	Statistical Learning Methods	Dr Ivan Petrunin	28	0	10	N	24/10/2022	24/10/22	28/10/22	50	ICW	100				FT 25/11/22 PT 09/12/22	10/0323
3		N-AAI-SE	Systems Engineering	Dr Tim Mackley	30	0	10	N	07/11/22	07/11/22	11/11/22	50	ICW	100				FT 09/12/22	05/05/23

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually.
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment					Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%)	Weighting within multi-part assessments[9](100%)		Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		PT 09/01/23	
4		N-AAI-ICPS	Intelligent Cyber Physical Systems	Dr Saba Al-Rubaye	28	0	10	Y	01/12/22	01/12/22	09/12/22	50	ICW	100				FT 23/01/23 PT 06/02/23	19/05/23
5		N-AAI-SO	Search and Optimisation	Dr W Guo	28	0	10	N	10/10/22	10/10/22	14/10/22	50	ICW	100				FT 11/11/22 PT 25/11/22	17/02/23
6		N-AVC-LAR	Logic and Automated Reasoning	Dr Marta Ceccaroni	28	0	10	Y	30/01/23	30/01/23	03/02/23	50	ICW	100				FT 09/03/23 PT 23/03/23	02/06/23
7		N-AAI-DAV	Data Analytics and Visualization	Dr Ivan Petrunin	28	0	10	Y	Occ A 21/11/22 (FT) Occ B 12/06/23 (PT)	Occ A 21/11/22 (FT) Occ B 12/06/23 (PT)	Occ A 25/11/22 (FT) Occ B 16/06/23 (PT)	50	ICW	100				Occ A 09/01/23(FT) Occ B 28/07/23 (PT)	12/05/23 (FT)
8		N-AAI-DL	Deep Learning	Dr Yang Xing	28	0	10	N	09/01/23	09/01/23	13/01/23	50	ICW	100				FT 10/02/23 PT 24/02/23	26/05/23
9		N-AAI-ERS	Ethical, Regulatory and Social Aspects of AI	Dr Anne-Marie Oostveen	30	0	10	N	27/02/23	27/02/23	03/03/23	50	ICW	100				FT 31/03/23 PT 18/04/23	09/06/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment						Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Independent Assessment					Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
													Type of Assessment	Weighting within module[8] (%)	Weighting within multi-part assessments[9](100%)		Weighting of individual elements of multi-part		
10		N-AAI-GDP	Group Design Project	Dr Yang Xing	30	0	40	N	Occ A 03/01/23 (FT) Occ B 18/04/23 (PT)	Occ A 03/01/23 (FT) Occ B 18/04/23 (PT)	Occ A 11/04/23 (FT) Occ B 21/08/23 (PT)	50	GCW	100				Occ A 11/04/23 (FT) Occ B 21/08/23 (PT)	At the next available opportunity which may not be until the course runs the following year
11		N-AAI-DISS	Dissertation on Applied Artificial Intelligence	Dr Yang Xing	20	0	40	N	18/04/23	18/04/23	21/08/23	50	ICW	100				21/08/23 (PT ONLY)	
12		N-AAI-THESIS	Individual Research Project	Prof Antonios Tsourdos	20	0	80	N	18/04/23	18/04/23	21/08/23	50	THESIS	100				21/08/23 (PT & FT)	N/A

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-AVC-LAR	Logic and Automated Reasoning	Autonomous Vehicles Dynamics and Control MSc	N/A
N-AAI-DAV	Data Analytics and Visualisation	Applied Artificial Intelligence	Defence and Security Programme
N-AAI-ICPS	Intelligent Cyber-Physical Systems	Applied Artificial Intelligence	Defence and Security Programme

8. How are the ILOs assessed?

The following assessment types are utilised:

Exam, Individual Coursework assignment, Group and Individual Projects.

This approach has been adopted because:

MSc-level assessment of ILOs in the area of Engineering requires the students to exhibit a deep knowledge and comprehension of the topic, but also the capability of the students to synthesise and evaluate complex strategies for problem solving. Thus, in many practical engineering subject this can be readily done relying on individual coursework assignments on realistic applications and problems.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5
2	ICW	ICW	ICW		
3		ICW			
4		EX			
5	ICW		ICW		ICW
6	ICW		ICW		ICW
7	ICW	ICW	ICW	ICW	
8	ICW	ICW	ICW		
9		EX			

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 6	ILO 7	ILO 8
10	GCW	GCW	GCW
11	ICW	ICW	ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 9	ILO 10
12	THESIS	THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The Applied Artificial Intelligence MSc course is designed both for improving the graduates' attractiveness to the market, broaden their career options and being more valuable resources if they are currently employed and attend the course as part of a traineeship program. Upon completion of the course, graduates will be exposed to the following opportunities:

- Research Degree (PhD);

- Direct employment or graduate schemes in a number of industries: Aerospace, Defence, Automotive, Public Sector, Transports.

- As possible career path, various role are available: Machine Learning Engineer, Applied Machine Learning Engineer, Data Scientist, Research Scientist, Big Data Engineer, Big Data Architect, Expert Analyst, Domain Expert, Software Engineer, Project/Program manager.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: 09/02/21/June 2022

1. What is the course?

Course information

Course Title	Applied Bioinformatics
Course code	MSABIFTC, MSABIPTC, PDABIFTC, PDABIPTC, PCABIFTC, PCABIPTC, MSABIPAC
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield
School(s)	School of Water, Energy and Environment
Theme	Environment & Agrifood
Centre	Cranfield Soil and Agrifood Institute
Course Director	Dr Fady Mohareb
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	Yes
Apprenticeship Standard the course is mapped to	L7 Bioinformatics Scientist (https://www.instituteforapprenticeships.org/apprenticeship-standards/bioinformatics-scientist-degree/)
Is the Degree apprenticeship integrated or non-integrated?	Non-integrated
Is the Mastership offered	Open

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

as an open and/or closed course?	
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	NA
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - up to three years
Course Start Month(s)	October

Institutions delivering the course

This course is delivered by the Bioinformatics Group at Cranfield University, which comprises a team of entirely computer-based researchers who have been involved in several multi-million pound national and international projects, mainly funded by the BBSRC, EPSRC, the Wellcome Trust, the European Commission, and several companies including Unilever, Sanofi Aventis and GlaxoSmithKline. Our research activities include Next-Generation sequencing informatics, genome and transcriptome informatics, plant molecular biology, drug discovery, systems biology and food science. This wide range of research activities and collaborations gives us the opportunity to offer a variety of research projects to our MSc students that suit their individual research interests.

Cranfield University interacts with the following institutions and in the following ways:

Sanger, GlaxoSmithKline, Unilever, London School of Hygiene and Tropical Medicine (LSHTM), Sanofi Aventis, Rothamsted Research, the European Bioinformatics Institute, the Wellcome Trust Institute, University of Athens and Imperial College. Our teaching team at Cranfield University benefits from the input of a group of world-renowned experts in a range of applied sciences, including bioinformatics. We lead and collaborate in diverse research and consultancy projects, both nationally and internationally.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2. What are the aims of the course?

This course aims to equip graduate scientists with the computational skills and awareness needed to manage, analyse and interpret the vast amounts of genomic, transcriptomic, proteomic and metabolic data now becoming available. On completion of this course, you will be able to apply information technology to the development of new sequencing analysis and diagnostic tools and platforms. Additionally, you will gain the skills to design and implement new software plugins to fulfill the need of the research community, and will be equipped with a diverse set of knowledge and skills that directly meet the requirements of employers in this sector.

This programme is intended for the following range of students:

- The course is aimed both at graduates with degrees in life sciences, biotechnology, food science, natural sciences or medicine and alternatively those with a computational background.

- Scientists in industry in areas such as molecular biology, cell biology, and analytical techniques requiring training, or who wish to acquire skills and expertise in the field of bioinformatics

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Applied Bioinformatics

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Define the field of bioinformatics and related disciplines, and demonstrate a critical awareness of current research in the area.

ILO 2. Use various programming languages to develop tailored bioinformatics applications to achieve specific computational biology tasks.

ILO 3. Effectively apply statistical methods, machine learning and pattern recognition algorithms to analyse and classify high throughput data.

ILO 4. Communicate the relevant concepts, both orally and in writing, to academics and practitioners from bioinformatics and related disciplines.

B. Postgraduate Diploma in Applied Bioinformatics

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO5. Apply automation tools for various bioinformatics tasks by integrating existing bioinformatics resources and tools

ILO6. Integrate various research platforms and programming languages in order to build bioinformatics solutions

ILO7. Organise and manage a programme of software development.

ILO8. Integrate knowledge, understanding and skills from the taught modules in a real-life situation

ILO9. Effectively work in a small project team to identify project objectives and select appropriate methodologies to address problems faced by industrial clients; collaborating with other team members to communicate findings in a professional manner in written, oral and visual forms.

C. MSc in Applied Bioinformatics

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO10. Define a research question, develop aim(s) and objectives, select and execute a methodology, analyse data, and evaluate findings and draw appropriate conclusions.

ILO11. To communicate their findings successfully via a thesis, written in an approved School style and in an oral presentation.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Provision of lectures from external speakers to strengthen teaching in selected areas from academia and industry outside the University's area of expertise.
- Access to library resources, both on-campus and online, which are introduced at the beginning of the course by the Library Information Specialist
- Computational teaching in well-equipped facilities typical of those available to bioinformatics research scientists
- Timetabling designed to allow plenty of opportunity to assimilate information and seek further academic guidance where necessary

- Provision of a personal development programme as a self-directed activity of reflection and action planning, designed to encourage independent development of transferrable skills such as oral presentation, written communication and project management.
- The potential to carry out a research project in another organisation so alternative research environments can be experienced.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction module	
ELECTIVE MODULES:	
60 Credits from the following modules:	
Introduction to Bioinformatics Using Python	10
Exploratory Data Analysis and Essential Statistics Using R	10
Next Generation Sequencing Informatics	10
Application of Bioinformatics in Epigenetics,Proteomics and Metagenomics	10
Machine Learning for Metabolomics	10
Programming Using Java	10
Data Integration and Interaction Networks	10
Advanced Sequencing Informatics and Genome Assembly	10
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction module	
Introduction to Bioinformatics Using Python	10
Exploratory Data Analysis and Essential Statistics Using R	10
Next Generation Sequencing Informatics	10
Application of Bioinformatics in Epigenetics,Proteomics and Metagenomics	10
Machine Learning for Metabolomics	10
Programming Using Java	10
Data Integration and Interaction Networks	10

Advanced Sequencing Informatics and Genome Assembly	10
Group project	40
TOTAL:	**120**

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	
Induction module	
Introduction to Bioinformatics Using Python	10
Exploratory Data Analysis and Essential Statistics Using R	10
Application of Bioinformatics in Epigenetics,Proteomics and Metagenomics	10
Next Generation Sequencing Informatics	10
Machine Learning for Metabolomics	10
Programming Using Java	10
Data Integration and Interaction Networks	10
Advanced Sequencing Informatics and Genome Assembly	10
Group project	40
Thesis	80
ELECTIVE MODULES:	
TOTAL:	**200**

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of

your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in October and are expected to complete the course within 12 calendar months.

Part-time students register for the course in October and are expected to complete the course within 3 years.

Each module is taught over two weeks, with the second week largely free of structured teaching to allow time for more independent learning and reflection.

Teaching methods:

- Lectures, usually 1-2 hours in length, which will include visiting lecturers / external speakers.
- Interactive sessions including workshops and hands-on tutorials.
- Practical elements including computer lab classes, demonstrations and site visits.

7. Course Level Assessment Strategy[4]

The course assessment tasks enable students to demonstrate a full range of skills and attributes. The taught component is entirely assessed on the submitted coursework, which means that there are no exams and the individual modules are 100% assessed based on the assignment submitted at the end of each module. The core programming modules such as "Introduction to Bioinformatics using Python", "Essential Statistics using R" and "Introduction to Java Programming" will introduce the fundamentals of software development and program coding using the object-oriented programming and scripting concepts. These modules assessments are based on developing either a single stand-alone piece of software, or a series of scripts to achieve a bioinformatics solution for a given biological/life science challenge. The software will be complemented with a short report covering the technical documentation

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

for the implementation and a user manual as it is normally the case for bioinformatics software. For the core bioinformatics modules such as “Next Generation Sequencing Informatics”, “Data Science for Metabolomics”, and “Advanced Sequencing Informatics and Genome Assembly”, the assignment would typically be a mixture of a practical work (e.g. a report describing a process of data analysis performed as part of assignment objectives as well as the script developed for the analysis pipeline). The requirement of each assessment task is clearly stated within the module descriptor and clearly addressed to the module level ILOs. Specific award ILOs apply to different aspects of each of the taught modules, Group Project and Thesis Project. Students then have opportunities to develop their communication skills, as they are required to give a group presentation within the group project (formative assessment) and individual presentation (summative: Thesis Poster). The ability to work effectively in groups is a highly desirable skill that has translated into all ILOs. Modules are supported by a number of formative tasks including group discussion, one-to-one discussion during the computational practicals. Formative feedback is given verbally within the classroom following discussions, and oral feedback provided by the tutor and peers. Students will also engage with an interactive learning activity that incorporates formative feedback. For all modules peer review informs practice and tutorials guide progress, students are generally encouraged to support each other by asking and answering questions via the VLE. The taught components precede the research project, so assessment can be used to develop skills required for the individual research project. Students are generally expected to be more self-directed in their learning during Group Projects and Thesis Project and guidance will be provided through supervisors and induction workshops.

Course modules

The following modules outline all parts of the programme leading to **MSc**. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments[9] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	I-AGF-INWK	Induction week (AgriFood Programme)	Sofia Kourmpetli	33	0	0	Y		03/10/22	07/10/22	N/A	AO	N/A				N/A	
2	I-BIX-PYT	Introduction to Bioinformatics Using Python	Alexey Larionov	25	0	10	N		10/10/22	14/10/22	40	ICW	100				FT 22/10/22 PT 05/11/22	05/23

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8](%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3	I-BIX-STS	Exploratory Data Analysis and Essential Statistics Using R	Maria Anastasiadi	25	20	10	N		24/10/22	28/10/22	40	ICW	100				FT 05/11/22 PT 19/11/22	05/23
4	I-BIX-NGS	Next Generation Sequencing Informatics	Fady Mohareb	25	5	10	N		07/11/22	11/11/22	40	ICW	100				FT 19/11/22 PT 03/12/22	0523
5	I-BIX-PRO	Application of Bioinformatics in Epigenetics, Proteomics and Metagenomics	Alexey Larionov	25	20	10	N		21/11/22	25/11/22	40	ICW	100				FT 03/12/22 PT 17/12/22	05/23
6	I-BIX-MET	Machine Learning for Metabolomics	Maria Anastasiadi	25	0	10	N		05/12/22	09/12/2022	40	ICW	100				FT 17/12/22 PT 14/01/23	05/23
7	I-BIX-JAV	Programming Using Java	Fady Mohareb	25	20	10	N		09/01/23	13/01/23	40	ICW	100				FT 21/01/23 PT 04/02/23	05/23
8	I-BIX-DAT	Data Integration and Interaction Networks	Tomasz Kurowski	25	3	10	N		23/01/23	27/01/23	40	ICW	100				FT 04/02/23 PT 18/02/23	05/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8](%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
9	I-BIX-SIM	Advanced Sequencing Informatics and Genome Assembly	Fady Mohareb	25	5	10	N		06/02/23	10/02/23	40	ICW	100				FT 18/02/23 PT 04/03/23	05/23
10	I-BIX-GRPP	Group Project: Building Bioinformatics Solutions	Fady Mohareb	16		40	N		20/02/23	05/05/23	50 50 50 50	GCW GPRES ICW RP	64 16 10 10				28/04/23 02/05/23 05/05/23 06/05/23	
11	I-AGF-THESIS	Individual Thesis Project	Sofia Kourmpetli	20		80	Y		08/05/23	08/09/23	50 50	THESIS OR	90 10				04/09/23 w/c 28/08/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
I-AGF-INWK	Induction Week (AgriFood Programme)	Applied Bioinformatics	Food Systems & Management Future Food Sustainability
I-AGF-THESIS	Individual Thesis Project	Applied Bioinformatics	Food Systems & Management Future Food Sustainability

8. How are the ILOs assessed?

The following assessment types are utilised:

Students on the MSc can typically expect to have eight pieces of individual assessment by submitted work, one piece of group project work, and one element assessed by a thesis and an oral presentation.

This approach has been adopted in order to assess the ability of the student to demonstrate their ability in a range of environments.

This approach has been adopted in order to assess the ability of the student to demonstrate their ability in a range of environments.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Applied Bioinformatics – Postgraduate Certificate

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3.	ILO 4.		
2	ICW	ICW				
3		ICW	ICW	ICW		
4	ICW		ICW	ICW		
5	ICW			ICW		
6		ICW	ICW			
7		ICW	ICW	ICW		
8	ICW	ICW				
9	ICW	ICW				

B. Applied Bioinformatics – Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 5.	ILO 6.	ILO 7.	ILO 8.	ILO 9.
10	GPROJ	GPROJ	GPROJ GCW RP ICW	GPROJ	GPROJ ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 10.	1LO 11.
11	THESIS/ OR	THESIS/ OR

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality

Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition, students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Our MSc opens doors to careers in industry, public research establishments and university research. The multidisciplinary nature of our course has allowed our students to follow diverse career paths in various medical-related sectors including:

- Pharmaceutical and Biotech companies
- Plant research institutes
- Food sector
- Public Institutions
- Bioinformatics research institutes
- IT companies.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: 01/02/2022

1. What is the course?

Course information

Course Title	**Applied Mathematics and Operational Research Programme (AMOR)**, encompassing courses: I. Defence Simulation and Modelling (DSM) II. Military Operational Research (MOR)
Course code	I. **(DSM)** MSDSMFTR - PCDSMFTR - PDDSMFTR - MSDSMPTR - PCDSMPTR – PDDSMPTR, II. **(MOR)** MSMORFTR – PCMORFTR – PDMORFTR - MSMORPTR – PCMORPTR – PDMORPTR iii. **SPAMRPTR** (DSM and MOR modules)
Academic Year	2022/23
Valid entry routes	MSc, PgDip, PgCert (both DSM and MOR)
Additional exit routes	PgDip, PgCert (both DSM and MOR)
Mode of delivery	Full-Time and Part-Time (both DSM and MOR)
Location(s)[1] of Study	Shrivenham
School(s)	Cranfield Defence and Security
Theme	Defence and Security
Centre	Centre for Simulation and Analytics
Course Director	Mr J R Searle
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	DSM : Yes MOR : No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements. Minimum IELTS of 6.5
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	Full time students: Full 12 months registration (eg early September to end August/Early September inclusive) Maximum part time registrations of: MSc 5 years, PgDip 4 years, PgCert 3 years.
Course Start Month(s)	Full time : September Part time : September (DSM & MOR), January (DSM only)

Institutions delivering the course

This course is delivered by the Centre for Simulation and Analytics, Cranfield Defence and Security where the research interests include the modelling and simulation of Defence systems for analysis, experimentation and training.

Cranfield University interacts with the following institutions and in the following ways:

- A range of Defence and industrial partners provide software to the SSEL (Simulation and Synthetic Environment Laboratory).
- The course is supported by external visiting speakers in order to illustrate the real-world application and relevance of the material being taught
- The topics for student research projects are often suggested by external agencies and companies.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2. What are the aims of the course?

Cranfield University offers this course in order to provide graduates with the technical qualities, transferable skills and independent learning ability necessary to make them effective in organisations that design, develop and use modelling and simulation in a defence context.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) entry and exit routes are provided for students who wish to access only parts of the course provided.

This programme is intended for the following range of students:

- Recent graduates wishing to acquire knowledge and skills in either modelling and simulation or military operational research or in order to obtain employment in the defence industry;
- Members of the Armed Forces working in or preparing to take up appointments in the area of modelling and simulation or of operational research;
- Graduates working in defence research organisations wishing to extend their knowledge of either modelling and simulation or operational research.

3. <u>What should students expect to achieve in completing the course?</u>

Award intended learning outcomes (ILOs) (skills and knowledge).

A. **Defence Simulation and Modelling Postgraduate Certificate**

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Appraise some of the issues involved in the design, development and application of models, simulations and Synthetic Environments (SEs)

ILO 2. Demonstrate an understanding of the broad principles of simulation software and how to apply this knowledge in creating and using a synthetic environment

ILO 3. Compare and critically evaluate some of the issues involved in procuring and using models and simulations for applications including training and analysis

For part-time PG Cert students, where a flexible path is available, note that some aspects may be limited by the elective module choices made.

B. **Defence Simulation and Modelling Postgraduate Diploma**

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Explain the fundamentals of models and simulations and Synthetic Environments (SEs) and their place in procurement, training, the development of future force structures and the efficient use of defence resources

ILO 5. Critically evaluate different methodologies used in modelling and simulation and SEs and compare their strengths and weaknesses and understand how to select an appropriate methodology for a given need or situation

ILO 6. Demonstrate knowledge of issues and trade-offs that must be considered when using models, simulations and SEs for analysis and training

ILO 7. Demonstrate understanding of the practical application of models, simulations and SEs in government and the defence industry

ILO 8. Plan, specify, configure and utilise a distributed simulation or synthetic environment system

ILO 9. Appraise and critically evaluate the appropriate hardware in creating and running models, simulations and SEs

C. **Defence Simulation and Modelling MSc**

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 10. Demonstrate technical expertise, independent learning abilities and critical appraisal skills, by completing a modelling and simulation related project

D. Military Operational Research Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Understand the basic philosophy and methodologies of operational research

ILO 2. Appreciate examples of the practical application of operational analysis in government and defence industry

ILO 3. Distinguish between a limited range of the different modelling methodologies used in operational analysis and evaluate their strengths and weaknesses

ILO 4. Explain the reasons for using models and describe how operational analysis is applied to support defence decision making

ILO 5. Show transferable skills through an ability to communicate findings and issues to a subject specific audience

For part-time PG Cert students, where a flexible path is available, note that some aspects may be limited by the elective module choices made.

E. Military Operational Research Postgraduate Diploma

In addition to the intended learning outcomes outlined in D. above, a diligent student would also be expected to achieve the following in a topic relevant to their named award:

ILO 6. Explain the fundamental principles of modelling in operational analysis (military operational research) and be aware of the contribution of modelling in procurement, training, the development of future force structures and the efficient use of defence resources

ILO 7. Demonstrate an in-depth understanding of a wide range of the modelling methodologies used in operational analysis and to critically evaluate their strengths and weaknesses

ILO 8. Demonstrate knowledge of the detailed design issues and trade-offs that must be considered when specifying, developing or choosing model components

ILO 9. Demonstrate an understanding of knowledge of the issues involved in the design, development, verification, validation and application of operational analysis models and in the interpretation and communication of the results

ILO 10. Show understanding of examples of the practical application of operational analysis in government and defence industry

ILO 11. Explain the reasons for using models and describe how operational analysis is applied to support defence decision making

ILO 12. Demonstrate an ability to communicate subject specific findings to both a specialist and general audience

F. Military Operational Research MSc

In addition to the intended learning outcomes outlined in D. and E. above, a diligent student would also be expected to achieve the following in a topic relevant to their named award:

ILO 13. Demonstrate technical expertise, independent learning abilities and critical appraisal skills by completing an Operational Research related project.

4. How is the course taught?

Teaching methods:

- lectures from Cranfield staff and visiting speakers
- participative sessions, including tutorials and group exercises
- practical application elements, e.g. computer based demonstrations and practical sessions
- for the MSc: individual research project, with academic supervision

In addition to the teaching methods outlined above, students will be supported in their learning and personal development by:

- coursework involving investigation into a technical subject area and presentation to their peers
- participation on the modules by practitioners who are able to raise current issues and comment on the latest developments
- access to the Simulation and Synthetic Environment Laboratory (SSEL)
- an Academic Advisor (Personal Tutor) who gives advice on academic and other matters, acts as a link between students and the University academic authorities and monitors progress

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

Defence Simulation and Modelling

A. Postgraduate Certificate

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

PgCert in Defence Simulation and Modelling – Full-time	Credits
COMPULSORY MODULES:	
Introductory Studies Foundations of Modelling & Simulation Modelling & Simulation Techniques and Acquisition Real Time Graphics War Gaming and Combat Modelling Advanced Module #1 Advanced Module #2	0 10 10 10 10 10 10
ELECTIVE MODULES:	
N/A	

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

TOTAL:	**60**

PgCert in Defence Simulation and Modelling – Part-time	**Credits**
COMPULSORY MODULES:	
Introductory Studies Foundations of Modelling & Simulation	0 10
ELECTIVE MODULES:	
5 modules chosen from: Modelling & Simulation Techniques and Acquisition Real Time Graphics War Gaming and Combat Modelling Synthetic Environment and Virtual Simulation Experimentation, Analysis and Trials for Simulation Weapon System Performance Assessment Networked and Distributed Simulation Advanced Module #1 Advanced Module #2 Networked and Distributed Simulation Exercise	50 (10 credits per module)
TOTAL:	**60**

B. Postgraduate Diploma

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

PgDip in Defence Simulation and Modelling (Full-time and Part-time)	**Credits**
COMPULSORY MODULES:	
Introductory Studies Foundations of Modelling & Simulation Modelling & Simulation Techniques and Acquisition Real Time Graphics War Gaming and Combat Modelling Synthetic Environments and Virtual Simulation Experimentation, Analysis and Trials for Simulation Weapon System Performance Assessment Networked and Distributed Simulation Advanced Module #1 Advanced Module #2 Advanced Module #3 Networked and Distributed Simulation Exercise	0 10 10 10 10 10 10 10 10 10 10 10 10
ELECTIVE MODULES:	
N/A	
TOTAL:	**120**

[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

MSc in Defence Simulation and Modelling (Full-time and Part-time)	**Credits**
COMPULSORY MODULES:	
Introductory Studies	0
Foundations of Modelling & Simulation	10
Modelling & Simulation Techniques and Acquisition	10
Real Time Graphics	10
War Gaming and Combat Modelling	10
Synthetic Environments and Virtual Simulation	10
Experimentation, Analysis and Trials for Simulation	10
Weapon System Performance Assessment	10
Networked and Distributed Simulation	10
Advanced Module #1	10
Advanced Module #2	10
Advanced Module #3	10
Networked and Distributed Simulation Exercise	10
MSc Research Project	80
ELECTIVE MODULES:	
N/A	
TOTAL:	**200**

Military Operational Research

A. Postgraduate Certificate MOR

The accumulation of 60 credits[5] through the assessment of taught modules as detailed below:

PgCert in Military Operational Research – Full-time	**Credits**
COMPULSORY MODULES:	
Introductory Studies	0
Introduction to Operational Research Techniques	10
Discrete and Continuous Simulation	10
Decision Analysis	10
War Gaming and Combat Modelling	10
Advanced Module #1	10
Advanced Module #2	10
ELECTIVE MODULES:	
N/A	
TOTAL:	**60**

[5] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

PgCert in Military Operational Research – Part-time	Credits
COMPULSORY MODULES:	
Introductory Studies Introduction to Operational Research Techniques	0 10
ELECTIVE MODULES:	
5 modules chosen from: Discrete and Continuous Simulation Decision Analysis War Gaming and Combat Modelling Statistical Analysis and Trials Weapon System Performance Assessment Intelligent Systems Logistics Modelling Advanced Module #1 Advanced Module #2 Advanced Module #3	50 (10 credits per module)
TOTAL:	**60**

B. Postgraduate Diploma

The accumulation of 120 credits[6] through the assessment of taught modules as detailed below:

PgDip in Military Operational Research (Full-time and Part-time)	Credits
COMPULSORY MODULES:	
Introductory Studies Introduction to Operational Research Techniques Discrete and Continuous Simulation Decision Analysis War Gaming and Combat Modelling Statistical Analysis and Trials Weapon System Performance Assessment Intelligent Systems Logistics Modelling Advanced Module #1 Advanced Module #2 Advanced Module #3 Advanced Module #4	0 10 10 10 10 10 10 10 10 10 10 10 10
ELECTIVE MODULES:	
N/A	
TOTAL:	**120**

[6] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

MSc in Military Operational Research (Full-time and Part-time)	**Credits**
COMPULSORY MODULES:	
Introductory Studies	0
Introduction to Operational Research Techniques	10
Discrete and Continuous Simulation	10
Decision Analysis	10
War Gaming and Combat Modelling	10
Statistical Analysis and Trials	10
Weapon System Performance Assessment	10
Intelligent Systems	10
Logistics Modelling	10
Advanced Module #1	10
Advanced Module #2	10
Advanced Module #3	10
Advanced Module #4	10
MSc Research Project	80
ELECTIVE MODULES:	
N/A	
TOTAL:	**200**

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [7]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended

[7] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
    - it is <u>not</u> permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months.

The courses are also offered on a part-time basis. Part-time students normally register for their course in September or January, but if they have an appropriate background, it may be possible to register at a different time.

The maximum registration period for part-time students is:

- MSc – 5 years
- PgDip – 4 years
- PgCert – 3 years.

The full-time PgCert requires successful completion of 4 standard taught modules and 2 self-study 'Advanced' modules. More flexibility is however available for part-time PgCert students, who may choose from a range of elective modules in order to arrange their studies with respect to their other commitments over the shorter period of registration available to them.

Building on this, the PgDip then also requires successful completion of an additional set of 4 standard taught modules and a further 2 self-study 'Advanced' modules.

For the MSc, students are also required to successfully complete a thesis.

Each standard taught module normally consists of a one week course of classroom lectures, tutorials and practical work, followed by directed study coursework, involving private study equivalent to a further week of full-time work, allowing time for more independent learning and reflection.

A limited number of these standard taught modules are approved for delivery (primarily for part-time students) by non-residential distance e-learning using the on-line Cranfield Moodle Virtual Learning Environment (VLE). A 10-week block period for part time students to complete such on-line modules is typically offered once in each standard academic term.

The two-week self-study Advanced modules are 'mini-projects' with individual topics unique to each student, usually suggested by each individual student (subject to formal agreement and approval), which build on material covered in the standard modules and offer students the opportunity to explore selected topics in more depth. Depending on the nature of the topic selected, and excepting the 'Networked and Distributed Simulation Exercise' for the DSM Course, advanced modules typically may not involve any additional classroom or on-site attendance. For full time students, their Advanced Modules are timetabled, with typically two two-week blocks in each of Terms 1 and 2. A 10-week block period for part time students to complete Advanced Modules (again, excepting NDSE for DSM) is typically offered once in each standard academic term

7. Course Level Assessment Strategy[8]

Within the AMOR Programme, the DSM and MOR Courses have a common structure and operate under common regulations, with a common core teaching team and with some shared taught modules. Students on both courses are typically (but not exclusively) mid-career personnel, who are already in employment in the military, public service or industry and who have a strong focus on Defence.

The two courses typically address slightly different student needs however and this is reflected in some differences in assessment between them, particularly where they have unique (ie non-shared) modules.

All DSM and MOR taught modules are also available as both Short Courses and as Short Courses for Credit. Students in these modes of study are not registered for formal Postgraduate Awards, but rather are attending isolated individual modules in standalone mode as Career Professional Development activities. Because of this standalone use of the modules, the assessments for any one module cannot depend on, or be linked to, attendance at other related modules, but must be limited to the content of that single module specifically.

Assessments cannot therefore explicitly encompass integration across several modules.
Further, many AMOR modules are also shared with other CDS Postgraduate programs (eg SEDC, MESE, DSP) which again reinforces the need for assessments to be limited to module specific content, as students from other programs may not have access to other AMOR modules.

Both AMOR Courses (DSM and MOR) are typically specialist niche areas with relatively small cohorts, mainly studying in part-time mode, which means that no elective options are available. Both courses have a fixed path of compulsory modules.

DSM students are often MOD personnel employed as technical Subject Matter Experts (SME) whose responsibilities are primarily in aspects such as procurement, acquisition, requirements, management, coordination and coherence. They are typically not developers or operators. Hence their coursework assessments relate primarily to their 'big-picture' need to understand a broad range of relevant issues.

Although few of them will normally develop or utilise the techniques, tools and methods directly, the coursework often employs those in order for the students to better understand what their contractors/vendors/subordinates will be doing, to enable them to communicate more effectively with those personnel as intelligent/educated customers.

In contrast, the MOR student body is smaller and yet more diverse. Their primary focus is on developing skills in the application of different approaches and techniques to problem-solving, analysis and decision-support in a defence context. For MOR it is perhaps more likely that the students themselves will directly use these technique in their real-world jobs.

Although the precise mix varies between the courses, both DSM and MOR employ assessments that are typically a mix of practical work and research-based assignments.

As both courses have a high proportion of part-time students (currently approaching 100% at the time of writing), assessed coursework must be able to be carried out away from facilities at CDS.

As coursework often involves access to suitable computer systems and specialist software (some of which is not generally academically available outside CDS at the Defence Academy), equipment pools are therefore maintained to allow students to borrow suitable systems to use at their remote stations. This includes laptops and peripherals (such as network switches, joysticks, steering wheels and VR systems), and also the necessary software tools and applications. Remote access to facilities in the SSEL is also offered.

[8] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Many of the taught AMOR modules have a high proportion of hands-on computer-based lab work and practical exercises, which allows the academic staff to provide immediate formative feedback, both individually and collectively at the time. With class sizes being typically small, this also often informally encourages student peer discussion (especially where group, collaborative effort is required) and allows taught theory to be quickly supported by, and related to, real world practical examples.

AMOR Advanced Modules require self-study work on individual, self-suggested topics. Although the formal summative assessment is through a written submission, students must also present their work to both staff and other students prior to the summative submission. This not only develops presentation skills, but also provides an opportunity for formative feedback from both teaching staff and peers. Advanced Modules are deliberately designed to foster independent study and research skills prior to MSc research project thesis work.

Group work occurs in one residential Advanced Module (NDSE) for DSM, which is the capstone of the taught phase of the year for full-time students, giving them an opportunity to apply and integrate learning from across their studies. While its formal summative assessment is based on individual written submissions, the 10-day nature of the exercise provides many opportunities for staff formative feedback and peer-learning. As with other Advanced Modules a student post-activity presentation is also required (NB a group presentation in this specific case) which, although not assessed, provides opportunities for further formative feedback.

Although part-time students have more freedom than full-time students, in terms of the order in which they attend/study modules, some prerequisites are stated which ensures that a logical progression is followed. Thus for example, Advanced Modules in a topic may not be taken until the base taught module in that area has been attended.

AMOR offers a limited amount of VLE-based distance learning, intended primarily to provide study flexibility for part-time students. Two taught modules on each Course are offered that way, with the modules each being made available once per academic term in a scheduled 10-week block.

The DSM Course in particular is currently adapting to better meet MOD's needs, at their explicit request. The main effort is to change focus away from teaching that is perceived as being 'too traditional and academic' to become more representative and inclusive of the contemporary issues that the MOD technical SME encounter. As these changes continue, this is likely to lead to an increase in case-based assessment based on real-world examples.

Course modules

The following modules outline all parts of the programme leading to **MSc**.. Other awards associated with the course include some or all of these modules.

Module Number	Related Award	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13]	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
1	DSM MOR	R-AMOR-INTRO	Introductory Studies A & B	Dr J D Salt	*30*	0	0	*Y*	A:05/09/22 B:09/01/23	05/09/22 09/01/23	09/09/22 13/01/23	N/A	AO	N/A				N/A	N/A
2	DSM	R-AMO R-FMS	Foundations of Modelling and Simulation A & B	Mr J M Hoggard	32	0	10	*Y*	A:12/09/22	12/09/22 16/01/23	16/09/22 20/01/23	40	ICW	100				A FT: 10/10/22 A PT: 24/10/22 B PT: 27/02/23	A FT: 23/01/23 A PT: 24/07/23 B & C PT:

[9] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[10] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[11] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[12] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[13] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[14] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[15] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Related Award	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers [10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
			C: AeroSystems only						B:16/01/23 C:06/03/23	06/03/23	10/03/23							C PT: 17/04/23	24/07/23
3	MOR	R-AMOR-IORT	Introduction to Operational Research Techniques	Mr J D Smith	30	0	10	Y	12/09/22	12/09/22	16/09/22	50	ICW	100				FT: 10/10/22 PT: 24/10/22	FT: 23/01/23 PT: 24/07/23
4	DSM	R-AMOR-MSAT	Modelling and Simulation Techniques and Acquisition	Mr J R Searle	32	0	10	Y	26/09/22	26/09/22	30/09/22	40	ICW	100				FT: 24/10/22 PT: 07/11/22	FT: 23/01/23 PT: 24/07/23
5	MOR	R-AMOR-DCS	Discrete and Continuous Simulation	Dr K R McNaught	30	0	10	Y	26/09/22	26/09/22	30/09/22	40	ICW	100				FT: 24/10/22 PT: 07/11/22	FT: 23/01/23 PT: 24/07/23
6	DSM	R-AMOR-RTG	Real Time Graphics A (FT)	Mr J M Hoggard	32	0	10	Y	A:10/10/22 B:10/10/22	10/10/22 10/10/22	14/10/22 16/12/22	40	ICW	100				A FT: 07/11/22 A PT: 21/11/22	A FT: 23/01/23 A PT: 24/07/23 B, C, D:

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Related Award	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers [10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
			Real Time Graphics B, C and D (PT) **						C:16/01/23 D:22/05/23	16/01/23 22/05/23	24/03/23 28/07/23							B:19/12/22 C:27/03/23 D:31/07/23	Next 10-week VLE module block.
7	MOR	R-AMOR-DA	Decision Analysis	Dr K R McNaught	30	0	10	Y	A:10/10/22	10/10/22	14/10/22	50	ICW	100				FT: 07/11/22 PT: 21/11/22	A FT 23/01/23 A PT: 24/07/23
8	DSM MOR	R-AMOR-WGC	War Gaming and Combat Modelling A War Gaming and Combat Modelling B, C and D (PT) **	Mr J D Smith	30	0	10	Y	A:24/10/22 B:10/10/22 C:16/01/23 D:22/05/23	24/10/22 10/10/22 16/01/23 22/05/23	28/10/22 16/12/22 24/03/23 28/07/23	40	ICW	100				A FT: 21/11/22 A PT: 05/12/22 B:19/12/22 C:27/03/23 D:31/07/23	A FT: 23/01/23 A PT: 24/07/23 B, C, D: Next 10-week VLE module block.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Related Award	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers [10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
9	MOR	R-AMOR-SAT	Statistical Analysis and Trials	Dr T J Ringrose	30	0	10	Y	09/01/23	09/01/23	13/01/23	40	ICW	100				FT:06/02/23 PT:20/02/23	FT:24/04/23 PT:24/07/23
10	DSM	R-AMOR-EATS	Experimentation, Analysis and Trials for Simulation	Mr J D Smith	30	0	10	N	16/01/23	16/01/23	20/01/23	40	ICW	100				FT: 13/02/23 PT: 27/02/23	FT: 24/04/23 PT: 24/07/23
11	DSM	R-AMOR-SEVS	Synthetic Environments and Virtual Simulation	Mr J M Hoggard	32	0	10	N	30/01/23	30/01/23	03/02/23	40	ICW	100				FT: 27/02/23 PT: 13/03/23	FT: 24/04/23 PT: 24/07/23
12	DSM MOR	R-AMOR-WSAP	Weapon System Performance Assessment	Mr J D Smith	30	0	10	Y	13/02/23	13/02/23	17/02/23	40	ICW	100				FT: 13/03/23 PT: 27/03/23	FT: 24/04/23 PT: 24/07/23
13	MOR	R-AMOR-IS	Intelligent Systems	Dr V V S S Sastry	30	0	10	Y	23/01/23	23/01/23	27/01/23	40	ICW	100				FT: 20/02/23 PT: 06/03/23	FT: 24/04/23 PT: 24/07/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Related Award	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers [10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
14	DSM	R-AMOR-NDS	Networked and Distributed Simulation	Mr J R Searle	32	0	10	Y	27/02/23	27/02/23	03/03/23	40	ICW	100				FT: 27/03/23 PT: 10/04/23	FT: 24/04/23 PT: 24/07/23
15	MOR	R-AMOR-LM	Logistics Modelling A Logistics Modelling B, C & D (Pt) **	Dr J D Salt	30	0	10	Y	A:27/02/23 B:10/10/22 C:16/01/23 D:22/05/23	27/02/23 10/10/22 16/01/23 22/05/23	03/03/23 16/12/22 24/03/23 28/07/23	40	ICW	100				A FT: 27/03/23 A PT: 10/04/23 B:19/12/22 C:27/03/23 D:31/07/23	A FT: 24/04/23 A PT: 24/07/23 B, C, D: Next 10-week VLE module block.

**Subject to approval by the Course Director, this module may be available for non-residential, on-line distance learning study using the Cranfield Virtual Learning Environment (VLE). A 10-week block period for part time students to complete such on-line modules is typically offered once in each standard academic term and relates to occurrences B, D and D.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

ADVANCED MODULES AND PROJECT

Module Number	Module code	Related Award	Title	Module Leader	Contact hours	Total hours delivered by Visiting Lecturers	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Residential' Start Date	Residential' End Date	Minimum Mark - 40% or 50%	Type of Assessment	Weighting within module (%) of Independent assessments	Weighting within module of multi-part assessments (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment	Assessment Submission and/or exam date	Assessment / Exam Retake date
16	R-AMOR-AD1	DSM MOR	Advanced Module #1 A (FT) Advanced Module #1 B, C & D (PT)	Mr J R Searle	5	0	10	Y	A FT: 07/11/22 B:10/10/22 C:16/01/23 D:22/05/23	07/11/22 10/10/22 16/01/23 22/05/23	18/11/22 16/12/22 24/03/23 28/07/23	40	ICW	100				A FT: 21/11/22 B:19/12/22 C:27/03/23 D:31/07/23	A FT: 24/07/23 B, C, D : Next 10-week VLE module block.
17	R-AMOR-AD2	DSM MOR	Advanced Module #2 A (FT) Advanced Module #2 B, C & D (PT)	Mr J R Searle	5	0	10	Y	A FT: 05/12/22 B:10/10/22 C:16/01/23 D:22/05/23	05/12/22 10/10/22 16/01/23 22/05/23	16/12/22 16/12/22 24/03/23 28/07/23	40	ICW	100				A FT: 19/12/22 B:19/12/22 C:27/03/23 D:31/07/23	A FT: 24/07/23 B, C, D: Next 10-week VLE module block.
18	R-AMOR-AD3	DSM MOR	Advanced Module #3 A (FT) Advanced Module #3 B, C & D (PT)	Mr J R Searle	5	0	10	Y	A FT: 13/03/23 B:10/10/22 C:16/01/23	13/03/23 10/10/22 16/01/23	24/03/23 16/12/22 24/03/23	40	ICW	100				A FT: 27/03/23 B:19/12/22 C:27/03/23	A FT: 24/07/23 B, C, D: Next 10-week VLE

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

								D:22/05/23	22/05/23	28/07/23							D:31/07/23	module block.
19	R-AMOR-NDSE	DSM	Networked and Distributed Simulation Exercise (DSM Advanced Module #4)	Mr J R Searle	10	0	10	N	17/04/23	17/04/23	28/04/23	40	ICW	100				FT/PT 02/05/23	24/07/23
20	R-AMOR-AD4	MOR	Advanced Module #4 A (FT) Advanced Modules #4 B, C & D (PT)	Mr J R Searle	5	0	10	N	A FT: 17/04/23 B:10/10/22 C:16/01/23 D:22/05/23	17/04/23 10/10/22 16/01/23 22/05/23	28/04/23 16/12/22 24/03/23 28/07/23	40	ICW	100				A FT: 02/05/23 B:19/12/22 C:27/03/23 D:31/07/23	A FT: 24/07/23 B, C, D: Next 10-week VLE module block.
21	R-AMR-THESIS	DSM MOR	Thesis	Mr J R Searle	N/A	N/A	80	Y	A FT: 03/01/23 A PT: 03/01/23 B PT: 01/08/22 C PT: 03/04/23	03/01/23 03/01/23 01/08/22 03/04/23	31/08/23 03/02/24 01/09/23 03/05/24	50	THESIS	100				FT: 31/08/23 PT: 03/02/24 B: 01/09/23 C:03/05/24	By arrange-ment By arrange-ment

Most Advanced Modules (except NDSE) comprise self-study, mini-project coursework, equivalent to 10 days effort for a full-time residential student (Occurrence A). For each part-time student the equivalent work will normally be conducted non-residentially over a block period of 10 weeks which is typically offered once in each standard academic term (Occurrences B, C and D). NDSE for the DSM Course however typically requires group-based self-study work and is therefore normally undertaken residentially at Shrivenham Campus alongside the full-time students.

Advanced Module Topics will typically be proposed individually by students to follow-on from previous studies in one or more standard taught modules as pre-requisites. Topics require the approval of the relevant Module Manager(s) and Course Director. NDSE is an exception to this, where the topic will be provided and students will work as a group.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Part-time students requiring to re-take Advanced Modules will complete the activity in the next scheduled 10 week block.

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
R-AMOR-FMS	Foundations of Modelling & Simulation	AMOR	MESE Defence and Security Programme AeroSystems
R-AMOR-DA	Decision Analysis	AMOR	SEDC share teaching in their R-SEDC- DAMS module.
R-AMOR-IS	Intelligent Systems	AMOR	Defence and Security Programme
R-AMOR-WGC	War Gaming and Combat Modelling	AMOR	Defence and Security Programme
R-AMOR-RTG	Real Time Graphics	AMOR	Defence and Security Programme
R-AMOR-IORT	Introduction to Operational Research Techniques	AMOR	Defence and Security Programme
R-AMOR-LM	Logistics Modelling	AMOR	Defence and Security Programme
R-AMOR-SAT	Statistical Analysis and Trials	AMOR	Defence and Security Programme

8. How are the ILOs assessed?

The following assessment types are utilised:
All the standard taught modules are assessed 100% by written individual coursework assignments. The coursework is normally issued at the beginning of the taught module. Full-time students are normally required to submit the coursework approximately three weeks after the end of the module. Of those three weeks, one week will always be clear of other activity and dedicated to that Coursework alone. Part-time students are normally required to submit the coursework approximately 5 weeks after the end of the module. It is felt that this mode of assessment best suits the practical and applied nature of the disciplines involved.

.

Advanced modules (including NDSE for DSM) are 100% assessed by written individual coursework, which may include an optional viva. An individual presentation is also normally required, although this is a formative part of the learning experience and does not contribute to the summative assessment.

The MSc research project is assessed by a written thesis and may include an optional viva.

This approach has been adopted in order that the individual elements of the courses can be assessed by the most appropriate method and that students can demonstrate their understanding in a number of different ways.

Assessment and ILO Mapping

DEFENCE SIMULATION AND MODELLING

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3
2. FMS	ICW	ICW	ICW
4. MSAT	ICW	ICW	ICW
6. RTG	ICW	ICW	ICW
8. WGC	ICW	ICW	ICW
10. SEVS	ICW	ICW	ICW
11. EATS	ICW	ICW	ICW
12.WSAP	ICW		ICW
14. NDS	ICW	ICW	ICW
16. AM#1	ICW	ICW	ICW
17. AM#2	ICW	ICW	ICW
19. NDSE	ICW	ICW	ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 4.	ILO 5.	ILO 6.	ILO 7	ILO 8.	ILO 9.
2. FMS	ICW	ICW	ICW	ICW	ICW	ICW
4. MSAT	ICW	ICW	ICW			
6. RTG	ICW	ICW	ICW	ICW		ICW
8. WGC	ICW	ICW	ICW	ICW		
10. SEVS	ICW	ICW	ICW	ICW		ICW

Award ILOs / Module No.	ILO 4.	ILO 5.	ILO 6.	ILO 7	ILO 8.	ILO 9.
11. EATS	ICW	ICW	ICW	ICW	ICW	
12. WSAP	ICW	ICW		ICW		
14. NDS	ICW	ICW	ICW	ICW	ICW	ICW
16. AM#1	ICW	ICW	ICW	ICW	ICW	ICW
17. AM#2	ICW	ICW	ICW	ICW	ICW	ICW
18. AM#3	ICW	ICW	ICW	ICW	ICW	ICW
19. NDSE	ICW	ICW	ICW	ICW	ICW	ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	*ILO 10.*
21 THESIS	THESIS

MILITARY OPERATIONAL RESEARCH

D. Postgraduate Certificate

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3	ILO 4.	ILO 5
3. IORT	ICW		ICW	ICW	ICW
5. DCS		ICW	ICW		
7. DA	ICW	ICW	ICW		
8. WGC	ICW	ICW			
9. SAT	iCW	ICW	ICW	ICW	
12. WSAP		ICW		ICW	
13. IS			ICW		
15. LM			ICW	ICW	ICW
16. ADV#1	ICW	ICW	ICW	ICW	ICW
17. ADV#2	ICW	ICW	ICW	ICW	ICW
18. ADV#3	ICW	ICW	ICW	ICW	ICW

E. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 6.		ILO 7.	ILO 8.	ILO 9	ILO 10.	ILO 11.	ILO 12.
3. IORT	ICW				ICW	ICW		
5. DCS				ICW	ICW			
7. DA				ICW	ICW	ICW		
8. WGC			ICW		ICW	ICW	ICW	
9. SAT			ICW		ICW	ICW		
12. WSAP	ICW			ICW			ICW	
13. IS					ICW			
15. LM						ICW		
16. ADV#1			ICW	ICW	ICW	ICW	ICW	ICW
17. ADV#2			ICW	ICW	ICW	ICW	ICW	ICW
18. ADV#3			ICW	ICW	ICW	ICW	ICW	ICW
20. ADV#4			ICW	ICW	ICW	ICW	ICW	ICW

F. MSc
In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessment:

Award ILOs / Module No.	*ILO 13.*
21 THESIS	THESIS

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Students on this course are generally either sponsored by their existing employer as preparation for specific roles in Training, Analysis, Acquisition and Experimentation in the Military, Defence Organisations or Defence Industry, or else are seeking employment in those areas.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Astronautics and Space Engineering with variants in: MSc in Astronautics and Space Engineering (extended thesis) MSc in Astronautics and Space Engineering (Spacemaster) – *full-time option only*
Course code	MSASEFTC, MSASEPTC, MSASMFTC
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	Not Applicable
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Autonomous and Cyber-physical Systems
Course Director	Dr Jenny Kingston
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	NA
Is the Degree apprenticeship integrated or non-integrated?	NA

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Mastership offered as an open and/or closed course?	NA
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	One year full-time, -three years part-time
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Autonomous and Cyber-physical Systems where the research interests include:

- The design and development of both space and aeronautical systems.

Cranfield University interacts with the following institutions and in the following ways:

- The Erasmus Mundus (Spacemaster) variants of the course are two year programmes taught jointly with other European institutions. The SpaceMaster involves prior learning and teaching for the first year from Lulea Technical University (Sweden).

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

MSc Astronautics and Space Engineering with SpaceMaster variant or Extended Thesis option is accredited by the Royal Aeronautical Society (RAeS) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- Equip students from backgrounds in engineering or physical science with the knowledge, understanding and skills required to enable them to contribute to the European space industry or to space-related research.
- Develop students' specialist technical skills and to give students an awareness of space system engineering so that their specialist skills can be most effectively applied.
- Develop the transferable skills of students for a professional career in the space industry or research.

This programme is intended for the following range of students:

- New graduates seeking to pursue a career in the space industry.

- Practitioners in the sector, particularly at junior and middle management levels, who are seeking to expand their knowledge and skills in space systems engineering in order to further develop their careers.
- Practitioners who are not employed in the sector, who are seeking a career in the space industry.
- Both practitioners and new graduates seeking to pursue doctoral research in the area of spacecraft engineering.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. MSc

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Demonstrate a systematic knowledge, understanding and critical evaluation of the key principles of the main spacecraft disciplines (propulsion, orbits, communications, structure, data handling, etc.) and be competent to analyse performance quantitatively.
ILO 2. Demonstrate a critical judgement of their specialist subject area(s) at a level appropriate to new recruits to the space industry such that they are able to contribute directly without significant further training.
ILO 3. Demonstrate a systematic knowledge of the organisation of the space industry and typical space projects, within the wider economic, legal, social, ethical and environmental context.
ILO 4. Be able to apply their knowledge and understanding practically to the design and analysis of space systems.
ILO 5. Write a technical report to communicate their work clearly to others.
ILO 6. Demonstrate the ability to make an effective oral presentation to describe the execution and results of a technical project.
ILO 7. Plan, execute and manage a small research project.
ILO 8. Work effectively as a member of a team on a technical project.
ILO 9. Undertake independent study and research.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Assessed modules comprising lectures and workshops.
- Attendance-only modules which are not directly assessed but build overall breadth and depth of space engineering knowledge, and which can be applied within the project work.
- Lectures and workshops delivered by industry practitioners, demonstrating the application of theory to various examples and case studies.
- Industry visits where possible to demonstrate industry practice and facilities.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. MSc

The accumulation of 200 credits (or more) through the assessment of taught modules and the successful completion of the Thesis as detailed below:

Astronautics and Space Engineering (standard course)

Description	Credits
COMPULSORY MODULES:	
Modules: 1 to 3 Group Design Project: 11 Individual Research Project:12	30 60 90
ELECTIVE MODULES:	
2 modules chosen from: 4-10	20
OPTIONAL MODULES:	
Any modules chosen from: 14-25	0
TOTAL:	200

Astronautics and Space Engineering (extended thesis option)

Description	Credits
COMPULSORY MODULES:	
Modules: 1 to 3 Extended Individual Research Project: 13	30 150
ELECTIVE MODULES:	
2 modules chosen from: 4-10	20
OPTIONAL MODULES:	
Any modules chosen from: 14-25	0
TOTAL:	200

Astronautics and Space Engineering (Spacemaster variant)

Description	Credits
COMPULSORY MODULES:	
Accredited prior learning at Lulea Technical University Module: 3 Individual Research Project: 13	120 10 90
ELECTIVE MODULES:	
2 modules chosen from: 4-10	20
OPTIONAL MODULES	

Any modules chosen from: 14-25	0
TOTAL:	240

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee);[3] [4]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are normally expected to complete the course within 11 calendar months.

Part-time students usually register for the course in September and are normally expected to complete the course within 3 years. (2 to 5 years is possible.)

---

[3] For students who were registered before 1 August 2015, the requirement to obtain a minimum mark for a taught assessment will not apply for taught assessment taken before 31 August 2015 (unless the assessment was designated as a "key assessment" under the previous Assessment Rules).

[4] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

The majority of lecture modules take place between October and March and run in parallel with the Group Design Project which concludes by early May. The Individual Research Project Component runs from March through to the end of the programme in September. An Extended Thesis variant of the course offers a longer more in-depth Individual Research Project Component that runs from November to the end of the programme instead of participation in the Group Design Project. This is generally aimed at students who have already had significant group project experience (for example in prior work in industry).

This course is also offered on a part-time basis. Students would instead complete the extended thesis variant of the course over the registration period, usually completing the taught element of the programme before starting the individual research project.

7. Course Level Assessment Strategy[5]

Summative assessments have been chosen to align with the stated ILOs for each course element, and also to provide a range of assessment types. These assessments cover key communication skills (written, oral, and team-working), and include elements where assessed work is performed both with (group project) and without (examination) peer collaboration, to assure robustness of the evaluation of an individual student's performance.

The range of assessment types allows for diversity within the cohort, and provision is made for part-time students in terms of additional time allocated to assignments and thesis. Appropriate provision is also made on a case-by-case basis for students with a Learning Support Agreement.

A large proportion of the summative assessments (assignments, oral presentations and reports/theses) include provision of formative feedback for enhancing learning. For example, feedback provided on the Group Design Project reports is targeted to enhance skills development for the subsequent thesis work. Formative industry feedback is also provided on the Group Design Project (at the Industry Day) and at the final IRP poster presentation.

Taught modules, including attendance-only modules) in general include elements of formative assessment, and these are described in the Module Descriptors.

[5] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to t. Other awards associated with the course include some or all of these modules.

	Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar				Assessment							
														Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date		Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments (%)[10]	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
1	N-ASE-AMA	Astrodynamics and Mission Analysis	Dr Marta Ceccaroni	20	0	10	N	07/11/2022	07/11/2022	18/11/2022	50	EX	100					14/12/2022	06/23	
2	N-ASE-SSE	Space Systems Engineering	Dr Jenny Kingston	26	0	10	N	10/10/2022	10/10/2022	21/11/2022	50	EX	100					04/01/2023	06/23	
3	N-ASE-SP	Space Propulsion	Dr Jenny Kingston	22	22	10	Y	10/10/2022	10/10/2022	02/12/2022	50	EX	100					06/01/2023	06/23	

[6] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[7] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[8] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[9] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[10] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[11] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[12] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

	Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers [7]	Credits	Is the module shared? Y/N	Calendar				Assessment							
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date		Minimum Mark[8] - 40% or [illegible]	Independent Assessment		Multi-part Assessment			Submission dates	
														Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments [illegible]	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
4	N-ASE-SCO4	Space Communications	Dr Saba Al-Rubaye	22	0	10	N	09/11/2022	09/11/2022	17/11/2022	40	ICW	100					FT 16/12/2022 PT 13/01/2023	At the next available opportunity which may not be until the course runs the following year
5	N-ASE-GNCSS	Guidance Navigation and Control of Space Systems	Dr Leonard Felicetti	36	0	10	N	23/01/2023	23/01/2023	10/02/2023	40	ICW	100					FT 17/03/2023 PT 31/03/2023	At the next available opportunity which may not be until the course runs the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

	Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers [7]	Credits	Is the module shared? Y/N	Calendar				Assessment							
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
													Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments (%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																			following year
6	N-ASE-AFEM	Finite Element Methods	Dr Jenny Kingston	35	22	10	N	21/11/2022	21/11/2022	09/12/2022	40	ICW	100					FT 19/02/2023 PT 03/03/2023	At the next available opportunity which may not be until the course runs the following year
7	N-ALS-ACAS	Advanced Composite Analysis and Impact	Dr Hessam Ghasemnejad	20		10	Y	24/10/2022	24/10/2022	28/10/2022	40	ICW	100					25/11/22	01/2023
8	N-ASE-SADC	Spacecraft Attitude Dynamics and Control	Dr Leonard Felicetti	22	22	10	N	30/01/2023	30/01/2023	03/03/2023	40	ICW	100					FT 10/03/2023 PT 24/03/2023	At the next available opportunity which may not be until

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

	Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers [7]	Credits	Is the module shared? Y/N	Calendar				Assessment							
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
													Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments (%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																			the course runs the following year
9	N-ASE-GPS	Aerospace Navigation and Sensors	Dr Stephen Hobbs	24	0	10	Y	13/02/2023	113/02/2023	24/02/2023	40	ICW	100					FT 30/03/2023 PT 13/04/2023	At the next available opportunity which may not be until the course runs the following year
10	N-ASE-ATD	Mathematics and Programming for Astrodynamics and Trajectory Design	Dr Joan Pau Sanchez	20	0	10	N	09/01/2023	09/01/2023	13/01/2023	40	IPRAC	100					FT 24/03/2023 PT 07/04/2023	At the next available opportunity which may not be until the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

	Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers [7]	Credits	Is the module shared? Y/N	Calendar				Assessment							
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates		
													Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments (%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date	
																			course runs the following year	
11	N-ASE-GP	Group Design Project	Dr Jenny Kingston	40-60	0	60	N		04/10/2022	04/10/2022	26/04/2023	50 50	ICW IPRES	90 10				10/04/2023 17/03/2023	SEPT 2023	
12	N-ASE-THESIS	Individual Research Project	Dr Jenny Kingston	20	0	90	N		27/03/2023	27/03/2023	23/08/2023	50	THESIS	100				23/08/2023		
13	N-ASE-EIRP	Extended Individual Research Project	Dr Jenny Kingston	40	0	150	N		27/03/2023	27/03/2023	06/10/2023	50	THESIS	100				06/10/2023		
14	N-ASE-LRE	Launch and Re-entry Aerodynamics	Dr Simon Prince	20	0	0	N		27/02/2023	27/02/2023	03/03/2023	n/a	AO	n/a				n/a	n/a	
15	N-ASE-ELS	Humans in Space and associated ECLSS	Prof David Cullen	10	0	0	N		16/01/2023	16/01/2023	20/01/2023	n/a	AO	n/a				n/a	n/a	
16	N-ASD-MDS	Modelling of Dynamics Systems	Dr James Whidborne	13	0	0	Y		24/10/2022	24/10/2022	28/10/2022	n/a	AO	n/a				n/a	n/a	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

	Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment								
													Independent Assessment		Multi-part Assessment			Submission dates		
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments (%)[10]	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
17	N-ASE-ODH	On Board Data Handling and Software Development	Dr Stephen Hobbs	12	0	0	N	23/01/2023	23/01/2023	27/01/2023	n/a	AO	n/a				n/a		n/a
18	N-ASE-SE	Space Environment	Dr Jenny Kingston	10	0	0	N	13/02/2023	13/02/2023	17/02/2023	n/a	AO	n/a				n/a		n/a
19	N-ASE-PEI	Payload Engineering and Instrumentation	Dr Stephen Hobbs	12	0	0	N	31/10/2022	31/10/2022	04/11/2022	n/a	AO	n/a				n/a		n/a
20	N-ASE-EOE	Earth Observation and the Environment	Dr Stephen Hobbs	12	0	0	N	16/01/2023	16/01/2023	20/01/2023	n/a	AO	n/a				n/a		n/a
21	N-ASE-RS	Research Skills	Dr Stephen Hobbs	4	0	0	N	15/02/2023	15/02/2023	17/02/2023	n/a	AO	n/a				n/a		n/a
22	N-ASE-SM	Structural Mechanics	Dr Jason Brown	20	0	0	N	17/10/2022	17/10/2022	04/11/2022	n/a	AO	n/a				n/a		n/a
23	N-ASE-ISP	Impact Dynamics and Spacecraft Protection	Dr Jason Brown	15	0	0	N	31/10/2022	31/10/2022	04/11/2022	n/a	AO	n/a				n/a		n/a
24	N-ASE-CAD	Introduction to Computer	Dr Jafar Jamshidi	12	0	0	N	09/01/2023	09/01/2023	13/01/2023	n/a	AO	n/a				n/a		n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

	Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers [7]	Credits	Is the module shared? Y/N	Calendar				Assessment							
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
													Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments 10/100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
		Aided Design (CAD)																	
25	N-ASE-TDS	Thermal Analysis and Design Software	Dr Jenny Kingston	10	0	0	N	06/03/2023	06/03/2023	10/03/2023	n/a	AO	n/a				n/a		n/a

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-ASE-GPS	Aerospace Navigation and Sensors	Astronautics and Space Engineering	Aerospace Dynamics Flight Test and Flight Dynamics
N-ASE-SP	Space Propulsion	Astronautics and Space Engineering	Thermal Power
N-ASD-MDS	Modelling of Dynamic Systems	Aerospace Dynamics	Aerospace Dynamics
N-ALS-ACAS	Advanced Composite Analysis and Impact	Advanced Lightweight and Composite Structures	Astronautics and Space Engineering

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. In the standard course, students can expect to have 6 written examinations, 3-4 pieces of assessment by submitted work and 2 elements of formative or summative assessment by presentation or viva.

This approach has been adopted in order to ensure all students achieve the intended learning outcomes of the programme.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. MSc

Award ILOs / **Module No.**	ILO 1.	ILO 2.	ILO 3.	ILO 4.	ILO 5.	ILO 6.	ILO 7.	ILO 8.	ILO 9.
1	EX	EX		EX					
2	EX	EX	EX	EX					
3	EX	EX		EX					
4	ICW	ICW		ICW					
5	ICW	ICW		ICW					
6	ICW	ICW		ICW					
7	ICW	ICW		ICW					
8	ICW	ICW		ICW					
9	ICW	ICW		ICW					
10	IPRAC	IPRAC		IPRAC					
11	ICW	ICW	ICW	ICW	ICW	IPRES		ICW	

Award ILOs / Module No.	ILO 1.	ILO 2.	ILO 3.	ILO 4.	ILO 5.	ILO 6.	ILO 7.	ILO 8.	ILO 9.
	IPRES	IPRES	IPRES	IPRES	IPRES			IPRES	
12	THESIS	THESIS		THESIS	THESIS		THESIS		THESIS
13	THESIS	THESIS		THESIS	THESIS		THESIS		THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
N/A	N/A	N/A	N/A
		N/A	N/A

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student

Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The vast majority of our graduates are recruited by both the space industry and space-related academic groups. The positions cover a wide range of engineering disciplines all with the requirement for the broad space systems understanding that the course provides.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Automotive Engineering
Course code	MSAEGFTC, PDAEGFTC, PCAEGFTC
Academic Year	2022/2023
Valid entry routes	MSc
Additional exit routes	PGDip, PGCert
Mode of delivery	Full-Time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Advanced Vehicle Engineering Centre
Course Director	Dr Glenn Sherwood
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements, IELTS 6.5

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Advanced Vehicle Engineering Centre where the research interests include:

- Vehicle Electrification
- Battery Technology
- Vehicle Autonomy
- Vehicle Braking Systems
- Hydrogen Transport Research

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Institution of Engineering and Technology (IET) until August 2025 and the Institution of Mechanical Engineers (IMechE) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this Automotive programme in order to:

- Meet employer demand for post graduate engineers who have strong applied analytical skills in all areas of vehicle system and component design to meet the challenging market and legislative demands for vehicle safety, Performance and sustainability.
- Provide a primary training and dissemination route for Cranfield University's increasing research portfolio in the area of low carbon vehicle technologies and design methods.
- Supply to the automotive industry (and associated supply chain) high calibre post graduate engineers with the technical qualities, transferable skills and independent learning ability to make them effective in organisations that design and develop automotive products.

Postgraduate Diploma (PGDip) and Postgraduate Certificate (PGCert) exit routes are provided.

This programme is intended for the following range of students:

- EU or international students with a 1st class or 2nd class UK honours degree (or equivalent) in an engineering related discipline.
- Qualifying Double Degree students from the EU.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Evaluate how the automotive design process is led by legislation.
ILO 2. Differentiate between the vehicle systems and subcomponents and appraise the interdependency.
ILO 3. Evaluate how automotive global emissions are impacted by powertrain and body design.
ILO 4. Identify the impact of design and processes during powertrain operations that affect the production of emissions and how these are abated to meet legislative requirements.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Appraise and evaluate the structure of different vehicle types and assess the impact of different materials and load path faults during vehicle design.

ILO 6. Critically evaluate the ride quality, dynamics and control of vehicles through modelling techniques.
ILO 7. Evaluate and design fundamental vehicle concepts including the interdependency between structure, powertrain, aerodynamics, suspension and braking systems including legislative requirements.
ILO 8. Appraise the role of a team manager and identify the steps in problem solving during the automotive design process.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Critically evaluate and assess the results of independently scholarly research.
ILO 10. Plan and implement a programme of individual research with effective written and oral communication of results.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Provision of lectures from academics from selected UK Universities to support the programme in areas outside the technical expertise of Cranfield University.
- Provision of lectures from leading industry experts and practitioners highlighting the practical implementation and constraints associated with the theoretical principles introduced on the programme.
- All course material is available via the web-based learning environment Canvas.
- The course is timetabled as a series of modules thereby allowing diligent students to effectively manage the assessment requirements of the course.
- The provision of non-assessed study-skills training covering areas such as; academic report writing, presentation skills, research skills and working with University facilities (IT, library, Student Support Services).
- The extensive use of tutorial sessions and computer aided engineering exercises employing software packages commonly utilised in industry, including Matlab, AVL BOOST and CAE/CATIA.
- The opportunity to complete an individual Research Project, which may be sponsored by industry and using industry scale laboratory facilities and software packages.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
1	10
ELECTIVE MODULES:	
50 credits from the following taught modules: 2, 3, 4, 5, 6, 7, 8	50
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 4, 5, 6, 7,8 Module 9	80 40
ELECTIVE MODULES:	
N/A	
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 4, 5, 6, 7,8 Module 9 Module 10	80 40 80
ELECTIVE MODULES:	
N/A	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months. This programme is not offered on a part-time basis.

The taught modules are preceded by an introductory, non-assessed, study skills module. The taught modules are delivered in a modular format and will typically last for one week. Throughout terms one and two, sufficient non-structured learning and teaching time is scheduled to facilitate independent learning, the completion of assessed work and for personal reflection.

Within the first term, all students participating on the automotive programme will attend the combined (core) automotive modules. Students will attend specialist modules for Automotive Engineering in the first and second term. From term two and for the duration of the 3rd term, students will complete the Group Design Project and have the opportunity to undertake their individual Research Project. There are no elective elements within the individual courses.

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

7. Course Level Assessment Strategy[4]

The assessment strategy encompasses individual as well as group work. There is a blend of assignments and examinations across the assessed modules, although it is important to note that each module has one form of assessment. The modules contribute 80 credits (40%). Where the group design project is concerned, assessment comprises group report and presentation. This equates to 40 credits in total (20%). Finally, the remaining 80 credits (40%) are assigned to the individual research project. Here the distribution is 80% for the thesis and 20% for the thesis individual presentation. The combination of these forms of assessment with their various weightings determine the award of the Master's degree. In addition there are exit routes of Postgraduate Diploma (PgD) and Postgraduate Certificate (PgC) should the student not attain the MSc award. Students will be supported in their learning and personal development by:

- Provision of lectures from academics from selected UK Universities to support the programme in areas outside the technical expertise of Cranfield University.
- Provision of lectures from leading industry experts and practitioners highlighting the practical implementation and constraints associated with the theoretical principles introduced on the programme.
- All course material is available via the web-based learning environment Canvas.
- The course is timetabled as a series of modules thereby allowing diligent students to effectively manage the assessment requirements of the course.
- The provision of non-assessed study-skills training covering areas such as; academic report writing, presentation skills, research skills and working with University facilities (IT, library, Student Support Services).
- The extensive use of tutorial sessions and computer aided engineering exercises employing software packages commonly utilised in industry, including Matlab, AVL BOOST and CAE/CATIA.
- The opportunity to complete an individual Research Project, which may be sponsored by industry and using industry scale laboratory facilities and software packages.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
0		N-AEG-IND	Automotive Engineering Induction	Dr Glenn Sherwood	16		N/A	N	27/09/2022	27/09/2022	01/10/2022	N/A	N/A						
1		NEW N-AP-VDP	Vehicle Design Propulsion and Performance (shared with AM and CAVE)	Dr Glenn Sherwood	30		10	N	03/10/2022	03/10/2022	07/10/2022	50	ICW	100				14 October 2022 16:00	Sept 2023
2		N-AP-AE02	Powertrain Simulation and Performance	Dr Glenn Sherwood	30		10	N	06/02/2023	06/02/2023	17/02/2023	50	GCW	100				17/02/2023 16:00	Sept 2023

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3		N-AP-AE03	Automotive Control and Simulation	Dr Daniel Auger	30		10	Y	17/10/2022	17/10/2022	21/10/2022	50	ICW	100				28/10/2022 16:00	Sept 2023
4		N-AP-VSC	Vehicle Structures	Dr Marzio Grasso	30		10	N	28/11/2022	28/11/2022	02/12/2022	50	GPRES	100				08-09/12/2022	Sept 2023
5		N-APE-VMAN	Vehicle Materials and Manufacturing	Dr Tim Rose	30		10	N	09/01/2023	09/01/2023	13/01/2023	50	ICW	100				20/01/2023 16:00	Sept 2023
6		N-AP-AE05	Vehicle Dynamics	Dr Efstathios Velenis	30		10	Y	14/11/2022	14/11/2022	18/11/2022	50	EX	100				06/01/2023 10:00	Sept 2023
7		N-AP-AM05	Vehicle Electrification and Hybridisation	Dr Efstathios Siampis	30		10	Y	31/10/2022	31/10/2022	04/11/2022	50	EX	100				04/01/2023 10:00	Sept 2023
8		NEW N-AP-AERO	Automotive Aerodynamics	Dr Glenn Sherwood	30		10	N	23/01/2023	23/01/2023	27/01/2023	50	GCW	100				03/02/2023 16:00	Sept 2023
9		N-AP-AE11	Automotive Engineering Design Project	Dr Glenn Sherwood	60		40	N	27/02/2023	27/02/2023	28/04/2023	50 50 50	ICW GCW GPRES	20 64 16				28/04/2023 21/04/2023 24/04/2023	Sept 2023
10		N-AP-AE13	Individual Research Project	Dr Abbas Fotouhi	10		80	Y	01/10/2022	01/05/2023	31/08/2023	50 50	THESIS IPRES	80 20				21/08/2023 29/08/2023 - 31/08/2023	Next opportunity

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
N-AP-VDP	Vehicle Design Propulsion and Performance (shared teaching Automotive Mechatronics and CAVE)	Automotive Engineering	Automotive Mechatronics CAVE
N-AP-AE03	Automotive Control and Simulation	Automotive Engineering	Automotive Mechatronics
N-AP-AE05	Vehicle Dynamics	Automotive Engineering	Automotive Mechatronics
N-AP-AM05	Vehicle Electrification and Hybridisation	Automotive Mechatronics	Automotive Engineering
N-AP-AE13	Individual Research Project	Automotive Engineering	Automotive Mechatronics CAVE

8. How are the ILOs assessed?

The following assessment types are utilised:

- In Term 1 modules 6 and 7 are assessed via written examinations that will be set early in late term1/early term 2. Conversely, modules 3 and 5 will be assessed via an individual assignment. It is noteworthy that these assignments will be aligned to the respective ILOs and may include elements of computer based analysis, model development and simulation.

- Modules in the second term (2, 4) are assessed by assignment that has a computer based analysis. . As with the core modules, the nature of the summative assignments in all cases will be constructively aligned to the respective module ILOs and may include an element of written work, oral presentation, numerical analysis and experimentation.

- Module 9 represents an extended Group Project Activity and is assessed via a combination of written and presentation

- The individual Research Project is assessed via a written thesis and a thesis individual presentation.

This approach has been adopted because:

The Automotive Engineering course has been running since 1960 and is constantly updated to reflect current industry practice. The experience of the course teaching team feel that this is the most appropriate blend of assessments to fulfil the ILO's.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4
1	ICW	ICW	ICW	ICW
2			GCW	GCW
3		ICW		
4	~~EX~~GPRES	GPRES		
5	ICW		ICW	
6	EX	EX	EX	
7		EX		EX
8			GCW	

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO5	ILO6	ILO7	ILO8
1			ICW	
2			GCW	
3		ICW		
4	GPRES			
5	ICW			
6		EX	EX	
7			EX	
8			GCW	
9	GCW GPRES ICW		GCW GPRES ICW	GCW GPRES ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO9	ILO10
10	THESIS / IPRES	THESIS / IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The following patterns have emerged with regard to the future career paths for those graduates who have successfully studied automotive engineering:

- Continued higher education – PhD Research, both within Cranfield University or within other high ranking UK/EU Universities
- Employment within internationally leading vehicle manufacturers, including:
    - Toyota Europe (Belgium)
    - PSA (France)
    - Jaguar Cars / Land Rover (UK)
    - Bentley Motors (UK)
    - Ford (UK)
- Employment within internationally leading engineering consultancies and system suppliers to the automotive industry, including:
    - AVL (UK and Europe)
    - Ricardo Consulting Engineers (UK)
    - TRW (UK)
    - Bosch (Germany)

Graduands will typically take-up a graduate / senior engineering roles, within the respective product development or research departments of the employing organisations and which are often linked to an accelerated promotion scheme.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: MARCH 2022

1. What is the course?

Course information

Course Title	MSc in Automotive Mechatronics
Course code	MSAMCFTC, PDAMCFTC, PCAMCFTC
Academic Year	2022-2023
Valid entry routes	MSc
Additional exit routes	PGDip, PGCert
Mode of delivery	Full-Time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Advanced Vehicle Engineering Centre
Course Director	Dr Efstathios Velenis
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	n/a
Is the Degree apprenticeship integrated or non-integrated?	n/a
Is the Mastership offered as an open and/or closed course?	n/a
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements IELTS 6.5

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Advanced Vehicle Engineering Centre where the research interests include:

- Vehicle Electrification
- Connected and Autonomous Vehicles
- Advanced Control
- Multi-domain Modelling
- Vehicle Dynamics
- Novel Engine Technology
- Vehicle Braking Systems

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Institution of Engineering and Technology (IET) until August 2025 and the Institution of Mechanical Engineers (IMechE) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- Meet employer demand for post graduate engineers who have strong applied analytical skills in all areas of vehicle system and component design to meet the challenging market and legislative demands for vehicle safety, Performance and sustainability.
- Provide a primary training and dissemination route for Cranfield University's increasing research portfolio in the area of low carbon vehicle technologies and design methods.
- Supply to the automotive industry (and associated supply chain) high calibre post graduate engineers with the technical qualities, transferable skills and independent learning ability to make them effective in organisations that design and develop automotive products.

Postgraduate Diploma (PGDip) and Postgraduate Certificate (PGCert) exit routes are provided.

This programme is intended for the following range of students:

- EU or international students with a 1st class or 2nd class UK honours degree (or equivalent) in an engineering related discipline.
- Qualifying Double Degree students from the EU.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. **Postgraduate Certificate**

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Analyse key engineering subjects as applied to automotive mechatronics.
ILO 2. Judge the technologies which underpin automotive mechatronics.
ILO 3. Rate engineering related disciplines in the context of automotive mechatronics.

B. **Postgraduate Diploma**

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Formulate managerial skills for a group project.
ILO 5. Evaluate one or more automotive mechatronics applications.
ILO 6. Assess their personal development with reference to individual contribution in a team working context.

C. **MSc**

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 7. Appraise an area or areas of automotive mechatronics through individual research.
ILO 8. Synthesise their individual research in the form of a thesis report and poster.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- Provision of lectures from academics from selected UK Universities to support the programme in areas outside the technical expertise of Cranfield University.
- Provision of lectures from leading industry experts and practitioners highlighting the practical implementation and constraints associated with the theoretical principles introduced on the programme.
- All course material is available via the web-based learning environment Canvas.
- The course is timetabled as a series of modules thereby allowing diligent students to effectively manage the assessment requirements of the course.
- The provision of non-assessed study-skills training covering areas such as; academic report writing, presentation skills, research skills and working with University facilities (IT, library, Student Support Services).
- The extensive use of tutorial sessions and computer aided engineering exercises employing software packages commonly utilised in industry, including Matlab, WAVE/AVL BOOST and CAE/CATIA.
- The opportunity to complete an individual Research Project, which may be sponsored by industry and using industry scale laboratory facilities and software packages.

Through the Taught Modules, Group Design and individual Research Project, students are encouraged to develop their transferable skills (such as oral and written communication skills, independent learning, networking and project management).

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate
The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
ELECTIVE MODULES:	
60 credits from the following taught modules: 1, 2, 3, 4, 5, 6, 7, 8	60
TOTAL:	60

B. Postgraduate Diploma
The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1,2,3,4,5,6,7,8 Module 9	80 40
ELECTIVE MODULES:	
N/A	
TOTAL:	120

C. MSc
In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules 1,2,3,4,5,6,7,8 Module 9 Module 10	80 40 80
ELECTIVE MODULES:	
N/A	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months. This programme is not offered on a part-time basis.

The taught modules are preceded by an introductory, non-assessed, study skills module. The taught modules are delivered in a modular format and will typically last for one week. Throughout terms one and two, sufficient non-structured learning and teaching time is scheduled to facilitate independent learning, the completion of assessed work and for personal reflection.

Within the first term, all students participating on the automotive programme will attend the combined (core) automotive modules. Students will attend specialist modules for Automotive Mechatronics in the first and second term. From term two and for the duration of the 3rd term, students will complete the Group Design Project and have the opportunity to undertake their individual Research Project. There are no elective elements within the individual courses.

7. Course Level Assessment Strategy[4]

The assessment strategy encompasses individual as well as group work. There is a blend of assignments and examinations across the assessed modules, although it is important to note that each module has one form of assessment. The modules contribute 80 credits (40%). Where the group design project is concerned, assessment comprises group report and presentation, and an individual contribution

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

component. This equates to 40 credits in total (20%). Finally the remaining 80 credits (40%) are assigned to the individual research project. Here the distribution is 80% for the thesis and 20% for the thesis individual presentation. The combination of these forms of assessment with their various weightings determine the award of the Master's degree. In addition there are exit routes of Postgraduate Diploma (PgD) and Postgraduate Certificate (PgC) should the student not attain the MSc award. Students will be supported in their learning and personal development by:

- Provision of lectures from academics from selected UK Universities to support the programme in areas outside the technical expertise of Cranfield University.
- Provision of lectures from leading industry experts and practitioners highlighting the practical implementation and constraints associated with the theoretical principles introduced on the programme.
- All course material is available via the web-based learning environment Black Board.
- The course is timetabled as a series of modules thereby allowing diligent students to effectively manage the assessment requirements of the course.
- The provision of non-assessed study-skills training covering areas such as; academic report writing, presentation skills, research skills and working with University facilities (IT, library, Student Support Services).
- The extensive use of tutorial sessions and computer aided engineering exercises employing software packages commonly utilised in industry, including Matlab, WAVE/AVL BOOST and CAE/CATIA.
- The opportunity to complete an individual Research Project, which may be sponsored by industry and using industry scale laboratory facilities and software packages.
- Provision of a Personal Development Programme integrated throughout the Taught Modules and an individual Research Project that encourages the development of transferable skills (such as oral and written communication skills, independent learning and project management).

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
0		N-AMC-IND	Automotive Mechatronics Induction	Dr Efstathios Velenis	11		0	N	27/09/2022	27/09/2022	01/10/2022	N/A	N/A					N/A	
1		N-AP-AE03	Automotive Control and Simulation	Dr Daniel Auger	30		10	Y	17/10/2022	17/10/2022	21/10/2022	50	ICW	100				28/10/2022 16:00	Sept 2023
2		N-AP-AE05	Vehicle Dynamics	Dr Efstathios Velenis	30		10	Y	14/11/2022	14/11/2022	18/11/2022	50	EX	100				6 Jan 2023	Sept 2023

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3		NEW N-AP-VDP	Vehicle Design Propulsion and Performance	Dr Glenn Sherwood	30		10	N	03/10/2022	03/10/2022	07/10/2022	50	ICW	100				14/10/22 16:00	Sept 2023
4		N-AP-AM01	Mechatronics Modelling for Vehicle Systems	Dr Stefano Longo	30		10	Y	28/11/2022	28/11/2022	02/12/2022	50	ICW	100				09/12/2022 16:00	Sept 2023
5		N-AP-AM02	Advanced Control and Optimisation	Dr Daniel Auger	30		10	Y	02/01/2023	09/01/2023	13/01/2023	50	ICW	100				20/01/2023 16:00	Sept 2023
6		N-AP-AM03	Vehicle Control Applications	Dr Marco Cecotti	30		10	Y	06/02/2023	06/02/2023	10/02/2023	50	ICW	100				24/02/2023 10:00	Sept 2023
7		N-AP-AM04	Embedded Vehicle Control Systems	Dr Stefano Longo	30		10	Y	23/01/2023	23/01/2023	27/01/2023	50	ICW	100				03/02/2023 16:00	Sept 2023
8		N-AP-AM05	Vehicle Electrification and Hybridisation	Dr Efstathios Siampis	30		10	Y	31/10/2022	31/10/2022	04/11/2022	50	EX	100				04/01/2023 10:00	Sept 2023
9		N-AP-AE12	Automotive Mechatronics Group Project	Dr Efstathios Siampis	60		40	N	27/02/2023	27/02/2023	28/04/2023	50 50 50	ICW GCW GPRES	20 64 16				28/04/2023 21/04/2023 24/04/2023	Sept 2023

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
10		N-AP-AE13	Individual Research Project	Dr Abbas Fotouhi	10		80	Y	01/10/2022	01/05/2023	31/08/2023	50 50	THESIS IPRES	80 20				21/08/2023 29/08/2023 - 31/08/2023	N/A

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
N-AP-VDP	Vehicle Design Propulsion and Performance	Automotive Engineering	CAVE Automotive Mechatronics
N-AP-AM03	Vehicle Control Applications	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year)
N-AP-AM01	Mechatronics Modelling for Vehicle Systems	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year)
N-AP-AM02	Advanced Control and Optimisation	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year)
N-AP-AM04	Embedded Vehicle Control Systems	Automotive Mechatronics	Advanced Motorsport Mechatronics Jaguar Land Rover TAS Scheme (not running this year) Connected and Autonomous Vehicle Engineering (Automotive)
N-AP-AE03	Automotive Control and Simulation	Automotive Engineering	Automotive Engineering, Automotive Mechatronics
N-AP-AE05	Vehicle Dynamics	Automotive Engineering	Automotive Engineering, Automotive Mechatronics
N-AP-AM05	Vehicle Electrification and Hybridisation	Automotive Mechatronics	Automotive Engineering, Automotive Mechatronics
N-AP-AE13	Individual Research Project	Automotive Engineering	Automotive Engineering, Automotive Mechatronics Connected and Autonomous Vehicle Engineering (Automotive)

8. How are the ILOs assessed?

The following assessment types are utilised:

- In Term 1 modules 2 and 8 are assessed via written examinations that will be set early in term 2. Conversely, modules 1 and 3 will be assessed via an individual assignment. It is noteworthy that these assignments will be aligned to the respective ILOs and may include elements of computer based analysis, model development and simulation.

- The specialised modules starting in term one and through to the second term (4, 5, 6, 7) are assessed by assignment that has a computer based analysis.. As with the core modules, the nature

of the summative assignments in all cases will be constructively aligned to the respective module ILOs and may include an element of written work, oral presentation, numerical analysis and experimentation.

- Module 9, represents an extended open-ended Group Project Activity and is assessed via a combination of written and presentation

- The individual Research Project is assessed via a written thesis and oral examination.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8
1	ICW	ICW	ICW					
2	EX	EX	EX					
3	ICW	ICW	ICW					
4	ICW	ICW	ICW					
5	ICW	ICW	ICW					
6	ICW	ICW	ICW					
7	ICW	ICW	ICW					
8	EX	EX	EX					

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8
9				ICW GCW GPRES	ICW GCW GPRES	ICW		

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO7	ILO8
10	THESIS	THESIS

Award ILOs / Module No.	ILO7	ILO8
		IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The following patterns have emerged with regard to the future career paths for those graduates who have successfully studied automotive engineering:

- Continued higher education – PhD Research, both within Cranfield University or within other high ranking UK/EU Universities
- Employment within internationally leading vehicle manufacturers, including:
    - Toyota Europe (Belgium)
    - PSA (France)
    - Jaguar Cars / Land Rover (UK)
    - Bentley Motors (UK)
    - Ford (UK)
- Employment within internationally leading engineering consultancies and system suppliers to the automotive industry, including:
    - AVL (UK and Europe)
    - Ricardo Consulting Engineers (UK)
    - TRW (UK)
    - Bosch (Germany)

Graduands will typically take-up a graduate / senior engineering roles, within the respective product development or research departments of the employing organisations and which are often linked to an accelerated promotion scheme.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Autonomous Vehicle Dynamics and Control
Course code	MSAVCFTC, PDAVCFTC, PCAVCFTC
Academic Year	2022/2023
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert (PDAVCFTC, PCAVCFTC only as exit routes)
Mode of delivery	Full-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Autonomous and Cyber-Physical Systems
Course Director	Dr Argyrios Zolotas
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	NA
Is the Degree apprenticeship integrated or non-integrated?	NA
Is the Mastership offered as an open and/or closed course?	NA
Teaching Institution	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Astronautics and Cyber-Physical Systems where the research interests include:

- Autonomous Systems
- Dynamics and Control for Autonomous Systems
- Sensor Fusion
- Artificial Intelligence for Autonomous Systems
- Decision-making in Autonomous Systems
- Guidance and Navigation for Autonomous Systems
- Autonomous Systems Design and Operation

Teaching and/or assessment is conducted at the Cranfield Campus.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is accredited by the Royal Aeronautical Society (RAeS) until August 2026 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

The global market for aerial, ground, and marine Autonomous Vehicles has grown rapidly due to the advent of drones and driverless cars. Defence, Aerospace, Automotive, and Marine Industries seek graduates conversant in key aspects of Autonomy including: dynamics & control, guidance & navigation, decision making, sensor fusion, artificial intelligence, communication & and networking. These durable and transferrable skills are the bedrock of this unique MSc course whose content has been based on advice from the Industrial Advisory Board, comprising the relevant Industrial representatives from Big Primes to Small and Medium-sized Enterprises.

The Autonomous Vehicle Dynamics and Control MSc is a unique course for graduates in engineering, physics, or mathematics wishing to acquire durable and transferrable skills in Autonomous Vehicles in order to pursue career opportunities in Defence, Aerospace, Automotive, and Marine Industries. Successful graduates of our MSc course become conversant in key aspects of Autonomy which advantageously differentiates them in today's competitive employment market

The taught part of the Autonomous Vehicle Dynamics and Control MSc course comprises eight ten-credit modules, followed by a forty-credit group project. The ten-credit modules are:

1) Introduction to Unmanned Aircraft Systems (UAS)

2) UAS Dynamics and Control
3) UAS Modelling & Simulation
4) Sensor Fusion
5) Artificial Intelligence for Autonomous Systems
6) Guidance & Navigation Systems for UAS
7) Autonomous Vehicle Control Systems
8) Logic and Automated Reasoning

The linchpin of the taught part is the group project in which the students design, build and fly an unmanned aerial vehicle, thus integrating and applying the knowledge acquired in modules 1–8.

The taught part of the course is followed by Individual Research Projects (IRPs) and the topic of each of the IRPs is provided by one of the member of the Industrial Advisory Board. The real-world relevance of the IRP topics is another unique feature of our MSc course and is another effective differentiator in the job market.

Postgraduate Certificate and Postgraduate Diploma are exit routes only.

This programme is intended for the following range of students:

- Engineers wishing to apply their skills into new areas.
- Qualified engineers working with autonomous systems.
- Recent STEM graduates wishing to extend their knowledge and skills in the above areas.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Distinguish the primary engineering challenges of Unmanned Aircraft Systems (UAS) analysis and design.
ILO 2. Appreciate technology and operations of UAS.
ILO 3. Analyse, design and relate control systems and their applications to UAS.
ILO 4. Formulate, analyse and simulate dynamic models of an air vehicle.
ILO 5. Appraise and utilise fundamental guidance and navigation techniques for UAS.
ILO 6. Relate sensor fusion and situational awareness aspects in the context of autonomously operating vehicles.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 7. Examine and relate advanced control systems, and Artificial Intelligence and their applications to UAS.
ILO 8. Design, build an unmanned (aerial) vehicle concept by working in a group environment.
ILO 9. Communicate effectively, verbally or in writing, to suit a range of audiences

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 10. Exhibit independent learning by planning, conducting and critically evaluating an individual programme of extended research into some aspect of UAS.

4. How is the course taught?

The course is delivered through a combination of lectures, tutorials and hands-on lab sessions and also a group project in which the students design, build and fly an unmanned aerial vehicle, thus integrating and applying the knowledge acquired in all the other modules.

The course uses the Canvas learning environment with all materials delivered in electronic form. In addition to standard learning support facilities (library facilities, IT provision, etc), the course utilises a number of specialised facilities, namely:

- Indoor flight area for small UAS.
- Indoor lab for small / medium UAS development.
- Controlled use of the Cranfield airport for flying UAS (when required).
- Individual Research Projects are proposed by industrial partners.

Individual Research Project (IRP) topics are provided by members of the Industrial Advisory Board (IAB). Progress on the IRPs is monitored by Interim Project Reviews which also serve to improve individual communication skills. After the final thesis viva, students are given an opportunity to prepare posters summarising their IRPs and present them to the IAB.

Students who produce high-quality IRP work are encouraged (and mentored) to write a conference / journal paper for peer-review publication.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules: 1-4, 6	50
ELECTIVE MODULES:	
Module 5 or Module 7	10
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits

COMPULSORY MODULES:	
Modules: 1-8 Group Project: 9	80 40
ELECTIVE MODULES:	
N/A	
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules: 1-8 Group Project: 9 Individual Research project: 10	80 40 80
ELECTIVE MODULES:	
N/A	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
    - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Only full-time version of the course is offered and full-time students register for the course in September and are expected to complete the course within 12 calendar months.

7. Course Level Assessment Strategy[4]

To meet the course and module learning outcomes, a range of different types of summative assessments is followed, namely: written assignments and oral presentations. Furthermore, in each module, you will have the chance to get formative assessment (feedback on your work that does not count towards your final mark).

Normally, information on formative assessment will be provided by the relevant module leader. Feedback on written assignments will be given through our virtual learning environment where you will be able to access comments and marks on your work. Feedback on exams is normally provided via a feedback session by the relevant module leader. Feedback on oral presentations is normally provided in class or via written comments after the presentation

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Independent Assessment		Multi-part Assessment		Submission dates		
												Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
0	N-AVC-IN	AVDC Induction	Dr Argyrios Zolotas	10		0	N	29/09/2022	29/09/2022	30/09/2022	N/A	AO						
1	N-AVC-IUAS	Introduction to Unmanned Aircraft Systems	Dr Saba Al-Rubaye	28		10	N	03/10/2022	03/10/2022	07/10/2022	50	ICW	100				04/11/2022	Next Available date within the academic year

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment		Submission dates			
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
2	N-AVC-UASFD	UAS Dynamics & Control	Dr Argyrios Zolotas	28		10	N	17/10/2022	17/10/2022	25/10/2022	50	ICW	100				18/11/2022	Next Available date within the academic year
3	N-AVC-UASMS	UAS Modelling and Simulation	Dr Dmitry Ignatyev	28		10	N	31/10/2022	31/10/2022	07/11/2022	50	ICW	100				02/12/2022	Next Available date within the academic year
4	N-AVC-SF	Sensor Fusion	Prof Hyo-Sang Shin	28		10	Y	21/11/2022	21/11/2022	30/11/2022	50	ICW	100				06/01/2023	Next Available Date within the academic year
5	N-AVC-AIAS	Artificial Intelligence for Autonomous Systems	Dr Ivan Petrunin	28		10	Y	04/01/2023	04/01/2023	10/01/2023	50	ICW	100				03/02/2023	Next Available Date within the academic year
6	N-AVC-GNS	Guidance and Navigation for UAS	Prof Hyo-Sang Shin	28		10	Y	16/01/2023	16/01/2023	24/01/2023	50	ICW	100				17/02/2023	Next Available date within the academic year
7	N-AVC-AVCS	Autonomous Vehicle Control Systems	Dr Argyrios Zolotas	28		10	N	05/12/2022	05/12/2022	13/12/2022	50	ICW	100				20/01/2023	Next Available date within the academic year
8	N-AVC-LAR	Logic and Automated Reasoning	Dr Marta Ceccaroni	28		10	Y	30/01/2023	30/01/2023	03/02/2023	50	ICW	100				FT 09/03/2023	Next Available date within the academic year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment		Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																	PT 23/03/2023	
9	N-AVC-GDP	Autonomous Systems Group Design Project	Prof Hyo-Sang Shin	60		40	N	14/11/2022	14/11/2022	31/03/2023	50	ICW GPRES GCW	25 25 50				29/03/2023 29/03/2023 31/03/2023	Next Available date within the academic year
10	N-AVC-THESIS	Individual Research Project	Prof Antonios Tsourdos/ Dr Argyrios Zolotas	20		80	N	03/04/2023	03/04/2023	05/09/2023	50	IPRES THESIS	20 80				05/09/2023 24/08/2023	R&R within 1 year of Exam Board

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
N-AVC-LAR	Logic and Automated Reasoning	Autonomous Vehicle Dynamics and Control	Applied Artificial Intelligence
N-AVC-SF	Sensor Fusion	Autonomous Vehicle Dynamics and Control	Defence and Security Programme (Engineering Stream) Advanced Air Mobility Systems/ Centre for Autonomous and Cyberphysical Systems
N-AVC-GNS	Guidance and Navigation for UAS	Autonomous Vehicle Dynamics and Control	Defence and Security Programme (Engineering Stream) Advanced Air Mobility Systems/ Centre for Autonomous and Cyberphysical Systems
N-AVC-AIAS	Artificial Intelligence for Autonomous Systems	Autonomous Vehicle Dynamics and Control	Defence and Security Programme (Engineering Stream) Advanced Air Mobility Systems/ Centre for Autonomous and Cyberphysical Systems

8. How are the ILOs assessed?

The following assessment types are utilised:

Written coursework assignments take the form of technical reports, laboratory reports and traditional style essays. Such assignments will demonstrate skills in information retrieval, literature citation, critical evaluation and written presentation skills to suit a variety of formats and audiences. Problem solving activities will also be incorporated in such assignments. This will ensure that successful students have achieved the learning outcomes, in particular ILOs 1 to 7.

Where appropriate as part of the learning process, some modules will include an element of group work, but this will not form part of the formal assessment procedure.

The group design project is examined for the MSc by group presentation (25%), and individual presentation contribution within the group as part of it (25%), and by group coursework report (50%). Within the project, other learning outcomes will be demonstrated to have been achieved.

The research project is examined for the MSc by Thesis (80%) and by Presentation (20%). . Within the project, other learning outcomes will be demonstrated to have been achieved.

In all instances, assessment will be based on the demonstration of appropriate knowledge, an appropriate mode of presentation, interpretation within the correct context, critical discussion and the use and citation of appropriate sources of information.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. MSc

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8	ILO9	ILO10
Module 0										
Module 1	ICW	ICW								
Module 2	ICW		ICW	ICW						
Module 3	ICW		ICW	ICW						
Module 4	ICW					ICW				
Module 5	ICW					ICW	ICW			
Module 6	ICW				ICW					
Module 7	ICW		ICW				ICW			
Module 8	ICW						ICW			
Module 9								GCW GPRES ICW	GCW GPRES ICW	
Module 10									THESIS IPRES	THESIS IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality

Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The knowledge and skills the graduates gain following the successful completion of the course enables them to work in a broad range of industries and a few graduates pursue academic careers through PhD Programmes.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: April 2022

1. What is the course?

Course information

Course Title	Aviation Digital Technology Management
Course code	MSAVTFTC – MSc in Aviation Digital Technology Management (Full Time) MSAVTPTC – MSc in Aviation Digital Technology Management (Part-Time) PDAVTFTC – PgDip in Aviation Digital Technology Management (Full Time) PDAVTPTC – PgDip in Aviation Digital Technology Management (Part Time) PCAVTFTC – PgCert in Aviation Digital Technology Management (Full Time) PCAVTPTC – PgCert in Aviation Digital Technology Management (Part Time)
Academic Year	2022/23
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	N/A
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport
Centre	Integrated Vehicle Health Management (IVHM)
Course Director	Dr Ip-Shing Fan
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University Entry Requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	Full-time MSc - one year; Part-time MSc - up to three years Full-time PgDip – one year; Part-time PgDip – 2 years Full-time PgCert – one year; Part-time PgCert – 2 years
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by SATM/Transport/IVHM where the research interests include:

Integrated Vehicle Health Management;
Predictive Maintenance;
Diagnostics and Prognostics;
Maintenance Repair Overhaul (MRO) planning and operations;
Aircraft inspection - visual, drone and robotics;
Analytics: reasoning, artificial Intelligence, machine learning;
Business Scenario Planning;
Management and Information Systems;
Knowledge Management.

Cranfield University interacts with the following institutions and in the following ways:

The course Industrial Advisory Board members will provide group and research projects for students. The current membership includes Boeing, Etihad, easyJet, Marshall Aerospace, SITA, STS Aviation and Thales.

It is the ambition to engage with the CAA to explore a future partnership similar to the Cranfield Aviation Safety Management, Risk and Regulation MSc.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not currently accredited by any PSRBs.

2. What are the aims of the course?

This MSc programme aims to prepare professionals to innovate and apply digital technology in the aviation context.

Increasingly more intelligent aircraft are being introduced and point to the future of electric and hydrogen powered aircraft, autonomous flying taxis and space commercialisation. As more intelligent and conscious aircraft enters service, aircraft and support systems are also becoming more intelligent. New technology like Internet of Things, big data, AI, machine learning, robotics, AR/VR, predictive maintenance, blockchain, and many others are being introduced to the industry at an accelerating pace. Digitalisation promises significant transformation of the aviation industry. Digital technology is

fundamental to achieve sustainable aviation. While the digital technology is similar to other industrial sectors, the safety conscious and highly regulated aviation industry imposes technology adoption hurdles specific to the aerospace regulatory domain and culture. The Cranfield DARTeC initiative is building up a unique set of research and facilities to bring new technology and practice into the aviation industry.

The aviation industry is an ecosystem that includes aircraft manufacturers, airlines, airports, maintenance organisations, aftermarket services, ground handlers, lessors, air navigation services, aviation authorities, travel & tourism operators, cargo & logistics operators, training organisations and many others. This course develops the technologists, engineers and managers who shape the digital transformation of the aviation business.

The course adds the digital component to aeronautical engineering graduates. It helps graduates to expand from the design and manufacture foci of established aeronautical engineering programmes to the wider aviation industry opportunities. The course also gives the large number of non-aerospace engineering and computing graduates who aspire to enter the aviation industry a route to develop their aerospace knowledge. The course is also a career development path for aerospace engineers in industry to up their digital and innovation skill. Our graduates shall play a crucial role in integrating the language and practice of digital technology and management in the aviation industry.

The course has an Industrial Advisory Panel including senior executives from Boeing, Etihad, easyjet, Marshall Aerospace, Thales and other aviation leaders. The Panel provides guidance to the course team on the skills need and content relevance of the MSc.

This programme is intended for the following range of students:

Aeronautical graduates aspiring to add Digital in postgraduate degree

Computing and Engineering graduates aspiring to enter aviation sector employment

Engineers/managers already in the aviation sector seeking a postgraduate degree for career progression

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

- ILO 1. Differentiate the stakeholders in the aviation industry and analyse the complex dynamics of their roles in aviation management
- ILO 2. Appraise the major aircraft structure and systems and their criticality to airworthiness
- ILO 3. Assess the digital technology for aerospace inspection and maintenance
- ILO 4. Assess the digital technology for aerospace technical and business information integration
- ILO 5. Prepare a programme of digital aviation business transformation

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

- ILO 6. Critically analyse the existing academic and industrial practices in digital aviation or closely related disciplines
- ILO 7. Propose and assess ideas and methodologies to enhance and/or improve the current practices in digital aviation or closely related disciplines by means of clear communication
- ILO 8. Critically evaluate own teamworking and communication skills when working as part of a team

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Undertake independent research and critically analyse the outcome on a topic relevant to digital aviation, test ideas, formulate and present conclusions.

4. How is the course taught?

Students will be supported in their learning and personal development by:

The course design takes into account the integrative and transformation nature of the Digital Aviation domain, the unique Cranfield aviation facilities, the Cranfield Andragogy** approach to learning, the exploitation of VLE.

The MSc course consists of three weighted components: taught modules, a group project and individual research project. The project components make up 60% of the MSc.

The taught course element includes eight taught compulsory modules, generally delivered from October to February. The course taught component is delivered through a combination of Lectures, Practicals, Computer Labs, Online Content, Workshops and Group Activities. Students will receive hands-on experience accessing equipment and facilities within our IVHM and Digital MRO Laboratories and the 737 Ground Demonstrator.

The taught part of the course is followed by a Group Project (GP) and Individual Research Projects (IRPs). The GP is a full-time challenge to tackle a real industrial problem within a fixed 12-week timescale. The group of students are expected to professionally deliver working results to the sponsor at the end of the project. This learn-by-doing approach integrates the knowledge students gained in the taught modules. The collaborative project prepares students for the workplace by giving experience of: teamwork with others of differing backgrounds and expertise; project management; preparing and delivering technical presentations.

The Individual Research Project prepares students for their chosen careers. This is a programme for the student to demonstrate his/her ability to conduct original investigations, to test ideas and to obtain appropriate conclusions from the work. Our industry partners sponsor and support practical projects that meet their business needs. Research focus projects could be agreed for students seeking an academic career. For part-time students it is common that their individual project is undertaken in collaboration with their place of work.

Students are also supported in their learning and personal development through participation in: industry seminars, group poster sessions, group discussions, group presentations, video demonstrations, case studies, laboratory experiments, coursework, and project work. Students will normally receive hands-on experience accessing equipment and facilities within our IVHM Centre, Digital Aviation Research and Technology Centre and Aerospace Integration Research Centre. Members of the Industrial Advisory Panel shall provide guest lectures, project topics and participate in the Group Project and Individual Project presentations.

**Andragogy is the science underpinning teaching of adults, or adult learning theory and how we can ensure that can happen. The course design incorporates the 'Four principles' of adult learning:
. learners must be involved in the planning and evaluation of their learning;
. experience gathered through instruction and activities must be integral;
. learning must have immediate impact and real-life relevance to the learner;
. learning is problem-centred rather than content driven - give learners opportunity to absorb information.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction (module 0) Modules 1, 2, 3, 4	0 40
ELECTIVE MODULES:	
2 modules from 5, 6, 7, 8	20
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Induction (module 0) Modules 1-8 Group Project (9)	0 80 40
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Induction (Module 0) Modules 1-8 Group Project (9) Individual Research Project (Module 10)	0 80 40 80
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months.

Part-time students register for the course in September and are expected to complete the course within 3 years.

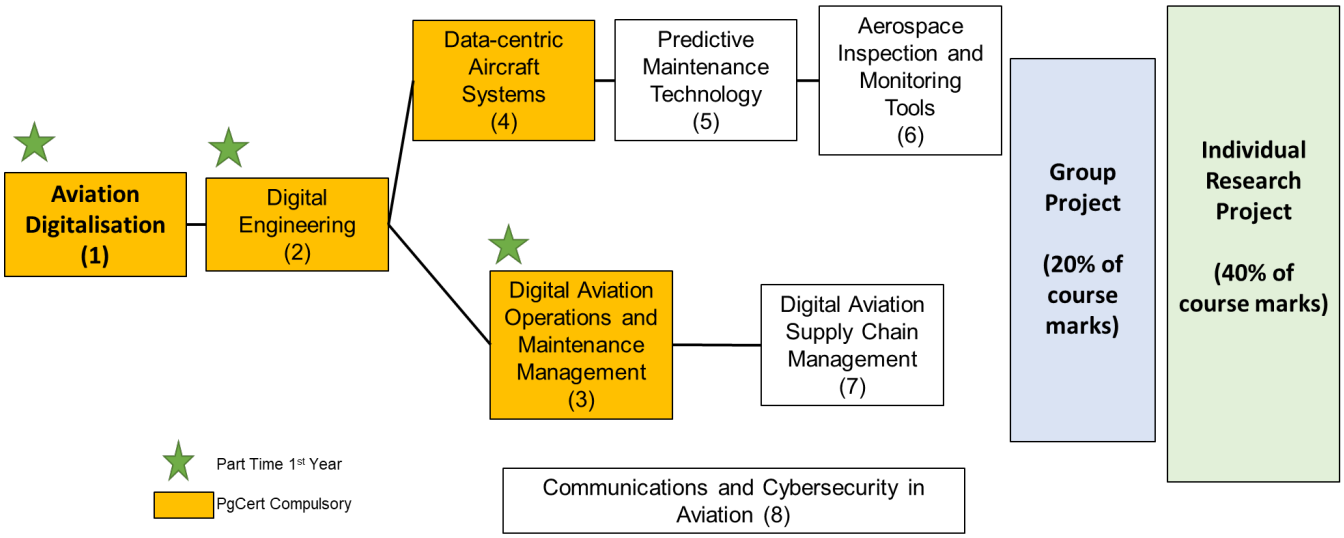
The course structure follows the same pattern as most of the technical MSc's in SATM.

Between October and January, the eight 10-credit modules are delivered following a typical SATM model. The content delivery is organised as one week contact time followed by private study time to complete the assessments. Pre-work and post-work are incorporated as appropriate. Private study weeks are spaced through the October to January period.

The learning journey support students in two complementary digital career directions: a technical direction to add cyber-physical capability to automate aircraft and facilities operations; and an informatics direction to focus on the management and exploitation of the large volume of aviation data. The taught modules build the components for progression to the projects. The Aviation Digitalisation Module establishes the foundation of the aviation industrial ecosystem. The Digital Engineering and the Data-Centric Aircraft Systems Modules together build the technical basis of intelligent aviation. The Predictive

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

Maintenance Technology and the Aerospace Inspection and Monitoring Tools modules covers the technology for digitalisation of the aviation asset operations and maintenance. The Digital Aviation Operations and Maintenance Management and the Digital Aviation Supply Chain Management modules bring together the internal and external views of aviation management. The Communications and Cybersecurity in Aviation module covers the secure communication needed in all aspects of technology and operations. The pre-requisite module path is illustrated in the diagram.



The Group Project takes place between February and April. Part time students complete their Group Project between February to August. Please see the module table for hand in dates.

The Individual Research Project runs from May until August. Please see the module table for hand in dates.

The maximum registration for part time students is three years. The preferred path for part-time students is to complete modules 0,1,2,4 and one additional taught module, and the group project during the first year. The Course Director discusses with each student to recommend the learning choices most appropriate to the student's background and career interest. In the second year, the student completes the rest of the taught modules and the Individual Research Project. Students who need to pace the study over three years agree with the Course Director an appropriate learning path.

7. Course Level Assessment Strategy[4]

The course uses a range of assessment types that are challenging and enable the students to develop and demonstrate a range of skills. Students can expect to have individual and group coursework assessments, individual and group projects, and finally individual and group presentations. This approach has been adopted in order to provide the student with a balanced mix of theory, application and development of soft skills.

Modules 1, 3 and 4 introduce students to digital aviation and will be assessed through essays and reports. These will be of varying lengths, recognising that writing articles to a short length can be more challenging for some and can develop different skills relevant to professional practice. The length of each assessment task is clearly stated within the module descriptor. Students will write employability relevant case reports and plans to equip them with the skills they require to succeed in aviation digital technology management and to address the specific award ILO5, 6 and 7. Students then have opportunities to develop their communication skills, as they are required to give a group presentation and individual presentation.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

The ability to work effectively in groups is a highly desirable skill which has translated into ILO 8. Feedback is given immediately after the group presentation.

Modules 1, 3 and 7 are supported by a number of formative tasks including group discussion, case studies, oral presentations. Formative feedback is given verbally by the teaching team and peers.

For Modules 2, 5, 6 and 7, peer review informs practice and tutorials guide progress, students are generally encouraged to support each other by asking and answering questions via the VLE.

The taught components precede the research project, so assessment can be used to develop skills required for the individual research project. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through regular supervision meetings. The research project addresses ILO 9 and takes the form of a Thesis.

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
0	N-AVT-IND	Induction	Dr Ip-Shing Fan	15	0	0	N	03/10/22	03/10/22	07/10/22	n/a	AO					N/A	N/A
1	N-AVT-AD	Aviation Digitalisation	Dr Ip-Shing Fan	32		10	N	10/10/22	10/10/22	14/10/22	50	ICW	100				FT 28/10/22 PT 11/11/22	05/23
2	I-GPD-A1507	Digital Engineering	Professor John Erkoyuncu	32		10	N	17/10/22	17/10/22	21/10/22	50	GCW	100				FT 18/11/22 PT 02/12/22	05/23

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education.
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3	N-AVT-DAOM	Digital Aviation Operations and Maintenance Management	Dr Ip-Shing Fan	32		10	N	31/10/22	31/10/22	04/11/22	50	ICW	100				FT 25/11/22 PT 09/12/22	05/23
4	N-AVT-DCAS	Data-centric Aircraft Systems	Dr Suresh Perinpanayagam	32		10	Y	07/11/22	07/11/22	11/11/22	50	ICW	100				FT 09/12/22 PT 15/12/22	05/23
5	N-AVT-PMT	Predictive Maintenance Technology	Professor Nico Avdelidis	32		10	N	28/11/22	28/11/22	02/12/22	50	ICW	100				FT 06/01/23 PT 20/01/23	05/23
6	N-AVT-AIMT	Aerospace Inspection and Monitoring Tools	Professor Nico Avdelidis	32		10	N	12/12/22	12/12/22	16/12/22	50	ICW	100				FT 27/01/23 PT 10/02/23	05/23
7	N-AVT-DASC	Digital Aviation Supply Chain Management	Dr Ip-Shing Fan	32		10	N	09/01/23	09/01/23	13/01/23	50	ICW	100				FT 03/02/23 PT 17/02/23	05/23
8	N-AVT-CCA	Communications and Cybersecurity in Aviation	Dr Mohammad Samie	32		10	N	16/01/23	16/01/23	20/01/23	50	ICW	100				FT 10/02/23 PT 24/02/23	05/23
9	N-AVT-GP	Group Project	Dr Ip-Shing Fan	30		40	N	01/02/23	01/02/23	28/04/23	50	GCW GPRES ICW	64% 16% 20%				FT 28/04/23	At the next available opportunity which may not

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																	PT 18/08/23	be until the course runs the following year
10	N-AVT-THES	Individual Research Project	Dr Suresh Perinpanayagam	20		80	N	FT 01/05/23 PT 01/02/23	FT 01/05/23 PT 01/02/23	30/08/23	50	THESIS IPRES	90% 10%				FT 30/08/23	As recommended by the Board of Examiners

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
I-GPD-A1507	Digital Engineering	GPDM	Global Product Development and Management Aviation Digital Technology Management

8. How are the ILOs assessed?

The following assessment types are utilised:

The Coursework assessments match the nature of the module. Modules 1, 3 and 7 are essays of research applied to representative business cases. Modules 2, 4, 5, 6, 8 are reports of simulation or practical work.

The group project has a combination of group and individual assessments to ensure each student fully participate and contribute to the group work, and also have personal accountability.

The individual research project is assessed through the thesis and oral presentation.

This approach has been adopted because:

It allows the students demonstrate their understanding through a wide range of learning techniques, but are not disadvantaged through any one approach.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / **Module No.**	ILO1	ILO2	ILO3	ILO4	ILO5
1	ICW	ICW		ICW	ICW
2			GCW	GCW	
3	ICW	ICW	ICW	ICW	ICW
4		ICW	ICW	ICW	
5		ICW	ICW	ICW	
6		ICW	ICW	ICW	
7	ICW	ICW		ICW	ICW
8	ICW	ICW			ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO6	ILO7	ILO8
9	GPRES GCW ICW	GPRES GCW ICW	GPRES GCW ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO9
10	THESIS IPES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
None	None	N/A	N/A

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The Industrial Advisory Panel provide advice and networking opportunities for students to engage with the aviation industry.

New Job Roles

- Technologists

Existing Job Roles – accelerate talent intakes with digital mindset and skills

- Aircraft (Airlines, MROs, parts suppliers, leasing, insurance and finance)
- Maintenance manager, and planners
- Operations and Engineering – Continuous Airworthiness Maintenance Organisation, reliability engineering, Aircraft-On-Ground, crew, communications etc
- Airport (Ground Operations, Engineering, Facilities, Security, IT, etc
- Aircraft services
- Air Navigation Services
- Aviation Authorities
- Space ports and operations

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Aviation Safety Management, Risk and Regulation
Course code	MSASRPTC MSc in Aviation Safety Management, Risk and Regulation MSASRPAC Apprenticeship in Aviation Safety Management, Risk and Regulation PDASRPTC PgDip in Aviation Safety Management, Risk and Regulation PCASRPTC PgCert in Aviation Safety Management, Risk and Regulation
Academic Year	2022/23
Valid entry routes	MSc, PGDip, PGCert
Additional exit routes	N/A
Mode of delivery	Part-time online delivery
Location(s)[1] of Study	Online
School(s)	SATM
Theme	Transport Systems
Centre	Cranfield Safety and Accident Investigation Centre
Course Director	Dr David Barry
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	Yes
Apprenticeship Standard the course is mapped to	Risk and Safety Management Professional
Is the Degree apprenticeship integrated or non-integrated?	Non-integrated

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Mastership offered as an open and/or closed course?	Open course
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	**enter here – NOTE: where PG-level subject benchmark statements exist, you should benchmark against these**
Registration Period(s) available	3 years (MSc), 2 years (PGDip), two years (PGCert)
Course Start Month(s)	January

Institutions delivering the course

This course is delivered by School of Aerospace, Transport and Manufacturing, Transport Systems Theme, Centre for Safety and Accident Investigation where the research interests include:

Aviation Safety Management
Accident Investigation
Aircraft Maintenance
Risk Analysis
Safety Leadership
Human Factors

Cranfield University interacts with the following institutions and in the following ways:

Civil Aviation Authority - through the provision of lecturing staff as part of each module

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2. What are the aims of the course?

Cranfield University offers this course in order to provide a spectrum of technical knowledge in the context of safety, risk and regulation in aviation. This is a background that staff at many levels in today's aerospace industry must possess. A detailed knowledge of safety issues before and during operations, design, modification, repair helps all aspects of business operation and enables a better balance to be struck between cost and safety. Specifically, the course aims to:

- Provide a globally unique course that relates the regulatory background of all aspects of safety in the operations, production and maintenance of aircraft.
- Promote excellence in risk and safety management via a M level course that forms part of a high technology Mastership programme in safety, risk and regulation.
- Promote safety management and performance-based regulatory practice within UK and world-wide industry and government agencies.

A Postgraduate Diploma (PgDip) entry route is provided for students who wish to access only part of the course provided. It is also suggested that the latter qualification may be more appropriate for staff who have no need for a separate research project.

There is also a Postgraduate Certificate (PGCert) entry route for those who wish to access a specific part of the course - two taught modules and short group project.

This programme is intended for the following range of students:

- Staff from airlines, Air Navigation Service Providers, airports, manufacturers and other parts of the aviation sector, both operations and engineering.
- Licensed engineers in aviation industry
- Staff in regulatory authorities with responsibility for all aspects of aviation safety

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Critically assess the principles and practice of risk management, including the application of safety management systems.
ILO 2. Evaluate the various approaches to regulatory practice and be able to assess the effectiveness of different oversight strategies used in aviation system.
ILO 3. Analyse, evaluate and formulate safety information to generate safety intelligence and communicate with different audiences.
ILO 4. Develop transferable communication skills through teamwork, written assignments and presentations to enhance their ability to influence the industry in safety regulation.

B. Postgraduate Diploma

In addition to the intended learning outcomes above, a diligent student would also be expected to:

ILO 5. Evaluate the influence of sociotechnical risk factors on the wider aviation system including human factors and management and be able to propose mitigation strategies.
ILO 6. Apply and appraise techniques for safety assurance in new and existing areas of emerging technologies and threats and develop where necessary.

C. MSc

In addition to the intended learning outcomes above, a diligent student would also be expected to:

ILO 7. Undertake independent research on a topic relevant to safety, risk and regulation in the aviation sector.

4. How is the course taught?

Students will be supported in their learning and personal development in various ways, which will include formative assessment for all modules. Delivery will be via on-line learning and use of a virtual learning environment. Most modules will be taught live on-line, supplemented with recorded material for students to work through when convenient. The course will be taught by a mixture of:

- Lectures from Cranfield, UK CAA and external speakers with relevant expertise for each module
- Problem-based learning may be used where appropriate
- Access to library resources

- Use of class exercises (including group work) to help develop knowledge and techniques in the field.
- Conducting individual research project in a commercial organisation to provide "real-life" environment

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where one credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2 Managing Current Safety Issues	50 10
ELECTIVE MODULES:	
N/A	
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 4 Managing Current Safety Issues Managing Emerging Safety Issues	80 10 30
ELECTIVE MODULES:	
N/A	
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules 1, 2, 3, 4 Managing Current Safety Issues Managing Emerging Safety Issues IRP	80 10 30 80

ELECTIVE MODULES:	
N/A	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
    - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
    - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
    - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Part-time students register for the course in January and are expected to complete the course within three years.

Each module is made up of a series of components which comprises of remote learning and or live digital delivery. The modules will therefore be a mixture of contact time interspersed by periods of self-directed

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

learning and on-line group work. Modules 1, 2 and Group Project 1 should be taken in Year 1. Module 1 is 30 credits and comprises of 13 days of live teaching, supplemented with recorded content, over two months. Module 2 (20 credits) is 8 days of live teaching over the course of one month, with additional off-line activities and recorded content. Group Project 1 - Managing Current Safety Issues – is spread over a period of four to five months (not continuous).

Modules 3, 4 and Group Project 2 should normally be taken in Year 2. Module 3 is a 10 credit, one-week module and Module 4 (20 credits) is 4 elements spread over 3 months. Group Project 2 - Managing Emerging Safety Issues - is spread over six months. In Year 3, each student will conduct their own Individual Research Project, which will be supervised by an appropriate member of staff. During this period there will be supervision meetings and training in research methods as required.

This MSc course differs from the normal system of 10 credit modules. The reasoning behind making three taught modules greater than the normal 10 credits was to offer a greater range and depth of understanding the subjects, making the modules more immersive. All modules (except M3 – existing module) are based on new and limited existing material. Module 5 (10 credits) and module 6 (30 credits) are both research modules.

The structure strongly promotes group work, with projects in both of the first two years. This provides an invaluable experience for the students not only on the MSc route but also on PGDip and PGCert exit routes. All students will experience working on group projects to develop their communication, team work and project management skills. This is one of the reasons that makes this MSc course appealing to a wide audience.

In summary, what makes this course **innovative, different, unique and flexible**:

- **(Innovative + Different)** Taught modules and group project modules have a variability of credits enabling more flexibility and enhanced depth of knowledge
- **(Innovative + Different)** Two group projects, each in the second half of each academic year (gives opportunity to students on PGDip and PGCert to gain experience in group projects)
- **(Flexible)** Delivered via a variety of modes: on-site face-to-face teaching, online live streaming of classes and pre-recorded material - this gives part-time students more flexibility and ability to time manage themselves
- **(Unique)** Developed and delivered in partnership with the UK Civil Aviation Authority
- **(Flexible)** Clear structure of the course providing part-time students with easy-to-follow structure of the course and modules – clarity on which module to take when. This addresses one of the identified challenges on some of the current MSc courses where student can pick and choose which module to take when, but no advice is available on the preferred order of the modules which could benefit the overall outcome of their study

The course is intended to explain the background theory to safety and risk in aviation, with a particular focus on regulation. The University's aviation operations will be used as a *Living Laboratory* providing case studies and real-life examples to supplement teaching. This will likely involve the Remote Tower facility, National Flying Laboratory, Accident Investigation Centre and Boeing 737. Using these facilities in teaching is something that the Safety and Accident Investigation Centre has a great deal of experience with and serve to enhance the learning experience. The new course is related to other MSc courses as shown in the figure on page 7.

7. Course Level Assessment Strategy[4]

The ILOs of the course have been developed in consultation with the teaching team and potential industry recipients of the course. The process has also been informed by the Apprenticeship Standard for *Risk*

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

and Safety Management Professional. The latter contains a large number of aspects relating to Knowledge, Skills and Behaviours, many of which may also be met by the MSc. Each module will consist of an initial part of declarative knowledge but will also facilitate the development of functioning knowledge for each student. Each and every module (except Module 0) will feature formative feedback as well as summative assessment, which will be diverse in nature and appropriate to the learning outcomes.

The ILOs of each module are linked to the teaching activities in order to meet the assessment. ILOs 1 and 2 cover the fundamentals of risk, safety management and regulation, and the assessment types are diverse in order to give some variety. Both Modules 1 and 2 feature individual coursework in order to test the ability to construct a written argument and meet the requirements of the course. Presentation skills are also assessed as these are vital in the communication of safety and risk in society. ILO3 is covered throughout the course. The first Group Project (MCSI) will also assess the ability to work within a team environment.

ILOs 4 and 5 will look more deeply into sociotechnical risk factors in aviation as well as techniques for safety assurance. ILO 4 is assessed by a blend of individual coursework and a Reflective Portfolio in Module 4 and via Group work in the second Group project (MESI). The latter is also used to assess ILO5 in addition to the module in Aircraft Accident Investigation and Response (Module 3).

The research aspect of the course is described by ILO6 and assessed by the IRP. A large part of this comprises a written thesis which will address some aspect of safety, risk management and regulation. As oral presentation skills are also vital, the viva will also be assessed to meet ILO6.

Figure 1 shows the interconnection between other related courses in the Centres for Safety & Accident Investigation and Air Transport. MSc in Aviation Safety Management, Risk and Regulation has some common themes with other safety-related and transport industry courses, and some of these are shown. However, the course is unique in its presentation of the role of the regulatory authority and how regulation permeates all aspects within the industry. This includes many aspects of risk and safety management, which makes an excellent fit with the Apprenticeship standard.

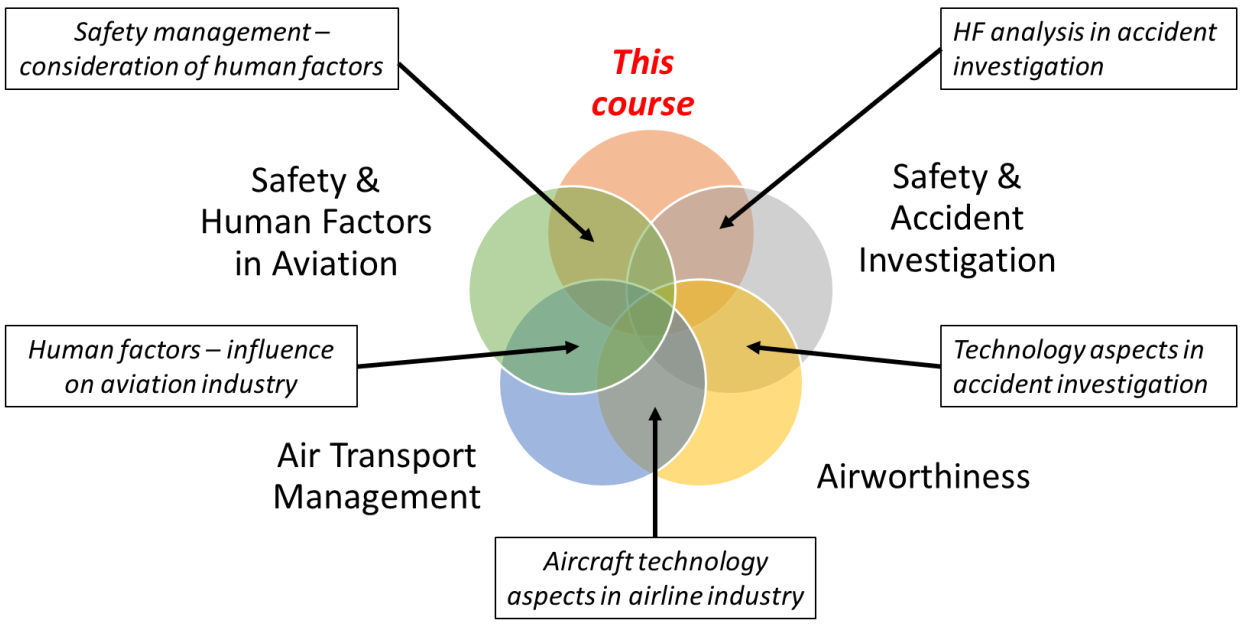


Figure 1 – Connections between related MSc courses within Transport Theme

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
M0	N-ASR-	ASMRR Induction	Dr D Barry	8	0	0	N	16/01/23	16/01/23	16/01/23	N/A	AO					N/A		

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
	IND Occ A22																	
M1	N-ASR-ASRM Occ A22	Advanced Safety and Risk Management	Dr D Barry	100		30	N	19/01/23	19/01/23	09/02/23	50% 50%	ICW IPRES	80% 20%				11/04/23 11/04/23	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
M2	N-ASR-ALRA Occ A22	Aviation Legislation & Regulatory Approach	C Turkoglu	50		20	N	04/05/23	04/05/23	24/05/23	50% 50%	ICW IPRES	70% 30%				24/07/23 09/06/23	At the next available opportunity which may not be until the course runs the following year
M3	N-HFS-AAI	Aircraft Accident Investigation and Response	Alan Parmenter	30		10	Y	22/04/24	22/04/24	26/04/24	50%	ICW	100%				24/06/24	At the next available opportunity which

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
	Occ B23																	may not be until the course runs the following year
M4	N-ASR-RRSS Occ A23	Responding to Risk in Sociotechnical Systems	Dr C Pilbeam	50		20	N	24/01/24	24/01/24	25/03/24	50% 50%	ICW RP	80% 20%				20/05/24 20/05/24	At the next available opportunity which may not be until the course runs the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
																		following year
MCSI (GP1)	N-ASR-MCSI Occ A23	Managing Current Safety Issues	C Turkoglu, Dr Abdul Abushalla	20	0	10	N	31/08/23	31/08/23	15/12/23	50%	GPRES	100%				26/02/24	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
MESI (GP2)	N-ASR-MESI Occ A23	Managing Emerging Safety Issues	C Turkoglu, Dr Abdul Abushalla	40	0	30	N	30/04/24	30/04/24	28/11/24	50% 50% 50%	GCW ICW GPRES	50% 30% 20%				03/02/24 09/02/24 16/02/24	At the next available opportunity which may not be until the course runs the following year
IRP	N-ASR-THESI	Individual Research Project	Dr D Barry	40	0	80	N	06/01/25	06/01/25	08/12/25	50%	THESIS	100%				08/12/25	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
	S Occ A24																		

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-HFS-AAI	Aircraft Accident Investigation and Response	Safety & Human Factors in Aviation	Airworthiness Forensic Engineering and Science Military Aerospace and Airworthiness Aviation Safety Management, Risk and Regulation

8. How are the ILOs assessed?

The whole MSc is expected to be completed in three years and the complete apprenticeship within 3.5 years (3-6 months following completion of the MSc). The PGCert is expected to be completed in one year and PGDip in two years.

Each module has summative individual assessment which needs to be completed within 8 weeks after the end of the corresponding module. Marks and formal feedback are expected to be available to the students within 4 weeks from the submission deadline.

The following assessment types are used:

- Individual course work
- Reflective portfolio
- Group presentation
- Individual presentation
- Group report
- Thesis for Individual research project
- Oral examination

This approach has been adopted because:

The MSc in Aviation Safety Management, Risk and Regulation has **three** distinct but interrelated elements: the Taught Modules, Group Projects and Thesis (Individual Research Project). Modules are assessed by a variety of methods, including written assignments, presentations, reflective portfolio and (in the case of the thesis) an oral examination, or viva.

The post-Module assessments are set to be challenging and to require the student to study the module topic areas in more depth, in particular the links between risk, safety management and regulatory practice. The objectives of the assignments are for the students to:

- Acquire the skill to efficiently search literature
- Apply skills and knowledge to assess the regulatory aspects within operations and engineering
- Develop the power to critically analyse data
- Compile succinct and informative reports to a high standard
- Formulate responses to specific questions against a time limit

Students are subject to two forms of assessment with regard to the group projects. Firstly, they must submit group coursework and secondly, their group project oral presentation is also assessed. In the latter form of assessment, each presentation is judged on how well their presentation is organised, the quality of their individual presentations and visual aids and how well they are able to answer questions from the audience. Both forms of assessment have an equal weighting with regard to the module mark.

The thesis is assessed using a combination of their written work and an oral poster presentation. The oral presentations are judged on the basis of the quality of the presentation in terms of content and visual aids, how well the key findings and other important elements of the research has been communicated and how well the student has responded to questions from the audience

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs. (Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / **Module No.**	ILO1	ILO2	ILO3	ILO4
M1	ICW IPRES	ICW	ICW IPRES	IPRES
M2	ICW IPRES	ICW IPRES	ICW IPRES	IPRES
Managing Current Safety Issues	GPRES	GPRES	GPRES	GPRES

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / **Module No.**	ILO5	ILO6
M3 – N-HFS-AAI		ICW
M4	ICW RP	
Managing Emerging Safety Issues	GCW ICW GPRES	GCW ICW GPRES

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / **Module No.**	ILO7
IRP	THESIS

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.

2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Most students will already be in full-time employment at the time of attending the course. However the MSc prepares them for a higher level of responsibility in a variety of areas. The course has a unique blend of subjects covering the varied topics within risk and safety management, which will have a huge benefit for people within all aviation sectors. It is therefore entirely possible that the course will enable people to take on additional responsibility and/or transition to other areas within aviation.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: 02/03/2023

1. What is the course?

Course information

Course Title	Battlespace Technology (BTC17)
Course code	MSBTCPTR - PDBTCPTR
Academic Year	2022-23
Valid entry routes	MSc, PgDip
Additional exit routes	PgDip
Mode of delivery	Part-time
Location(s)[1] of Study	Shrivenham
School(s)	Cranfield Defence and Security
Theme	Defence and Security
Centre	
Course Director	Mr Nick Manners
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	Yes
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University academic entry requirements

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

UK Qualifications Framework Level	QAA FHEQ level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	A student who registers for the PgDip will have a registration period of 4 years and for the MSc, 5 years.
Course Start Month(s)	April

Institutions delivering the course

This course is delivered by Cranfield Defence and Security where the research interests include a wide range of Defence related topics. The military context of the taught material is reinforced by experienced Military Directing Staff and visiting lecturers including experts from industry, research establishments and Government departments, particularly MoD.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2. What are the aims of the course?

Cranfield University offers this course in order to:

Provide a broad understanding of fundamental technologies, their acquisition and support, and a deeper understanding of a particular sub-set of battlespace technologies and capability integration, to enable graduates to contribute most effectively to the delivery of defence capability.

The Postgraduate Diploma (PgDip) exit route is provided for students who do not wish to undertake a research project on successful completion of the taught phase of the course.

This programme is intended mainly for selected non-specialist UK Army Officers.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Diploma

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Critically evaluate relevant fundamental technologies under-pinning defence equipment capability and their integration in weapon and vehicle systems

ILO 2. Analyse the role of information technologies in enhancing operational effectiveness

ILO 3. Think conceptually within a defined area of battlespace technology

ILO 4. Critically evaluate the role of systems engineering and project management in defence acquisition and equipment support

ILO 5. Analyse and critically compare potential solutions to meet a capability requirement within a particular area of battlespace technology

ILO 6. Communicate technical information and critical deduction effectively both orally and in writing

ILO 7. Establish clear aims, objectives and specifications and work to agreed timelines and milestones

ILO 8. Critically apply appropriate methods, tools, techniques, processes and knowledge in tackling and solving problems.

ILO 9. Play an effective part as a member of a project team in the formulation and communication of a design solution to a system requirement

B. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 10. Independently plan, manage and undertake an appropriate defence related research project.

ILO 11. Acquire, analyse, critically evaluate, synthesise and correctly reference information relating to a specific project topic.

ILO 12 Defend the research approach, arguments and conclusions.

4. How is the course taught?

Students will be supported in their learning and personal development by some or all of the following methods using a blended learning approach:

- lectures, tutorials and practical demonstrations
- independent and group research exercises
- technical investigations
- presentations to and from their peers
- small group and whole class guided discussions
- guidance from experienced Military Directing Staff
- visits to industry and MoD establishments
- learning and teaching resources and course material on the Virtual Learning Environment

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 7. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Diploma

The accumulation of 120 credits through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Module 1 - Introduction to Battlespace Technologies Module 11 - Defence Acquisition and Project Management Module 12 - Fundamentals of Information Systems and Technologies Module 13 - Capability Integration	20 20 10 30
ELECTIVE MODULES:	
Four from modules 3-10 or module 2 plus two from modules 5, 8, 9 and 10 2. Defence Modelling and Simulation (Sim ET) 3. Mobility (Battlespace Manoeuvre Stream) 4. Communication Infrastructure (Information Manoeuvre Stream) 5. Precision Attack (Battlespace Manoeuvre Stream) 6. Sensor Systems (Information Manoeuvre Stream) 7. Lethality (Battlespace Manoeuvre Stream) 8. Network Infrastructure (Information Manoeuvre Stream) 9. Survivability (Battlespace Manoeuvre Stream) 10. Cyber & Electromagnetic Activities (Information Manoeuvre Stream)	40
TOTAL:	**120**

B. MSc

The accumulation of 200 credits through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Module 1 - Introduction to Battlespace Technologies Module 11 - Defence Acquisition and Project Management Module 12 - Fundamentals of Information Systems and Technologies Module 13 - Capability Integration Module 14 - Project	20 20 10 30 80
ELECTIVE MODULES:	
Four from modules 3-10 or module 2 plus two from modules 5, 8, 9 and 10 2. Defence Modelling and Simulation (Sim ET) 3. Mobility (Battlespace Manoeuvre Stream) 4. Communication Infrastructure (Information Manoeuvre Stream) 5. Precision Attack (Battlespace Manoeuvre Stream) 6. Sensor Systems (Information Manoeuvre Stream) 7. Lethality (Battlespace Manoeuvre Stream)	40

8. Network Infrastructure (Information Manoeuvre Stream) 9. Survivability (Battlespace Manoeuvre Stream) 10. Cyber & Electromagnetic Activities (Information Manoeuvre Stream)	
TOTAL:	**200**

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Students start the BTC in April and normally complete the residential, taught phase of the course (PgDip) by the end of December, before starting their Staff Course in January.

Students wishing to complete the MSc are normally expected to complete the research project during their two-year BTC related employment posting.

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

7. Course Level Assessment Strategy[4]

The BTC is assessed through a variety of methods and provides formative feedback to enable students to develop learning and relevant skills throughout the course.

The modules at the start and end of the taught phase of the course are assessed through group exercises, where students need to work effectively as part of a small team. This helps develop skills relevant to many working environments beyond the course. Each team produces a data pack/portfolio for the exercise and explains its solution to the requirement during a presentation. The individual members of the team are then asked questions on their work.

The other modules in the taught phase of the course are all individual assessments through written coursework, an individual presentation or questions and answers. Assessed tasks require independent research and critical evaluation, which helps the students further develop some of the necessary skills in preparation for the independent research phase of the MSc.

The research phase of the course is assessed through completion of an individual research project and submission of a thesis.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments[9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	R-BT-IBT	Introduction to Battlespace Technologies A22	Nick Manners	120		20	N	26/04/23	26/04/23	09/06/23	40	GCW	100				06/06/23	Arranged as required
12	R-BT-ECN	Fundamentals of Information Systems and Technologies A22	Simon Renfrey	65		10	N	12/06/23	12/06/23	30/06/23	40	ICW	100				10/07/23	Arranged as required

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
2	R-BT-MS	Defence Modelling and Simulation (Sim ET) A23	Jonathan Searle	165		20	Y	29/08/23	29/08/23	29/09/23	50 50	OR ICW	50 50				29/09/23 09/10/23	Arranged as required
3	R-BT-BM(M)	Mobility (Battlespace Manoeuvre Stream) A23	Gareth Appleby-Thomas	50		10	N	31/07/23	29/08/23	08/09/23	50	ICW	100				02/10/23	Arranged as required
4	R-BT-IS(CI)	Communication Infrastructure (Information Manoeuvre Stream) A23	Peter Barker	45		10	N	29/08/23	29/08/23	08/09/23	50	IPRES	100				26/09/23	Arranged as required
7	R-BT-BM(L)	Lethality (Battlespace Manoeuvre Stream) A23	Hugh Goyder	45		10	N	11/09/23	11/09/23	22/09/23	50	ICW	100				02/10/23	Arranged as required
6	R-BT-IS(SS)	Sensor Systems (Information Manoeuvre Stream) A23	David James	47		10	N	31/07/23	11/09/23	22/09/23	50	ICW	100				02/10/23	Arranged as required

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
5	R-BT-BM(PA)	Precision Attack (Battlespace Manoeuvre Stream) A23	David Galvao Wall	50		10	N	02/10/23	02/10/23	13/10/23	50	ICW	100				06/11/23	Arranged as required
8	R-BT-IS(NI)	Network Infrastructure (Information Manoeuvre Stream) A23	Philip Nobles	45		10	N	02/10/23	02/10/23	13/10/23	50	ICW	100				06/11/23	Arranged as required
9	R-BT-BM(S)	Survivability (Battlespace Manoeuvre Stream) A23	Gareth Appleby-Thomas	55		10	N	31/07/23	16/10/23	27/10/23	50	ICW	100				06/11/23	Arranged as required
10	R-BT-IS(CS)	Cyber and Electromagnetic Activities (Information Manoeuvre Stream) A23	Daniel Clarke	45		10	N	16/10/23	16/10/23	27/10/23	50	ICW	100				06/11/23	Arranged as required
11	R-BT-DAPM	Defence Acquisition and Project Management A22	Pete Ito	125		20	N	03/07/23	03/07/23	28/07/23	40	ICW1 ICW2	50 50				07/08/23 07/08/23	Arranged as required

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
13	R-BT-CI	Capability Integration A23	Kieran Holling	120		30	N	06/11/23	06/11/23	15/12/23	50 50	GCW GPRES	50 50				08/12/23 12-14/12/23	Next occurrence of module
14	R-BT-THESIS	Thesis	Nick Manners	20		80	N		01/01/23 01/08/23 01/01/24 01/08/24 01/01/25 01/08/25 01/01/26 01/08/26	31/07/24 13/01/25 31/07/25 13/01/26 31/07/26 13/01/27 31/07/27 13/01/28	50	THESIS	100			B22 A23 B23 A24 B24 A25 B25 A26	31/07/24 13/01/25 31/07/25 13/01/26 31/07/26 13/01/27 31/07/27 13/01/28	Arranged as required

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
R-BT-MS	Defence Modelling & Simulation	Simulation Employment Training (Sim ET)	Simulation Employment Training (Sim ET)

8. How are the ILOs assessed?

The following assessment types are utilised:

Modules are assessed through a variety of types of written coursework, presentations, or a weighted combination.
The Capability Integration team project, which brings together the core elements of the course in a realistic acquisition exercise, is assessed through a portfolio of evidence consistent with the guidelines for capability management within defence acquisition plus presentations with Q&A.
The MSc research project is assessed through the project execution and a written thesis.

This approach has been adopted in order that the individual elements of the course can be assessed by the most appropriate method but also that the students can demonstrate their learning in a number of different ways.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Diploma

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5	ILO 6	ILO 7	ILO 8	ILO 9
1 IBT	GCW					GCW	GCW	GCW	GCW
2 M&S			OR & ICW		OR & ICW	OR & ICW	OR & ICW	OR & ICW	
3 Mob	ICW		ICW		ICW	ICW	ICW	ICW	
4 CI	IPRES	IPRES	IPRES		IPRES	IPRES	IPRES	IPRES	
5 PA	ICW		ICW		ICW	ICW	ICW	ICW	
6 SS	ICW	ICW	ICW		ICW	ICW	ICW	ICW	
7 Leth	ICW		ICW		ICW	ICW	ICW	ICW	
8 NI	ICW	ICW	ICW		ICW	ICW	ICW	ICW	
9 Surv	ICW		ICW		ICW	ICW	ICW	ICW	
10 CEMA	ICW	ICW	ICW		ICW	ICW	ICW	ICW	
11 DAPM				ICW1&2		ICW1&2	ICW1&2	ICW1&2	
12 FIST	ICW	ICW	ICW			ICW	ICW	ICW	
13 Cap Int	GCW		GCW	GCW	GCW	GCW	GCW	GCW	GCW

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5	ILO 6	ILO 7	ILO 8	ILO 9
	GPRES		GPRES	GPRES	GPRES	GPRES	GPRES	GPRES	GPRES

B. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4	ILO 5	ILO 6	ILO 7	ILO 8	ILO 9
14 Project			THESIS		THESIS	THESIS	THESIS	THESIS	
	ILO 10	ILO 11	ILO 12						
14 Project	THESIS	THESIS	THESIS						

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.

2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Students on this course are sponsored by their employer and have been selected for specific employment posts within the MOD or Defence related establishments.

POSTGRADUATE AWARD BEARING COURSE SPECIFICATION

Cranfield University: Postgraduate Award Bearing Course Specifications
Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision:	May 2022

1. What is the course?

Course information

Course Title	MSc Business and Management
Course code	PAB01PTC PgAward Business and Management: Leadership and Organisational Behaviour PAB02PTC PgAward Business and Management: Strategic Management PAB03PTC PgAward Business and Management: Economics and Finance PAB04PTC PgAward Business and Management: Strategic Marketing and Sales PAB05PTC PgAward Business and Management: Organisational Transformation and Design PAB06PTC PgAward Business and Management: Procurement and Supply Chain Management PAB07PTC PgAward Business and Management: Project and Performance Management PAB08PTC PgAward Business and Management: Leading Organisational Resilience
Academic Year	2022-2023
Valid entry routes	PgAward (students cannot register initially for the PgCert, PgDip or MSc)
Additional exit routes	PgAward; PgCert; PgDip; MSc
Mode of delivery	Part-time
Location(s)[1] of Study	Online (asynchronous, synchronous)
School(s)	School of Management
Theme	Leadership and Management
Centre	CED
Course Director	Dr. Elmar Kutsch
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is this course offered as an Apprenticeship?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Apprenticeship offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	• IELTS 6.5 for a PgAward. • Successful completion of two core PgAwards will constitute the entry requirements for PgCert. • Successful completion of the PgCert will constitute the entry requirements for the PgDip. • Successful completion of the PGDip will constitute the entry requirements for the MSc.
UK Qualifications Framework Level	QAA FHEQ level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	Three registration windows for a 20-credit PG Award will be offered per academic year PgAward – 1 year PgCert – 3 years PgDip – 4 years MSc – 5 years
Course Start Month(s)	March, July, November

Institutions delivering the course

This course is delivered jointly by CED and SOM where the research interests include:

A wide range of business and management topics. The PgAwards are either existing or combinations of modules already taught on existing courses offered by SOM. Teaching is provided by SOM Faculty as well as selected visiting faculty. Cranfield SOM remains fully responsible for the quality of delivery of the course and the assessment of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

N/A

2. What are the aims of the course?

The aim of the stackable MSc in Business and Management is to provide unique learning experiences based on the latest evidence-based insights, with personalised pathways, and the flexibility to study at a time and pace that suits our students.

The objectives are fivefold:

1. To prepare students for the world of employment in management, partly through a balanced focus between theoretical perspectives and application.

2. The advanced study of organisations, their management and the changing external context in which they operate.
3. Development of a range of business knowledge and skills, together with self-awareness of learning impact.
4. Development of the ability to apply concepts and theories to complex management issues, both systematically and creatively.
5. Enhancement of lifelong learning through the development of transferable intellectual, study and research skills, personal development to enable self-direction and creativity, in order to contribute to knowledge transfer, behaviour change, and business impact.

3. What should students expect to achieve in completing the course?

1. Students cannot register initially for the PgCert, PgDip or MSc. Students register for PgAwards (20 credits). Students then stack PgAwards to create higher awards. (3 core 20-credit PgAwards for a PgCert; 3 further elective 20-credit PgAwards for a PgDip; an additional 80-credit thesis for MSc).
2. Students cannot purchase the PgCert, PgDip or MSc. They can only buy badges, PgAwards and the thesis. The pricing of badged content has not changed (£99 Bronze, £199 Silver, £699 Gold). We will now offer a discounted price of £1800 for the entire PgAward and £5000 for the Thesis. As such the MSc price (6 PgAwards and thesis) would be £16,964 if badges are purchased individually and £15,800 if purchased as PgAwards.
3. Entry requirements and progression: IELTS 6.5 (or equivalent language test). Successful completion of two core PgAwards will constitute the entry requirements for PgCert, and successful completion of the PgCert will constitute the entry requirements for the PgDip. The successful completion of PGDip and the thesis result in the award of an MSc.
4. The duration of all awards starts with access to the first bronze element.

Award intended learning outcomes (ILOs) (skills and knowledge).

Bronze, Silver, Gold Badges
The basic building blocks of the stackable MSc are Bronze (asynchronous, self-paced), Silver (asynchronous, self-paced), Gold (synchronous, live-online, faculty-led). Bronze, silver and gold digital badges will be awarded on completion of each element. All badged elements have specific ILOs detailed in the Appendix of each PgAward module descriptor.

- At the bronze level, the focus is on learning about existing models and frameworks
- At the silver level personal experience is engaged further by stimulating and accessing observation, application and reflection on practice.
- At the gold level, the emphasis is given to the co-creation of new knowledge by addressing live issues, sharing and auditing experiences, and critiquing and 'stretching' concepts and theory in relation to student's own areas of responsibility in order to plan and apply key aspects of the theme to drive improvement in their own organisation (or elsewhere).

A. Postgraduate Award

In completing this course, and achieving the associated award, a diligent student should be able to meet the module and stack specific ILOs (please see module descriptors).

B. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:
1. Systematically and critically evaluate current business and management concepts and frameworks and evaluate its relevance to industrial and commercial practice.
2. Analyse management issues or situations under consideration and select and apply appropriate tools and/ or techniques accurately by drawing on appropriate management frameworks.
3. Critically evaluate the strategic context of the business and be able to critically comment on the fit between business and functional strategies including operations, finance, organisational structure (culture and values).

C. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

4. Integrate knowledge and apply multi-disciplinary approaches to solve business problems and to justify and communicate findings in a professional manner.
5. Draw connections between business and functional strategies including operations, finance, organisational structure (culture and values), and different contexts (including the student's context).
6. Develop and demonstrate advocacy qualities in designing and implementing a cross-functional change initiative within a business.

D. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

8. Scope an individual piece of research and develop an appropriate set of research questions/project objectives.
9. Plan and execute a long-term research project work programme with reference to the key project management processes (time, risk management, contingency, resourcing)
10. Select and justify methodologies and analytical tools and techniques appropriate to the task and apply them correctly to a business/management problem or current issue
11. Collect, analyse and critically evaluate literature, data, and information to make evidence-based decisions which lead to justified conclusions/recommendations
12. Write and communicate concisely, informatively and persuasively to produce a high-quality thesis
13. Produce a high-quality thesis and critically evaluate its impact on the student's professional development.

4. How is the course taught?

Postgraduate Award Learning Hours

Each module, comprising of two stacks (see Figure 3), encompasses 200 notional learning hours.

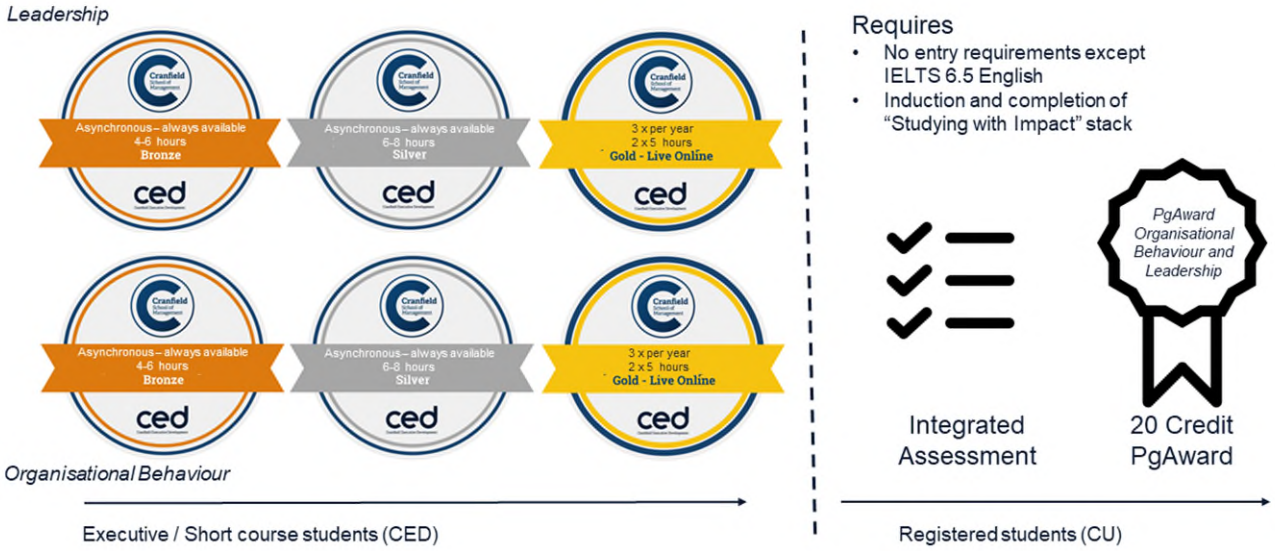


Figure 3. A 20 credit PgAward

In its most compressed form, Figure 4 shows a typical distribution of these 200 notional learning hours for a single PG Award:

- 40 hours are set aside for asynchronous and synchronous learning at Bronze, Silver, and Gold level.
- A further 80 hours learning over a period of at least 7 weeks is reserved for independent research and learning in preparation of the summative assessment.
- An additional 80 hours of independent learning (indicated by numbers in italics) enables the student to engage with the completion of their workbook activities (see Figure 3).

Overall, the maximum hours of learning hours per week is not greater than 16.

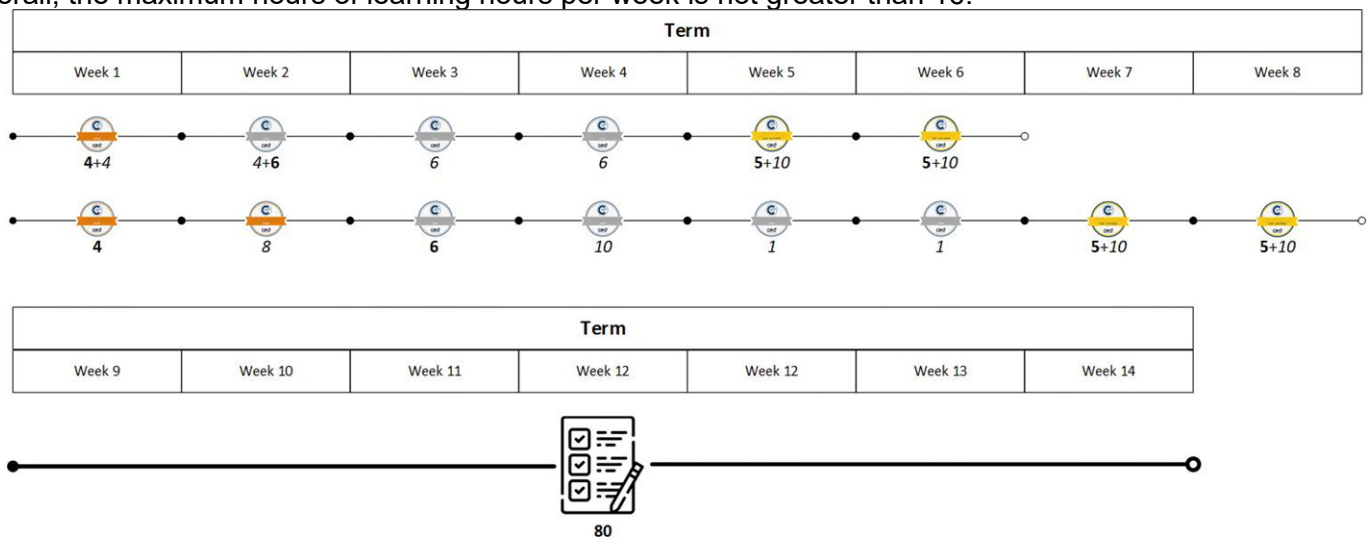


Figure 4. Compressed distribution of 200 notional learning hours

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Award
The accumulation of 20 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
PgAward	20
ELECTIVE MODULES:	
N/A	N/A
TOTAL:	20

B. Postgraduate Certificate
The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Three core 20-credit PG Awards (from Modules 1 to 3)	60
ELECTIVE MODULES:	
N/A	N/A
TOTAL:	60

C. Postgraduate Diploma
The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Three core 20-credit PG Awards (from Modules 1 to 3)	60
ELECTIVE MODULES:	
Three elective 20-credit PG Awards (from Modules 4 to 8)	60
TOTAL:	120

D. MSc
In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Three core 20-credit PG Awards (from Modules 1 to 3) Thesis	60 80
ELECTIVE MODULES:	

Three elective 20-credit PG Awards (from Modules 4 to 8)	60
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists, and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules as stated below:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- Completion of all assessments with the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee);[3]
- **For Taught Assessments[4],** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits (up to 60 learning credits for MBA students)**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits (or 60 learning credits for MBA students), you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the Thesis,** a mark of ≥50% in order to receive a pass (where it exists).

Specific pass criteria in relation to the entry progression routes on the MSc Business and Management:

Postgraduate Award

- A mark of ≥50% on the assessment.
- If you fail the assessment(s) you will normally be permitted one re-take. A re-take assessment would normally be capped at 50%, unless exceptional circumstances have been presented and accepted.
- Failure at the first attempt of more than one assessment at any stage will prevent you progressing onto the PgCert.

Postgraduate Certificate

- A mark of ≥50% in each PgAward assessment.

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than or equal to 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits (60 credits for MBA students). At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[4] The MBA is composed entirely of Taught Assessments.

- Failure at the first attempt of more than one of the assessments that make up the PgCert will prevent you achieving the intended award and progressing onto a PgDip.

Postgraduate Diploma

- A mark of ≥50% in each PgAward assessment.
- Failure at the first attempt of more than one of the assessments that make up the PgDip (including those completed as part of the PgCert) will prevent you achieving the intended award and progressing onto an MSc.

6. How is the course structured?

The course will be offered on a part-time basis only. Students may register for a PgAward during nine registration windows within 13 calendar months (every September, January, May).

In addition to the teaching methods outlined in section 3 above, students will be supported in their learning and personal development by:

- Induction
- Library induction, referencing and plagiarism sessions
- Two module stacks specifically aimed at supporting students
  - Studying with Impact Bronze and Silver (mandatory prior to summative assessment of core modules)
  - Researching with Impact Bronze, Silver, and Gold (mandatory for the thesis)
- A Virtual Community of Practice (see Section 7 below for more information)
- Learning impact review workshops (see Section 7 below for more information)

Bronze, Silver and Gold Badges

- Some learners will consume badged content but choose not to take the final summative assessments. This allows stackable content to be sold independently and used on non-award bearing executive programmes.
- Gold elements (synchronous, live-online, faculty-led) will be offered three times a year.
- Learners remain short course students until they register for the summative assessment, at which point they become registered students.

A. Postgraduate Awards

Education Committee and Senate (March 2022) approved the principle of PgAwards.

1. PgAward is an entry award only, with a minimum of 20 credits
2. PgAward to be named after the parent course, e.g., Postgraduate Award in Business and Management.
3. PgAward certificate and transcript issued with named integrated modules:

   Core PgAwards:
   - PgAward Business and Management: Leadership and Organisational Behaviour
   - PgAward Business and Management: Strategic Management
   - PgAward Business and Management: Economics and Finance

   Elective PgAwards:
   - PgAward Business and Management: Strategic Marketing and Sales
   - PgAward Business and Management: Organisational Transformation and Design
   - PgAward Business and Management: Procurement and supply chain management

- PgAward Business and Management: Project and Performance Management
- PgAward Business and Management: Leading Organisational Resilience

To be developed:

- PgAward Business and Management: People Management
- PgAward Business and Management: Entrepreneurship and innovation management
- PgAward Business and Management: Sustainable and Ethical Business
- PgAward Business and Management: Digital Transformation

Additional elective PgAwards may be added in the future.

4. Students cannot be registered for two PgAwards at the same time.
5. The entry requirements for a PgAward is IELTS 6.5 English
6. All students wishing to register for a PgAward will need to complete an online induction and study skills designed to prepare them for assessments. There will be three inductions per year. Additional learning and support materials will always be available.
7. It is expected that students (all part time) will complete the PgAwards in 4 months and will take no less than 1 month or more than 12 months.
8. The duration of the PgAward starts with access to the first bronze element and ends with the final summative assessment.
9. On successful completion of the final summative assessment, students can graduate with the PgAward or continue to study towards a higher award.
10. Students may wish to collect PgAwards and never upgrade to PgCert.

B. Postgraduate Certificate

1. When students successfully complete two core PgAwards they can register for PgCertificate (PgCert).
2. Successful completion of two core PgAwards will constitute the entry requirements for the PgCert.
3. Successful completion of the 3 x 20 credit core PgAwards will result in a PgCert (Business and Management)
4. PgAwards to be surrendered to transfer to PgCert (following the existing Transfer to a Higher Award process).
5. It is expected that students (all part-time) will complete the PGCert in months 0-12 and will take no less than 6 months or more than 36 months.
6. The duration of the PgCert starts with access to the first bronze element of the first PgAward and ends with the final summative assessment of the third core PGAward.

C. Postgraduate Diploma

1. When students with the PgCert successfully complete two elective PgAwards they can register for PgDiploma (PgDip).
2. Successful completion of the PgCert will constitute the entry requirements for the PgDip.
3. Successful completion of the PgCert and 3 x 20 elective credit PgAwards will result in a PgDip (Business and Management).
4. PgCert to be surrendered to transfer to PgDip (following the existing Transfer to a Higher Award process).
5. It is expected that students (all part time) will complete the PGDip in months 13-24 and will take no less than 10 months or more than 48 months years.
6. The duration of the PgDip starts with access to the first bronze element of the first PgAward and ends with the final summative assessment of the third elective PgAward.

D. MSc

1. When students complete the PgDip they can register for the MSc.
2. Successful completion of the PgDip will constitute the entry requirements for the MSc.
3. Successful completion of the PgDip and a thesis will result in a MSc in Business and Management.
4. Students must undertake the evidence-based management/research methods training (online) designed to support the thesis.
5. PgDip to be surrendered to transfer to MSc (following existing Transfer to a Higher Award process).
6. It is expected that students (all part time) will complete the thesis in months 25-36 (3-year MSc) and will take no less than 13 months or more than 60 months.
7. The duration of the MSc starts with access to the first bronze element of the first PgAward and ends with the submission of the thesis.

The overall structure of the stackable MSc is shown below (see Figure 5):

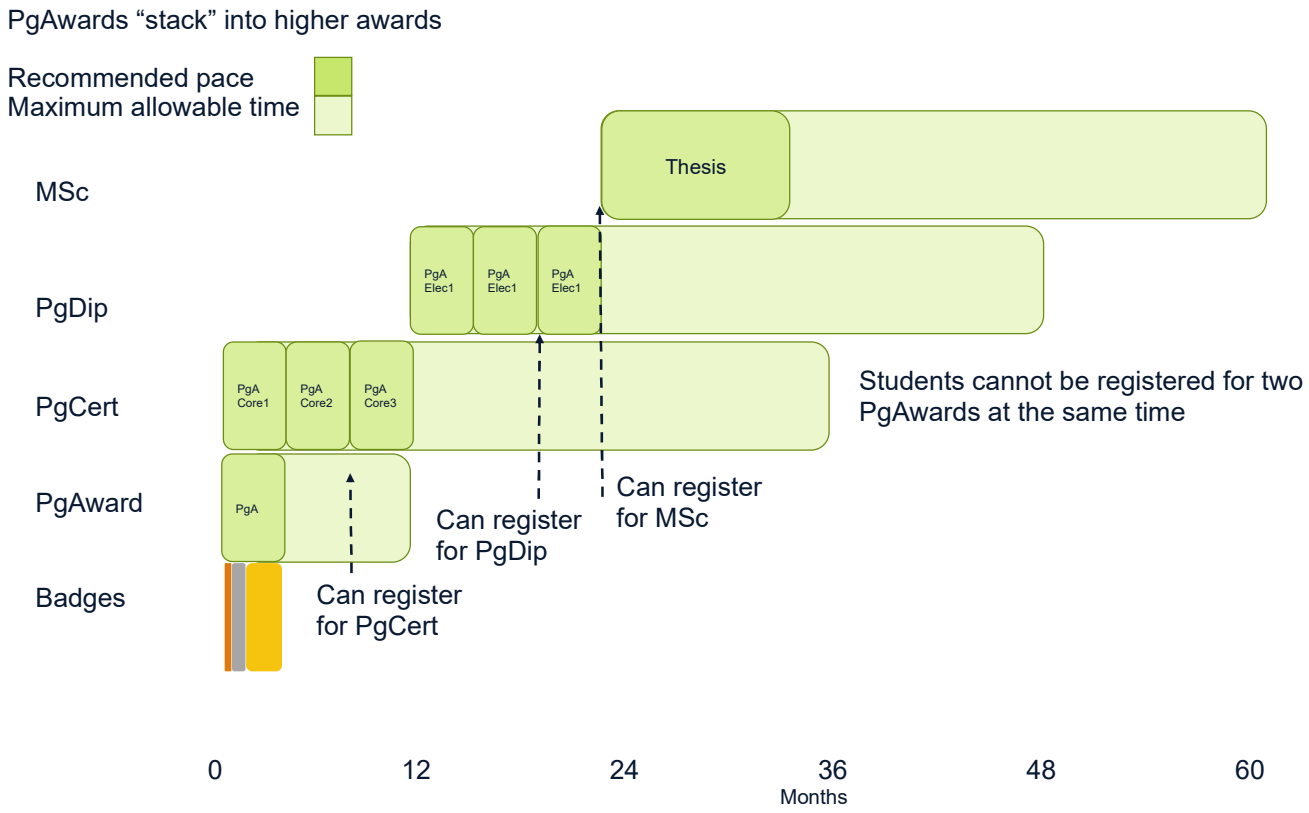


Figure 5. Overall structure

7. Course Level Assessment Strategy[5]

The aim is to provide a varied, stimulating and workbook activity-led learning environment at Bronze, Silver and Gold level. At Gold level, formal live online lectures, in-class case discussions, group and self-study complement the learning experience.

The learning, teaching and assessment strategy of this course is challenging and diverse and enables students to demonstrate a full range of skills and attributes. Central to this strategy is the Digital Workbook that is characterised by the purposeful collection of the student’s formative work (see Figure 6) that exhibits evidence of the student’s participation in defining a managerial problem, diagnosing it, designing and discovering an answer to it, delivering its implementation, and deliberating its impact.

[5] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

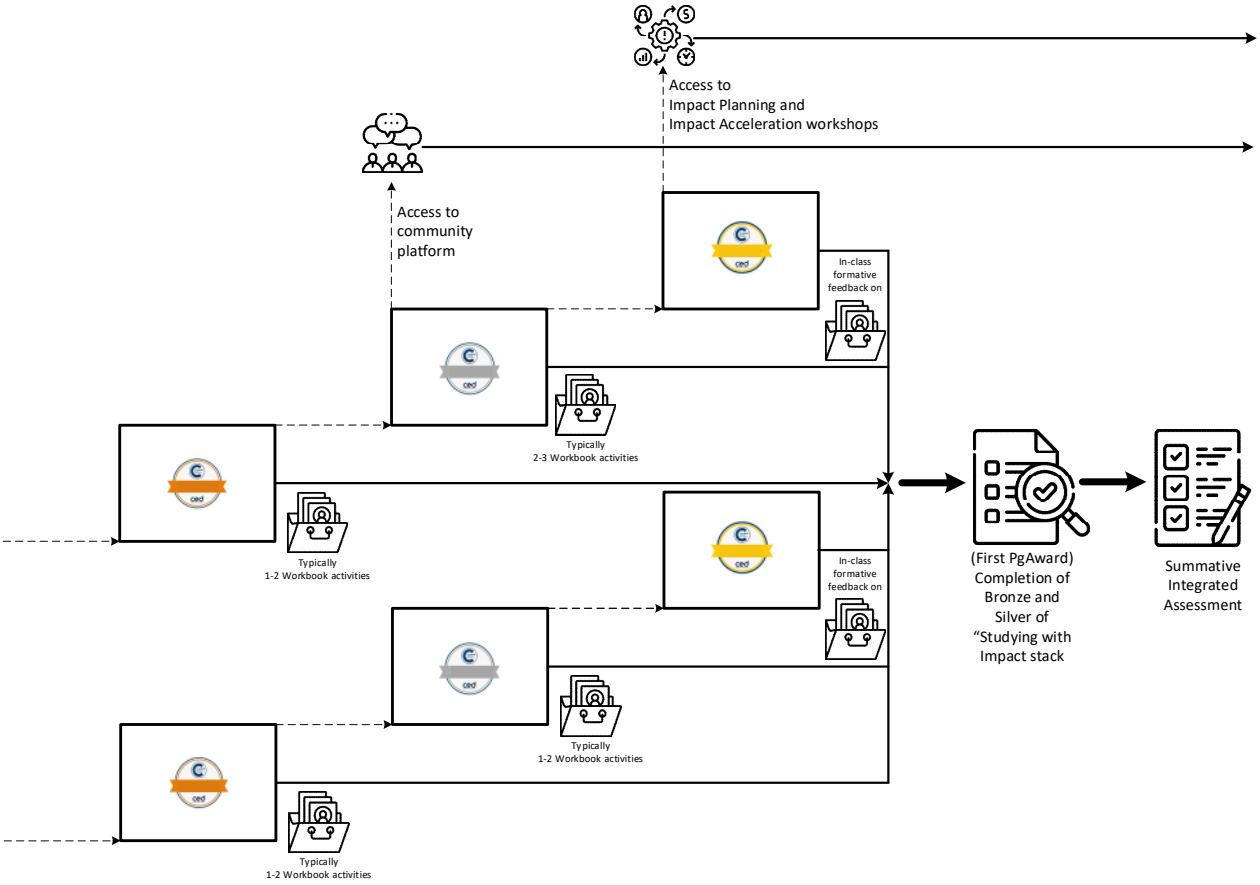


Figure 6. A staggered digital workbook approach

The Digital Workbook includes the following features:

- The module and stack leads determine the quantity and focus of formative learning evidence to be produced and uploaded to Canvas.
- To proceed towards Gold (see Gateways), students have to upload 100% of their Learning Evidence to Canvas. In addition, to advance to the Summative Integrated Assessment, students need to have attended 75% of their Gold live-online lectures (and thus have engaged with all formative learning activities that provide them with critical feedback on their Digital Workbook).
- At Bronze and Silver, the students' formative learning is characterised by self-reflection; at Gold level, students receive in-class, real-time feedback on the produced learning evidence (see Quality Checks).

The module descriptors display the Digital Workbook as follows (see Table 4):

Bronze and Silver				
Digital Workbook	**Formative**	Activity-led creation and upload of student's study work to a digital workbook	Feedback via self-reflection	Upon student reflection
Gold				
Digital Workbook	**Formative**	Reflection on student's Bronze and Silver study work	Group activity, presentational and discussion	Instant

Table 4: Module Descriptor definition of Digital Workbook

Digital Workbook: Gateways

At Bronze, Silver, and Gold level, learning gateways are implemented to review and monitor progression (see Table 4).

	Gateway 1: Upload of Learning Evidence	Gateway 2: Attendance	Gateway 3: Studying with Impact stack
Bronze and Silver	100%		
Gold		75%	
1st PgAward			Bronze and Silver

Table 4. Gateways

The upload of learning evidence (Bronze and Silver) will be monitored on Canvas. At Gold level, attendance sheets will be completed. The completion of Bronze and Silver activities of the Studying with Impact stack (e.g. including eRap) constitutes a further gateway for submitting the Summative Integrated Assessment.

Digital Workbook: Quality Checks

The onus of producing high-quality learning outputs (such as the one defined above) is on the learner. That implies that a module or stack lead is not responsible for screening the uploaded learning activities for their quality of being acceptable or unacceptable. Instead, first, we will encourage the learner to discuss these learning outputs with other learners on the community (of Practice) platform students are encouraged then to peer-review their learning evidence, leave likes, comment on it, and discuss it without compromising aspects of plagiarism and confidentiality.

Second, the process of self-reflection is supported by a physical activity log and reflection form to help students reflect upon their produced learning evidence. About the learning objectives for Bronze and Silver, students provide brief learning statements.

Third, in addition to self- and peer-reflection at Bronze and Silver, students receive formative feedback on the Digital Workbook during the live-online lectures. This feedback is to be carried out in the form of group activities, with the showcasing and critically reviewing of outstanding learning evidence uploaded for Bronze and Silver.

Digital Workbook: Focus of learning activities

In addition to module and stack leads specifying the number of activities and learning evidence to be produced and uploaded, to be shared and discussed among peers, focus of each learning activity is defined in accordance to: Define, Diagnose, Design, Deliver, Deliberate (see Appendix A for more information about the 5D framework).

For example, students may be asked the following:

1. Please create a 2-minute video about two organisations facing adversity:
   Define: What type of adversity are they facing?
   Please upload the 2-minute vlog (to Canvas).

2. Please search for two peer-reviewed papers that address the following question:
   Design: How do teams anticipate and respond to adversity?
   Please upload your two papers (to Canvas).

3. Please create a benefits map on:
   Deliver: How to benefits-manage the 'to be' state of Organisational Resilience.

Please upload your Benefits Map to (to Canvas).

The module and stack leads are encouraged to follow a logical progression (e.g. Define and Diagnose activities at Bronze, Design and Deliver activities at Silver, and Deliberate activities at Gold) to provide a holistic learning journey (see Figure 7).

With access to Bronze, students will not only be informed about the Summative Integrated Assessment, but also about what learning activities, across Bronze, Silver and Gold to complete, and how these learning activities align with each other and build towards the expected learning outcomes as well as demands of the Summative Integrated Assessment.

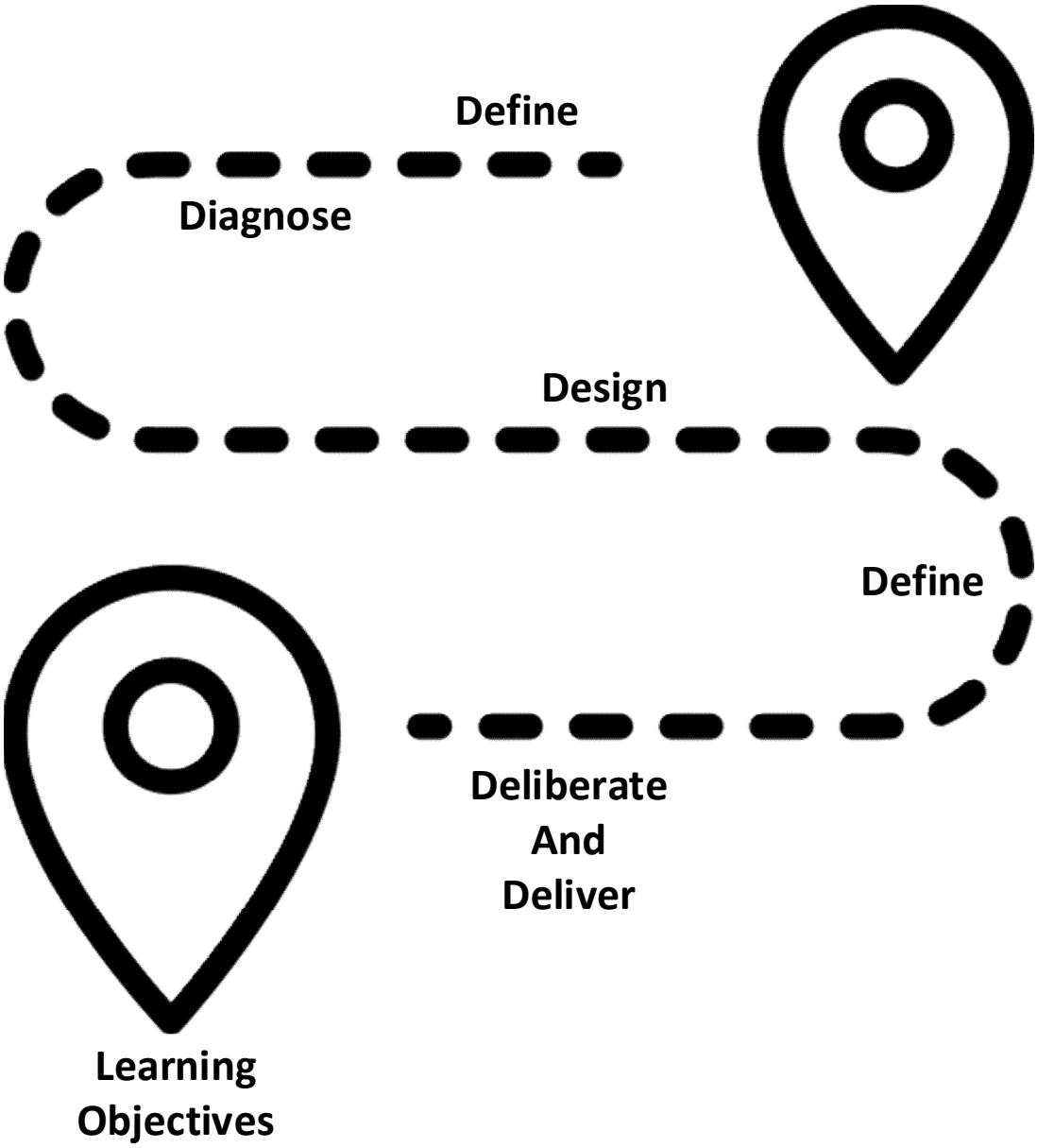


Figure 7. An example of a learning navigator

In line with this learning navigator, students will be reminded frequently to produce and upload the necessary learning evidence, and complete their activity log and reflection form.

Digital Workbook: Summative Integrated Assessment

The aim of integrating (synoptic) assessments is to:

- combine students' learning from multiple modules into a single assessment. Enable students to make connections between knowledge and learning that span multiple modules
- require students to recognise the integrated and complex nature of the management topics being studied,
- help focus on applied project work and real-world issues,
- assess proportional to need and avoid repetition between taught components

Assessments may be submitted or undertaken during 'assessment windows' offered 3 times per year. The windows will enable forward resource planning for marking and it will add a degree of structure to the course to facilitate more effective student feedback and progress tracking.

Digital Workbook: Learning with Impact

The innovative practice of connecting learning to 'life' is to allow students to transcend their learning beyond formative and summative assignments; to focus on the impact of learning rather than the content. Regarding this course, students will receive access to Impact Planning and Impact Acceleration workshops upon signing up for any Gold level (see Figure 6).

During the 2-hour live-online Impact workshop, students will be encouraged to set personal objectives and share ideas and achievements. An impact framework will underpin these workshops (see Figure 8).

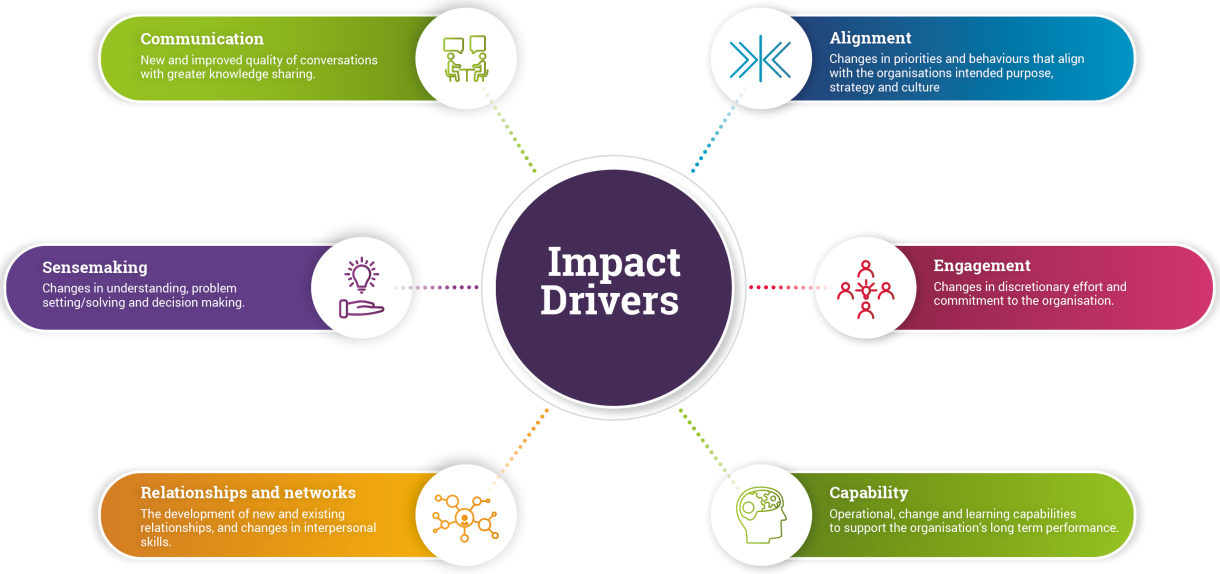


Figure 8. Impact Acceleration Drivers

The examples of impact provided by participants will be used to:

- encourage other students to gain value from their experiences
- inform Cranfield's insights into the quality of development
- market the stackable portfolio to potential students

A student has to attend five Impact Workshops (including the Impact Planning Workshop) to be awarded a "Learning with Impact" Gold badge.

Learning with Impact: Impact Planning workshop
Once a student has signed up for a module Gold badge, a questionnaire will be sent out to the students. The questionnaire will help the students set learning priorities relating to their own specific context. Results of the questionnaire will be shared and discussed during the 2-hour Impact Planning workshop. The participants will look back on what has been achieved and look forward to what they would like to achieve next. In addition, barriers to achievement and ideas for accelerating progress will be shared. Discussions will occur in pairs or threes of 'impact buddies'.

Learning with Impact: Impact Acceleration workshops
To attend an Impact Acceleration workshop, a student has to have attended an Impact Planning Workshop. During the 2-hour live-online workshop, students:

- Address questions of application of learning
- Look back
- Look forward
- Carry out an Impact review

Students complete an impact template (see Appendix B) and upload it to their Digital Workbook. Potentially, subject matter experts are invited to deepen the impact of learning. The Impact Acceleration workshops are defined by discussions between 'impact buddies'.

Learning with Impact connects formative and summative learning activities with their own professional context, to enable students to immediately become more effective, productive, and fulfilled as a learner (see Figure 9).

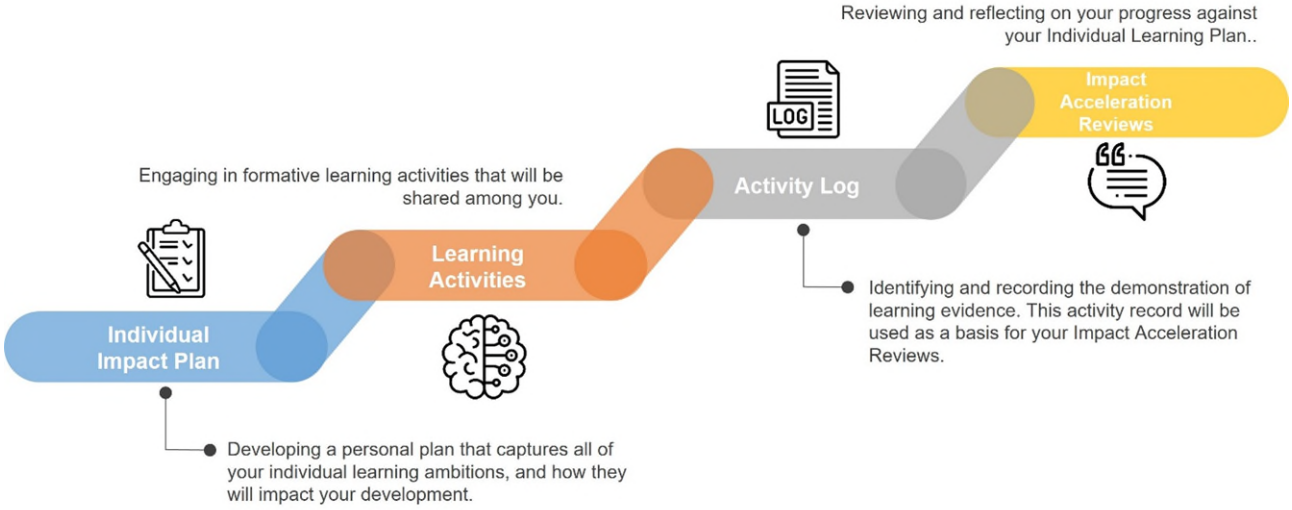


Figure 9. Integrating Learning with Impact

Beyond the primary responsibility of enhancing the quality of education, the Academic Director will run both Impact Planning and Acceleration workshops (see Figure 6). This ensures a close relationship between students and the Academic Director and provides frequent opportunities to gather feedback and gauge students' moods.

Researching with Impact: Thesis

Students are generally expected to be more self-directed in their learning during the research project and guidance will be provided through the “Researching with Impact” stack and meetings with their thesis supervisor. For more information, please see Module Descriptor 9: Thesis.

Community of Practice

The envisaged Community of Practice provides students with a space where processes of social learning occur between people with a common interest in a subject, problem or module, who collaborate over longer periods to share and exchange ideas, find solutions and build knowledge. At the heart of a Community of Practice is a continuous, real-time discourse and dialogue to build personal, individual understanding and shared group understanding and relationships beyond Bronze, Silver, and Gold learning.

A student will receive access, for a year, to the Community of Practice platform (Pronto; see Appendix C) once a student has signed up for a Silver badge (see Figure 6). With every consecutive sign-up for a Silver badge, access to the Community of Practice is being extended by another year.

The Community of Practice provides a forum for students to negotiate the meaning of the learning they have received at Bronze, Silver, and Gold levels, with others in the community. As a result, a range of learning activities are suggested to support such social learning:

- Coffee Talk Time: A dedicated thread is opened for a specific time for members to share their personal and professional updates
- Seed Content: Questions or resources are posted on behalf of the community's members. Such content may relate to a summative integrated assessment
- Showcase: With the student's consent, an excellent piece of learning evidence can be showcased.
- Member Spotlight: A student records a vlog and talks about their greatest achievements
- Winner! Contests: Hosting a contest with (challenging) quizzes or alternative testing tools.
- Polls: Providing students with online polls (e.g. about grand challenges)

The coordination of the Community of Practice is being carried out by a Customer Experience Manager . The Customer Experience Manager's role is to interact with students via the Community of Practice platform and channels and coordinate with the Academic Director to fine-tune the customer experience.

Course modules

The following modules outline all PG Awards of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Thinking ahead to AY23 and beyond when there will be a course spec which covers a whole academic year, I suggest that the occurrence letters are aplied as:
A = November
B = March
C = July
In which case, we would create all of the occurrences below as C even though there will be only one run of these modules in AY22 due to the course not starting until late in the academic year.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; TCA – Time-Compressed Assignment

Module Number	Module code	Module Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment[8]				
												Independent Assessment		Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%[10]	Type of Assessment	Weighting within module[11] (%) of Independent assessments	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
1	MX-BM-LOB	Leadership and Organisational Behaviour	Prof David Denyer	20		20	N	Occ B 10.07.23	10.07.23	11.08.23	50	ICW	100	Occ B 11.08.23	TBC
2	MX-BM-STM	Strategic Management	Prof Andrey Pavlov	20		20	N	Wave 2 – Occ B dates TBC			50	ICW	100	ADD	ADD
3	MX-BM-EAF	Economics and Finance	Prof Joe Nellis	20		20	N	Occ B 10.07.23	10.07.23	11.08.23	50	ICW	100	Occ B 11.08.23	TBC

[6] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[7] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[8] For courses accredited by Professional Engineering Institutes licensed to accredit academic programmes by the Engineering Council it should be noted that condonement of modules is not allowed.
[9] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[10] For courses accredited by Professional Engineering Institutes licensed to accredit academic programmes by the Engineering Council it should be noted that a maximum of 20 credits may be compensated in a Masters degree.
[11] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education. Further guidance can be found under Section 7.1.2 of the Sente Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx
[12] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; TCA – Time-Compressed Assignment

Module Number	Module code	Module Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment[8]				
												Independent Assessment		Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[9] - 40% or 50%[10]	Type of Assessment	Weighting within module[11] (%) of Independent assessments	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
4	MX-BM-OTD	Organisational Transformation and Design	Prof Emma Parry	20		20	N	Occ B 10.07.23	10.07.23	11.08.23	50	ICW	100	Occ B 11.08.23	TBC
5	MX-BM-PPM	Project and Performance Management	Prof Neil Turner	20		20	N	TBC	TBC	TBC	50	ICW	100	ADD	ADD
6	MX-BM-SMS	Strategic Marketing and Sales	Prof Stan Maklan	20		20	N	TBC	TBC	TBC	50	ICW	100	ADD	ADD
7	MX-BM-LOR	Leading Organisational Resilience	Prof David Denyer	20		20	N	TBC	TBC	TBC	50	ICW	100	ADD	ADD
8	MX-BM-PSCM	Procurement and Supply Chain Management	Dr. Farooq Habib	20		20	N	Occ 10.07.23	10.07.23	11.08.23	50	ICW	100	Occ A 11.08.23	TBC
9	MX-BM-THS	Thesis	Dr Elmar Kutsch	20		80	N	May 25 CHECK	May 25	September 25	50	THESIS IPRES	80 20		

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; TCA – Time-Compressed Assignment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
n/a			

8. How are the ILOs assessed?

Course ILOs assessed through mapping of module ILOs to the course learning outcomes. At a module level, ILOs are evaluated by the learning outcomes of the summative assessment, and the formative learning activities.

The following assessment types are utilised:

Summative assessments: A module specific assessment rubric is matched with the module and stack ILOs.

Formative assessments: The formative learning activities of the Digital Workbook (see Figure 3 and 7, and Appendix A) are mapped against the requirements of the summative assessment.

In addition to module evaluations forms, post PGAward feedback sessions will be held to assess ILOs. In addition, frequent Impact Acceleration workshops are provided to students to allow self-reflection beyond ILOs.

This approach has been adopted because:

Structured feedback section and Impact Acceleration workshops provide us with 360 assessment of learning.

Assessment and ILO Mapping

NB: PGAwards are mapped directly to the individual integrating ASS

A. Postgraduate Certificate

Award ILOs / Module No.	ILO1	ILO2	ILO3
1	ICW	ICW	ICW
2	ICW	ICW	ICW
3	ICW	ICW	ICW

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO4	ILO5	ILO6	ILO7
4	ICW	ICW	ICW	ICW
5	ICW	ICW	ICW	ICW
6	ICW	ICW	ICW	ICW
7	ICW	ICW	ICW	ICW
8	ICW	ICW	ICW	ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO8	ILO9	ILO10	ILO11	ILO12	ILO13
9	THESIS IPRES	THESIS IPRES	THESIS IPRES	THESIS IPRES	THESIS IPRES	THESIS IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
n/a			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6-year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality

Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner/s, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition, students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

.

10. What opportunities are graduates likely to have on completing the course?

This programme is intended for the following range of students:

1. International students who wish to study at a prestigious UK university but are unable or unwilling to travel.
2. Domestic and international students who want to structure their learning around work and family; and/or feel that a structured progression from PgAward to PgCert, to PgDip to MSc is less daunting; and/or want to spread the cost of their education.
3. Domestic and international students, including Cranfield alumni, with a degree or MSc in different (perhaps technical) disciplines who want to continue their education with a 'top up' in business and management; and/or have a management degree or MSc who want an 'update' with the latest research and thinking or want to obtain a specific set of awards to address their lack of aptitude and to build confidence in certain areas.
4. L&D Directors and Managers buying learning opportunities on behalf of their employees/organisation who want to select a certain set of PgAwards to help address a specific organisational need.

The programme is designed to enhance career prospects through the advanced study of business and management topics in organisations. It aims to educate graduates to make an early and substantial contribution to their (future) employer in broad areas, from management of operations and finance, to marketing and strategy.

In addition, the micro credentials (with a digital badge as representation) provide students with narrow but flexible upskilling options, and thus serve the needs of a changing workplace that is characterised by certification and dynamic specialisations.

Appendix A - The 5D learning model

The 5D framework – *Define, Diagnose, Design, Deliver, Deliberate* – offers the students a structured, evidence-based approach to their Digital Workbook.

Define

This step is about identifying a practical challenge. A challenge can be an issue or a threat that an organisation, team, or individual is facing that is sufficiently significant that it cannot or should not be ignored. It could also be an opportunity. The litmus test question is: “What happens if you did nothing?”. A key aspect is that a student needs to justify why the problem is a problem.

The challenge should not be so big that it becomes overwhelming or outside of the students’ influence. An adequate choice of the challenge is within a reasonable degree of student’s access to evidence and ability to act in response.

The challenge can be approached from a managerial or consulting angle. A managerial challenge is where a student takes direct managerial responsibility for making things happen, whilst a consulting challenge entails the student identifying and advising on solutions (see Figure 4).

The following questions are informative about the Define activity:

- What is the **significance of this challenge** to your organisation and why should others in your organisation care?
- What would happen if you (or other members in the organisation) did **nothing**? What, if any, **potential negative consequences** might arise if not taking on this challenge?
- What might be the **potential benefits** or consequences of acting on this challenge?
- What are the **key stakeholders’ views** on this? It’s a good idea to establish if there is an appetite, and ideally support, among key stakeholders.

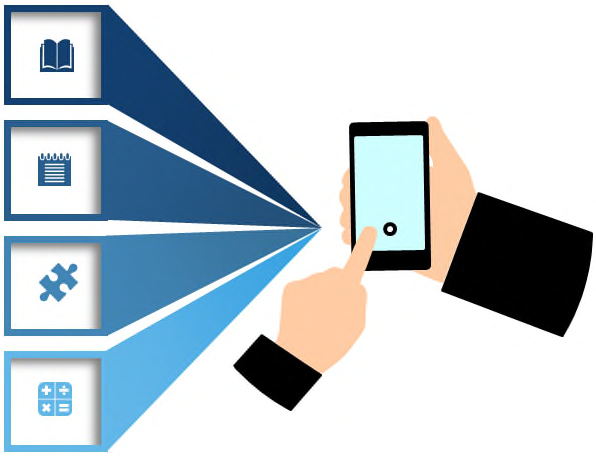


Figure 4. Define - Questions to consider

Diagnose

Diagnosing is about probing deeper into the challenge to reveal insights about what is going on. Students need to develop a more nuanced understanding of their challenge by diagnosing it and providing a prognosis if appropriate (see Figure 5).

- What is happening? What are the **key internal and/or external trends or patterns** you identified?
- What are the **potential sources or causes** of the challenge?
- What is the **actual or anticipated impact of the challenge** on the organisation, internal members, external stakeholders and/or others?
- What is your **prognosis of the problem** if left unaddressed?

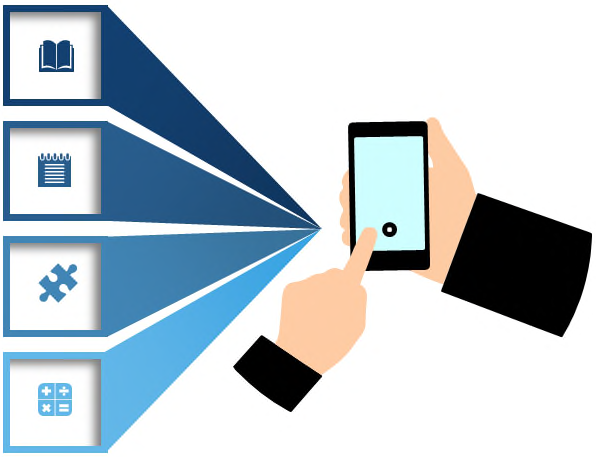


Figure 5. Diagnose – Questions to consider

Design

Designing an argument around the diagnosed problem requires the student to engage with the process of ideation and solution generating, creative thinking, sketching and drawing, and modelling alternative solutions to the diagnosed problem (see Figure 6).

- What **problem is addressed** in the resource? How has the author defined the **main concepts**?
- **What theories and methods** are used in the resource? What is the **conclusion** of the resource?
- What is the **relationship between the resource and other resources** (i.e. debates, patterns, trends)
- How does the resource **contribute to knowledge** about the topic?

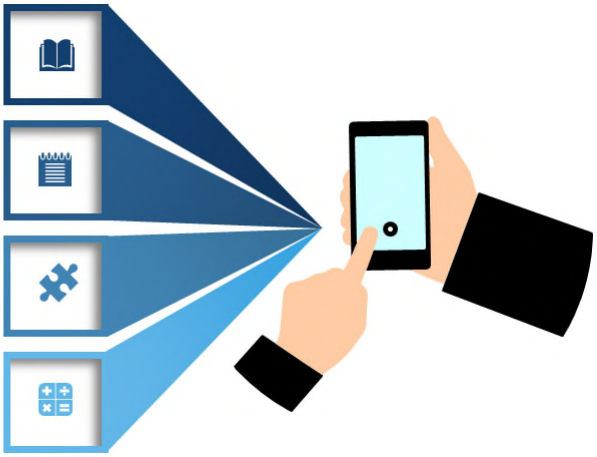


Figure 6. Design – Questions to consider

Deliver

The Deliver stage is about implementing the solution(s) that the student would like to adopt to address their challenge. Their response needs to take into account the appropriateness, feasibility, and desirability of their intervention, including financial implications (see Figure 7).

- What **alternative solutions** to the diagnosed problem does the literature suggest?
- Based on your **analysis of the challenge**, which solution should the team or organisation adopt?
- Is your solution **appropriate**, **desirable**, and **feasible**?
- What might be the **financial implications**?

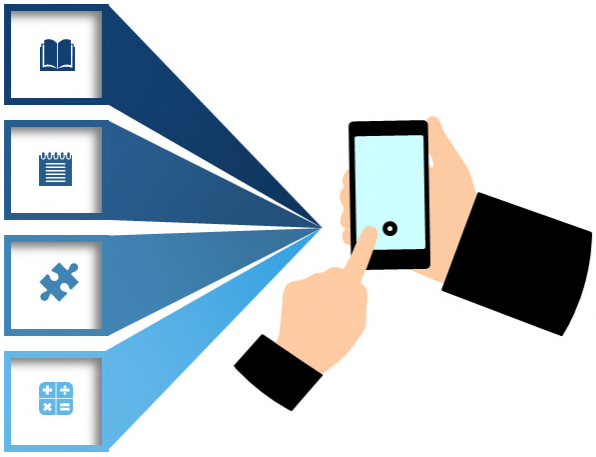


Figure 7. Deliver – Questions to consider

Deliberate

The final learning activity comprises a critical reflection on working through this challenge (see Figure 8). This section should demonstrate the ability of the student to think critically about the challenge, solution, and implementation. This stage is less about reporting on the results of the study but more about the evidence-based interpretation of the underlying meaning of the results.

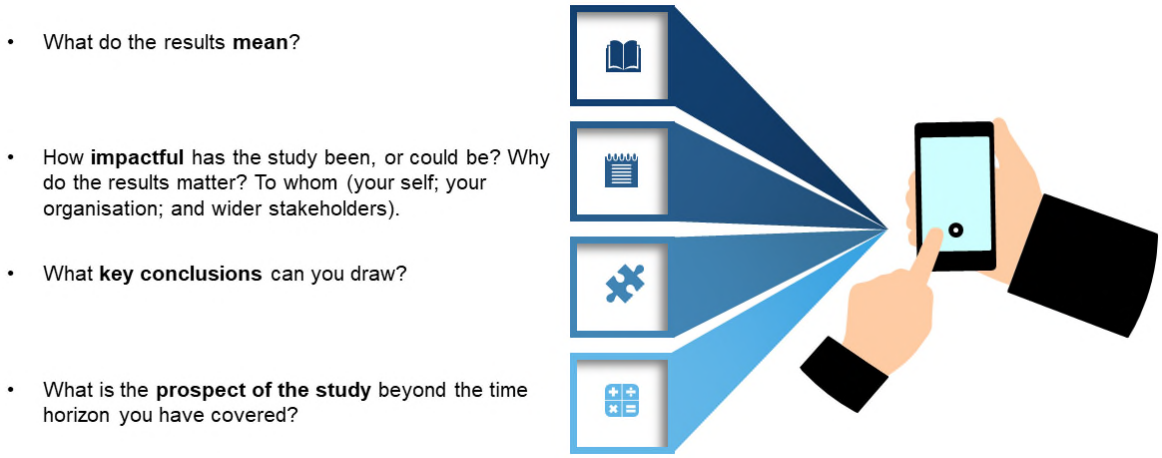


Figure 8. Deliberate – Questions to consider

Appendix B – Impact Questionnaire

Q1 Please enter the name of the module that you attended:

_____

Q2 I believe that I am more capable as a consequence of participating in the module

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q3 The change in my capability has resulted in performance benefits within my organisation

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q4 I didn't learn anything new during the module

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q5 I have initiated new conversations as a consequence of my participation in the module

- ○ Strongly Disagree (1)
- ○ Disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Agree (4)
- ○ Strongly agree (5)

Skip To: Q7 If I have initiated new conversations as a consequence of my participation in the module = Strongly Disagree

Skip To: Q7 If I have initiated new conversations as a consequence of my participation in the module = Disagree

Skip To: Q7 If I have initiated new conversations as a consequence of my participation in the module = Neither agree nor disagree

Q6 The new conversations have had an impact on: (please select all that are relevant)

- ☐ My personal performance (1)
- ☐ The performance of others within my organisation (2)
- ☐ My organisation's performance (3)

Q7 The way I communicate has changed as a consequence of attending the module

- ☐ Strongly Disagree (1)
- ☐ Disagree (2)
- ☐ Neither agree nor disagree (3)
- ☐ Agree (4)
- ☐ Strongly agree (5)

Q8 I have solved personal challenges using the techniques I learnt during the module

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q9 I have solved organisational challenges using the techniques I learnt during the module

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)

Q10 I have shared the techniques I learnt with other people within my organisation

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q11 What I learnt during the module is not relevant to my organisation

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q12 My priorities have changed as a consequence of attending the module

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Skip To: Q15 If My priorities have changed as a consequence of attending the module = Strongly Disagree

Skip To: Q15 If My priorities have changed as a consequence of attending the module = Disagree

Skip To: Q15 If My priorities have changed as a consequence of attending the module = Neither agree nor disagree

Q13 The change in my priorities has improved my personal performance

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q14 The change in my priorities has improved my organisation's performance

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q15 I am more motivated as a consequence of attending the program

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q16 I am more committed to my organisation as a consequence of attending the module

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q17 I have thought about leaving my organisation as a consequence of attending the module

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q18 During the program I developed relationships that have been of benefit to me

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q19 During the program I developed relationships that have had an impact on my organisation's performance

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q20 I have not kept up the relationships I developed during the module

- ○ Strongly Disagree (1)
- ○ Disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Agree (4)
- ○ Strongly agree (5)

Q21 There has been a financial benefit to my organisation as a consequence of my participation in the module

- ○ Strongly Disagree (1)
- ○ Disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Agree (4)
- ○ Strongly agree (5)

Skip To: Q23 If There has been a financial benefit to my organisation as a consequence of my participation in the... = Strongly Disagree

Skip To: Q23 If There has been a financial benefit to my organisation as a consequence of my participation in the... = Disagree

Skip To: Q23 If There has been a financial benefit to my organisation as a consequence of my participation in the... = Neither agree nor disagree

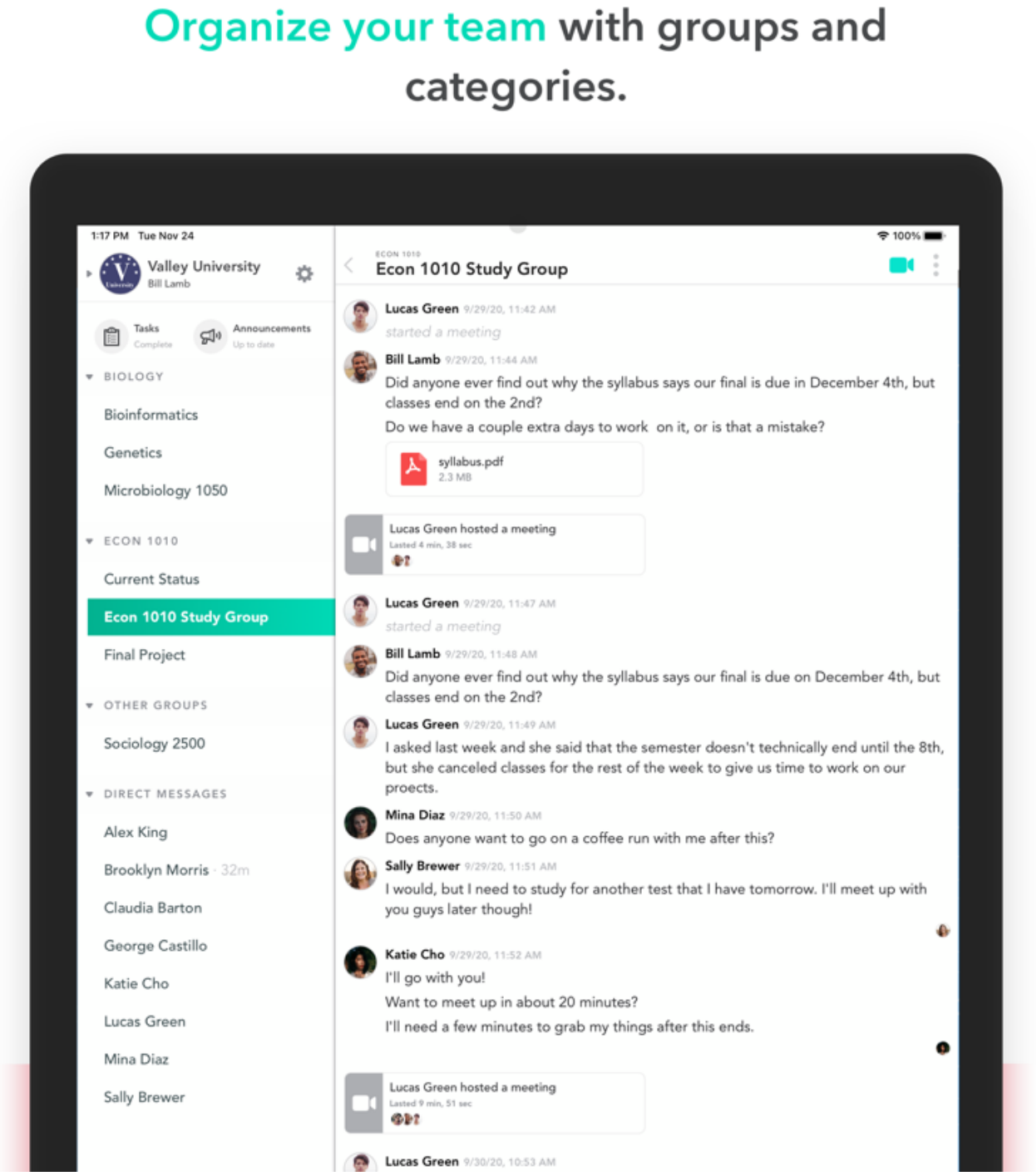
Q22 Please provide a short explanation of the financial benefit in the box below:

_____

Q23 If you would be willing to provide additional information about your experience of the module via a short telephone interview please enter your email address below:

_____

Appendix C – Pronto Screenshot



COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: August 2020

1. What is the course?

Course information

Course Title	Business and Strategic Leadership *(AON Cohort 1 Occurrence H)*
Course code	MSBSLPTC, PDBSLPTC, PCBSLPTC, MSBSLPAC
Academic Year	2020/21
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	PgDip, PgCert
Mode of delivery	Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Management
Theme	Leadership and Management
Centre	CED
Course Director	Mikko Arevuo, Philippa Thurgur
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	Yes
Apprenticeship Standard the course is mapped to	Level 7 Senior Leaders
Is the Degree apprenticeship integrated or non-integrated?	Integrated
Is the Mastership offered as an open and/or closed course?	Closed
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	MSc - part-time - maximum of 5 years PG Certificate – 3 years PG Diploma – 4 years
Course Start Month(s)	October 2020

Institutions delivering the course

This course is delivered by the Centre for Customised Executive Development, School of Management. The research interests include: management, leadership and change management.

This is offered as a closed corporate programme and Cranfield interacts with the client in the following ways:

- Delivery locations are jointly agreed with the client but have to meet Cranfield's requirements
- Core modules are set but in consultation with the client the course can be customised to suit a specific industry or client need through the agreeing pre-scribed electives which the students have to take.
- Students will undertake their research and/or project work off campus, in their own work place.
- Teaching and assessing is provided by Cranfield faculty and Cranfield RTS Associates

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

What are the aims of the course?

Diploma (PgDip) and MSc entry levels. Exit routes are provided for students at the end of the certificate and diploma for those who wish to access only parts of the course provided.
The aims of the Certificate are:

- To develop participants' knowledge and awareness of business functions and disciplines relevant to being able to analyse a business in preparedness for strategic change.
- To enable participants to develop appropriate knowledge and skills to lead and or participate in the start of a change initiative in their organisation.

In addition, the aims of the Diploma are:

- To enable participants to gain a systematic understanding and apply their knowledge relating to strategy, change, and leadership in order they can critique the relevance of this understanding to their business context.
- To enable participants to lead both the formulation and implementation of a change programme demonstrating their ability to work effectively as individuals and as part of a team, resolving problems and communicating clearly.

In addition, the aims of the MSc are:

- To develop the participants capabilities to conduct independent research into an aspect of change management, strategy or leadership in a business context.

- To advance the participants understanding of strategic change to enable them to effectively critique and contribute to the development of their organisation.

This programme is intended for the following range of students:

- For those who have been in management positions in their client organisation or related network for at least 2 years and have relevant experience in organisations for a minimum of 5 years.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Business and Strategic Leadership

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Systematically assess and describe the strategic context of the business and be able to critically comment on the fit between business and functional strategies including finance, organisational structure, culture and values.

ILO 2. Critically evaluate a business's need and readiness for change.

ILO 3. Develop and apply the personal qualities and skills necessary to assess, influence and manage change; and to operate as an effective team member.

ILO 4. Demonstrate the ability to integrate knowledge and apply multi-disciplinary approaches to solve real-life business problems and to justify and communicate findings and recommendations with stakeholders in a professional manner.

B. Postgraduate Diploma in Business and Strategic Leadership

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Select, justify, apply and adapt theories, and diagnostic techniques relevant to change, strategy and leadership.

ILO 6. Develop and demonstrate leadership and advocacy qualities in designing and implementing a cross functional strategic change initiative within a business.

ILO 7. Communicate clearly in a leadership role in an organisation change management context and to engage with key stakeholder concerns.

ILO 8. Develop team working skills in themselves and support others to improve the overall performance of a team.

C. MSc in Business and Strategic Leadership

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Demonstrate the ability to identify appropriate management frameworks for an issue or situation under consideration and apply tools and techniques accurately.

ILO 10. Display practical capabilities in self-directed research, data gathering, data analysis and interpretation, report writing and presentation skills.

ILO 11. Produce a high quality thesis and critically evaluate the interpretations of the data and to effectively communicate the results.

4. How is the course taught?

The course is taught with a mixture of lectures, case studies, experiential exercises primarily. The method of teaching includes face to face, use of webinars and webcasts.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate Business and Strategic Leadership

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
1-5	50
ELECTIVE MODULES[3]:	
One element from 11-19	10
TOTAL:	60

B. Postgraduate Diploma Business and Strategic Leadership

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
1-10	100
ELECTIVE MODULES:	
Two elements from 11-19	20
TOTAL:	120

C. MSc Business and Strategic Leadership

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
1-10 20 21	100 AO 80
ELECTIVE MODULES:	
Two elements from 11-19	20
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

[3] The Client agrees which elective modules will be offered to the students during contract negotiations.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [4]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

As this is a corporate (closed) course elective modules, exact dates and venues have to be agreed with the client.

Given the applied nature of the programme modules take place roughly every 2 to 3 months, exact dates have to be agreed with the organisation. There is no set pattern for the delivery location but at least one module is run at Cranfield and the University aim to facilitate requests for visits to organisations of interest to the client.

7. Course Level Assessment Strategy[5]

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The initial modules introduce students to the rigour of academic writing, and assessments are in the form of essays and reports. These will be of varying lengths, recognising that writing articles of a short length can actually be more challenging and can develop different

[4] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[5] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

skills relevant to professional practice. The length of each assessment task is clearly stated within the module descriptor and the requirements for each will be discussed by the module leader. Some modules will include a number of formative tasks including group discussions, case studies, and oral presentations. Formative feedback is given verbally within the classroom following discussions and presentations, and written feedback given for submitted assignments.

Students have opportunities to develop their communication skills, as they are required to give both group and individual presentations. The ability to work effectively in groups is a highly desirable skill and this is developed throughout the course, specifically through the two group projects. The taught components precede the research project, so assessment can be used to develop skills required for the thesis phase. The two group projects help develop skills in reviewing literature, developing appropriate research methods, collecting and analysing data, and drawing appropriate conclusions. This builds the skills necessary for the individual thesis, where students are generally expected to be more self-directed in their learning, whilst being guided by an academic supervisor. The 10,000-word thesis is expected to be both academically rigorous and beneficial to their organisation in terms of addressing a specific business issue.

Course modules – AON Cohort 1 – Occurrence H

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Independent Assessment		Multi-part Assessment			Submission dates	
													Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments[10](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
Year 1																			
1		MXS/PD1 H20	Personal Development 1	Richard Kwiatkowski	16	15	10	N		19/10/20	22/10/20	40	ICW	100				02/09/21	
2		MXS/FAC H20	Finance and Accounting	Keith Parker	16	15	10	N		10/02/21	12/02/21	40	ICW	100				22/03/21	
3		MXS/SMG H20	Strategic Management 1	Imran Zawwa	16		10	N		07/12/20	10/12/20	40			MULTI 100	GCW ICW	80 20	25/01/21	

[6] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[7] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[8] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[9] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[10] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[11] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[12] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments[10](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
4		MXS/OBV H20	Organisational Behaviour	Deirdre Anderson	16	15	10	N		23/03/21	25/03/21	40	ICW	100				10/05/21	
5		MXS/GP1 H20	Group Project Challenge and Action Learning 1	Philippa Thurgur	16	15	10	Y		19/10/20	22/10/20	40	GCW GPRES ICW	60 20 20				12/07/21 19/07/21 23/07/21	
6		MXS/PD2 H21	Personal Development 2	Richard Kwiatkowski	16	15	10	N		13/09/21	15/09/21	40	ICW	100				09/05/22	
7		MXS/CMG H21	Change Management	Sergio Pellegrinelli	16	15	10	N		17/01/22	19/01/22	40	ICW	100				07/03/22	
8		MXS/LDS H21	Leadership	Jacqueline Drake	16		10	N		16/05/22	18/05/22	40	ICW	100				27/06/22	
9		MXS/GP2 H21	Group Project Challenge and Action Learning 2	Philippa Thurgur	16	15	10	N		13/09/21	15/09/21	40	GCW GPRES ICW	60 20 20				06/06/22 13/06/22 16/06/22	
10		MXS/SM2 H21	Strategic Management 2	Imran Zawwa	16		10	N		15/11/21	17/11/21	40	GPRES	100				04/01/22	
11		M-T/LCS Occ H	Leading Corporate Sustainability	Rosina Watson	16		10	Y		Not running		40	ICW	100					
12		MXM/MKT Occ H	Strategic Marketing	Emma Macdonald	16		10	Y		Not running		40	ICW	100					

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments[10](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
13		MXM/SOM Occ H	Strategic Operations Management	Abdelkader Aoufi	16		10	Y		14/03/22	16/03/22	40	GCW	100				03/05/22	
14		M-M/DVSC Occ H	Driving Value through the Supply Chain	Mike Bernon	16		10	Y		Not running		40	ICW	100					
15		M-M/SHR Occ H	Strategic Human Resource Management in the 21st Century	Frank Horwitz	16		10	Y		Not running		40	ICW	100					
16		MXM/ECBS Occ H	Economics and Business Strategy	Catarina Figueira	16		10	Y		Not running		40	GCW	100					
17		M-M/LSO Occ H	Leading Sales and Customer Management Organisations	Javier Marcos	16		10	Y		Not running		40	ICW	100					
18		M-M/-MSI Occ H	Managing Strategic Innovation	Imran Zawwa	16		10	Y		Not running		40	ICW	100					
19		MXS-CCC Occ H	Customer Centricity	Stan Maklan	16		10	N		14/06/21	16/06/21	40	GCW	100				06/09/21	
20		MXS/RMS H20	Research Methods	Mikko Arevuo	16	15	0	N		19/10/20	27/06/22	N/A	AO					N/A	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent assessments	Weighting within module of multi-part assessments[10](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
21		MXS/THSH21	Thesis	Mikko Arevuo	0		80	N		27/06/22	17/04/23	50	THESIS	100				17/04/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
MXM/MKT	Strategic Marketing	Executive MBA	Business and Strategic Leadership
MXM/SOM	Strategic Operations Management	Executive MBA	Business and Strategic Leadership
M-M/DVSC	Driving Value through the Supply Chain	FT MBA	Executive MBA; Business and Strategic Leadership
M-M/SHR	Strategic Human Resource Management in the 21st Century	MBA;	Executive MBA ; Business and Strategic Leadership
M-M/MSI	Managing Strategic Innovation	MBA;	Executive MBA ; Business and Strategic Leadership
MXM/ECBS	Economics and Business Strategy	Executive MBA	Business and Strategic Leadership
M-M/LSO	Leading Sales and Customer Management Organisations	FT MBA	Executive MBA; Business and Strategic Leadership
MXS/GP1	Group Project Challenge and Action Learning	Business and Strategic Leadership	Retail and Digital Banking
M-T/LCS	Leading Corporate Sustainability	Management	MCS, BSL, ELSCM

8. How are the ILOs assessed?

The following assessment types are utilised:

Taught module assessment on the course is predominantly through assignment. Assignments are set by individual module co-ordinators for the certificate and diploma subjects. The thesis is based 100% on the written submission which falls within the University guidelines that an MSc thesis should be >30% of the overall assessment weighting. This weighting will also impress on students the importance of the written thesis and reinforce their understanding that a poor thesis (R&R or failing) cannot be compensated for by an exceptional presentation.

The use of assignments as opposed to exams which require the application of knowledge to their own organisation produces more tangible benefits inside the organisation, and helps to ensure they have moved from knowledge accumulation to learning. The move to splitting assessments for personal development and the group project is to support the need to learn throughout these subjects and ensure application of learning to themselves or the group theme.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

	PgCert				PgDip				MSc		
Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8	ILO9	ILO10	ILO11
1			X				X	X			
2	X				X						
3	X	X			X						
4	X	X	X		X			X			
5		X	X	X	X	X	X	X	X	X	
6		X	X			X		X			
7	X	X	X	X	X	X					
8		X			X	X	X				
9			X	X	X	X	X	X	X	X	
10	X	X			X	X			X		
11	X				X		X				
12	X				X						
13	X				X						
14	X				X						
15	X				X				X		
16	X				X						
17	X			X	X						
18									X	X	
19	X	X		X	X		X		X	X	
20									X	X	
21									X	X	X

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and

procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. <u>What opportunities are graduates likely to have on completing the course?</u>

This is a closed corporate course with all participants directly sponsored onto the programme by their organisation. These participants have been selected for capability and leadership development and on completing the course can expect to be promoted to significant and/or senior roles.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: August 2020

1. What is the course?

Course information

Course Title	Business and Strategic Leadership *(BBC Cohort 1 Occurrence G)*
Course code	MSBSLPTC, PDBSLPTC, PCBSLPTC, MSBSLPAC
Academic Year	2020/21
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	PgDip, PgCert
Mode of delivery	Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Management
Theme	Leadership and Management
Centre	CED
Course Director	Mikko Arevuo, Philippa Thurgur
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	Yes
Apprenticeship Standard the course is mapped to	Level 7 Senior Leaders
Is the Degree apprenticeship integrated or non-integrated?	Non-integrated
Is the Mastership offered as an open and/or closed course?	Closed
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	MSc - part-time - maximum of 5 years
Course Start Month(s)	September 2020

Institutions delivering the course

This course is delivered by the Centre for Customised Executive Development, School of Management. The research interests include: management, leadership and change management.

This is offered as a closed corporate programme and Cranfield interacts with the client in the following ways:

- Delivery locations are jointly agreed with the client but have to meet Cranfield's requirements
- Core modules are set but in consultation with the client the course can be customised to suit a specific industry or client need through the agreeing pre-scribed electives which the students have to take.
- Students will undertake their research and/or project work off campus, in their own work place.
- Teaching and assessing is provided by Cranfield faculty and Cranfield RTS Associates

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

What are the aims of the course?

Diploma (PgDip) and MSc entry levels. Exit routes are provided for students at the end of the certificate and diploma for those who wish to access only parts of the course provided.
The aims of the Certificate are:

- To develop participants' knowledge and awareness of business functions and disciplines relevant to being able to analyse a business in preparedness for strategic change.
- To enable participants to develop appropriate knowledge and skills to lead and or participate in the start of a change initiative in their organisation.

In addition, the aims of the Diploma are:

- To enable participants to gain a systematic understanding and apply their knowledge relating to strategy, change, and leadership in order they can critique the relevance of this understanding to their business context.
- To enable participants to lead both the formulation and implementation of a change programme demonstrating their ability to work effectively as individuals and as part of a team, resolving problems and communicating clearly.

In addition, the aims of the MSc are:

- To develop the participants capabilities to conduct independent research into an aspect of change management, strategy or leadership in a business context.
- To advance the participants understanding of strategic change to enable them to effectively critique and contribute to the development of their organisation.

This programme is intended for the following range of students:

- For those who have been in management positions in their client organisation or related network for at least 2 years and have relevant experience in organisations for a minimum of 5 years.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Business and Strategic Leadership

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Systematically assess and describe the strategic context of the business and be able to critically comment on the fit between business and functional strategies including finance, organisational structure, culture and values.

ILO 2. Critically evaluate a business's need and readiness for change.

ILO 3. Develop and apply the personal qualities and skills necessary to assess, influence and manage change; and to operate as an effective team member.

ILO 4. Demonstrate the ability to integrate knowledge and apply multi-disciplinary approaches to solve real-life business problems and to justify and communicate findings and recommendations with stakeholders in a professional manner.

B. Postgraduate Diploma in Business and Strategic Leadership

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Select, justify, apply and adapt theories, and diagnostic techniques relevant to change, strategy and leadership.

ILO 6. Develop and demonstrate leadership and advocacy qualities in designing and implementing a cross functional strategic change initiative within a business.

ILO 7. Communicate clearly in a leadership role in an organisation change management context and to engage with key stakeholder concerns.

ILO 8. Develop team working skills in themselves and support others to improve the overall performance of a team.

C. MSc in Business and Strategic Leadership

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Demonstrate the ability to identify appropriate management frameworks for an issue or situation under consideration and apply tools and techniques accurately.

ILO 10. Display practical capabilities in self-directed research, data gathering, data analysis and interpretation, report writing and presentation skills.

ILO 11. Produce a high quality thesis and critically evaluate the interpretations of the data and to effectively communicate the results.

4. How is the course taught?

The course is taught with a mixture of lectures, case studies, experiential exercises primarily. The method of teaching includes face to face, use of webinars and webcasts.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8.

Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Diploma Business and Strategic Leadership

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
1-9	100
ELECTIVE MODULES[1]:	
Two elements from 10-18 (agreed by client during contract negotiations)	20
TOTAL:	120

B. MSc Business and Strategic Leadership

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
1-9 19 20	100 AO 80
ELECTIVE MODULES:	
Two elements from 10-18 (agreed by client during contract negotiations)	20
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

As this is a corporate (closed) course elective modules, exact dates and venues have to be agreed with the client.

Given the applied nature of the programme modules take place roughly every 2 to 3 months, exact dates have to be agreed with the organisation. There is no set pattern for the delivery location but at least one module is run at Cranfield and the University aim to facilitate requests for visits to organisations of interest to the client.

7. Course Level Assessment Strategy[4]

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The initial modules introduce students to the rigour of academic writing, and assessments are in the form of essays and reports. These will be of varying lengths, recognising that writing articles of a short length can actually be more challenging and can develop different skills relevant to professional practice. The length of each assessment task is clearly stated within the module descriptor and the requirements for each will be discussed by the module leader. Some modules will include a number of formative tasks including group discussions, case studies, and oral presentations. Formative feedback is given verbally within the classroom following discussions and presentations, and written feedback given for submitted assignments.

Students have opportunities to develop their communication skills, as they are required to give both group and individual presentations. The ability to work effectively in groups is a highly desirable skill and this is developed throughout the course, specifically through the two group projects. The taught components precede the research project, so assessment can be used to develop skills required for the thesis phase. The Group Project Challenge and Action Learning help develop skills in reviewing literature, developing appropriate research methods, collecting and analysing data, and drawing appropriate conclusions. This builds the skills necessary for the individual thesis, where students are generally expected to be more self-directed in their learning, whilst being guided by an academic supervisor. The 10,000-word thesis is expected to be both academically rigorous and beneficial to their organisation in terms of addressing a specific business issue.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules – BBC Cohort 1 – Occurrence G

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1		MXS/PD1 G20	Personal Development 1	Richard Kwiatkowski	16	15	10	N		02/12/20	06/06/21	40	ICW	100				01/07/21	
2		MXS/FAC G20	Finance and Accounting	Keith Parker	16	15	10	N		18/01/21	20/01/21	40	ICW	100				01/03/21	
3		MXS/SMG G20	Strategic Management 1	John Glen	16		10	N		28/09/20	01/10/20	40	GCW	100				09/11/20	
4		MXS/OBV G20	Organisational Behaviour	Deirdre Anderson	16	15	10	N		09/03/21	11/03/21	40	ICW	100				26/04/21	

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*).* If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
5		MXS/PD2 G21	Personal Development 2	Richard Kwiatkowski	16	15	10	N		07/09/21	05/05/22	40	ICW	100				16/05/22	
6		MXS/CMG G20	Change Management	Sergio Pellegrinelli	16	15	10	N		16/11/20	19/11/20	40	ICW	100				04/01/21	
7		MXS/LDS G21	Leadership	Jacqueline Drake	16		10	N		03/05/22	05/05/22	40	ICW	100				13/06/22	
8		MXS/GPA G21	Group Project Challenge and Action Learning	Philippa Thurgur	16	15	20	N		07/09/21	07/09/21	40	GCW GPRES ICW	60 20 20				20/06/22	
9		MXS/SM2 G21	Strategic Management 2	Kevin Morrell	16		10	N		09/11/21	11/11/21	40	GPRES	100				04/01/22	
10		M-T/LCS Occ G	Leading Corporate Sustainability	Rosina Watson	16		10	Y		07/06/21	09/06/21	40	ICW	100				19/07/21	
11		MXM/MKT Occ G	Strategic Marketing	Emma Macdonald	16		10	Y		Not running		40	ICW	100					
12		MXM/SOM Occ G	Strategic Operations Management	Abdelkader Aoufi	16		10	Y		Not running		40	GCW	100					
13		M-M/DVSC Occ G	Driving Value through the Supply Chain	Mike Bernon	16		10	Y		Not running		40	ICW	100					
14		M-M/SHR Occ G	Strategic Human	Frank Horwitz	16		10	Y		Not running		40	ICW	100					

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number		Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
15		MXM/ECBS Occ G	Economics and Business Strategy	Catarina Figueira	16		10	Y		Not running		40	GCW	100					
16		M-M/LSO Occ G	Leading Sales Organisations	Javier Marcos	16		10	Y		Not running		40	ICW	100					
17		M-M/-MSI Occ G	Managing Strategic Innovation	Mike Sutliff	16		10	Y		12/01/22	14/01/22	40	GCW	100				21/02/22	
18		MXS-CCC Occ G	Customer Centricity	Stan Maklan	16		10	N		Not running		40	GCW	100					
19		MXS/RMS G20	Research Methods	Mikko Arevuo	16	15	0	N		28/09/20	13/06/22	N/A	AO					N/A	
20		MXS/THS G21	Thesis	Mikko Arevuo	0		80	N		13/06/22	27/03/23	50	THESIS	100				27/03/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
MXM/MKT	Strategic Marketing	Executive MBA	Business and Strategic Leadership
MXM/SOM	Strategic Operations Management	Executive MBA	Business and Strategic Leadership
M-M/DVSC	Driving Value through the Supply Chain	MBA	Executive MBA; Business and Strategic Leadership
M-M/SHR	Strategic Human Resource Management in the 21st Century	MBA;	Executive MBA ; Business and Strategic Leadership
M-M/MSI	Managing Strategic Innovation	MBA;	Executive MBA ; Business and Strategic Leadership
MXM/ECBS	Economics and Business Strategy	Executive MBA	Business and Strategic Leadership
M-M/LSO	Leading Sales Organisations	MBA	Executive MBA; Business and Strategic Leadership
M-T/LCS	Leading Corporate Sustainability	MSc Management	Management and Human Resource Management, Management and Corporate Sustainability, Business and Strategic Leadership, Management and Leadership, Food Systems and Management, Environment Management for Business, Global Environmental Change

8. How are the ILOs assessed?

The following assessment types are utilised:

Taught module assessment on the course is predominantly through assignment. Assignments are set by individual module co-ordinators for the certificate and diploma subjects. The thesis is based 100% on the written submission which falls within the University guidelines that an MSc thesis should be >30% of the overall assessment weighting. This weighting will also impress on students the importance of the written thesis and reinforce their understanding that a poor thesis (R&R or failing) cannot be compensated for by an exceptional presentation.

The use of assignments as opposed to exams which require the application of knowledge to their own organisation produces more tangible benefits inside the organisation, and helps to ensure they have moved from knowledge accumulation to learning. The move to splitting assessments for personal development and the group project is to support the need to learn throughout these subjects and ensure application of learning to themselves or the group theme.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

	PgCert				PgDip				MSc		
Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8	ILO9	ILO10	ILO11
1			X				X	X			
2	X				X						
3	X	X			X						
4	X	X	X		X			X			
5		X	X			X		X			
6	X	X	X	X	X	X					
7		X			X	X	X				
8			X	X	X	X	X	X	X	X	
9	X	X			X	X			X		
10	X				X		X				
11	X				X						
12	X				X						
13	X				X						
14	X				X				X		
15	X				X						
16	X			X	X						
17									X	X	
18	X	X		X	X		X		X	X	
19									X	X	
20									X	X	X

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic

staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

This is a closed corporate course with all participants directly sponsored onto the programme by their organisation. These participants have been selected for capability and leadership development and on completing the course can expect to be promoted to significant and/or senior roles.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: October 2020

1. What is the course?

Course information

Course Title	Business and Strategic Leadership - BBC Cohort 2 (O, P, Q)
Course code	MSBSLPAC
Academic Year	2020/21
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	PgDip, PgCert
Mode of delivery	Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Management
Theme	Leadership and Management
Centre	CED
Course Director	Mikko Arevuo, Philippa Thurgur
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	Yes
Apprenticeship Standard the course is mapped to	Level 7 Senior Leaders
Is the Degree apprenticeship integrated or non-integrated?	Non-integrated
Is the Mastership offered as an open and/or closed course?	Closed
Teaching Institution	Cranfield University
Admissions body	Cranfield University

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	N/A
Registration Period(s) available	MSc - part-time - maximum of 5 years
Course Start Month(s)	November 2020

Institutions delivering the course

This course is delivered by the Centre for Customised Executive Development, School of Management. The research interests include: management, leadership and change management.

This is offered as a closed corporate programme and Cranfield interacts with the client in the following ways:

- Delivery locations are jointly agreed with the client but have to meet Cranfield's requirements
- Core modules are set but in consultation with the client the course can be customised to suit a specific industry or client need through the agreeing pre-scribed electives which the students have to take.
- Students will undertake their research and/or project work off campus, in their own work place.
- Teaching and assessing is provided by Cranfield faculty and Cranfield RTS Associates

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

What are the aims of the course?

Diploma (PgDip) and MSc entry levels. Exit routes are provided for students at the end of the certificate and diploma for those who wish to access only parts of the course provided.
The aims of the Certificate are:

- To develop participants' knowledge and awareness of business functions and disciplines relevant to being able to analyse a business in preparedness for strategic change.
- To enable participants to develop appropriate knowledge and skills to lead and or participate in the start of a change initiative in their organisation.

In addition, the aims of the Diploma are:

- To enable participants to gain a systematic understanding and apply their knowledge relating to strategy, change, and leadership in order they can critique the relevance of this understanding to their business context.
- To enable participants to lead both the formulation and implementation of a change programme demonstrating their ability to work effectively as individuals and as part of a team, resolving problems and communicating clearly.

In addition, the aims of the MSc are:

- To develop the participants capabilities to conduct independent research into an aspect of change management, strategy or leadership in a business context.
- To advance the participants understanding of strategic change to enable them to effectively critique and contribute to the development of their organisation.

This programme is intended for the following range of students:

- For those who have been in management positions in their client organisation or related network for at least 2 years and have relevant experience in organisations for a minimum of 5 years.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Business and Strategic Leadership

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Systematically assess and describe the strategic context of the business and be able to critically comment on the fit between business and functional strategies including finance, organisational structure, culture and values.

ILO 2. Critically evaluate a business's need and readiness for change.

ILO 3. Develop and apply the personal qualities and skills necessary to assess, influence and manage change; and to operate as an effective team member.

ILO 4. Demonstrate the ability to integrate knowledge and apply multi-disciplinary approaches to solve real-life business problems and to justify and communicate findings and recommendations with stakeholders in a professional manner.

B. Postgraduate Diploma in Business and Strategic Leadership

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Select, justify, apply and adapt theories, and diagnostic techniques relevant to change, strategy and leadership.

ILO 6. Develop and demonstrate leadership and advocacy qualities in designing and implementing a cross functional strategic change initiative within a business.

ILO 7. Communicate clearly in a leadership role in an organisation change management context and to engage with key stakeholder concerns.

ILO 8. Develop team working skills in themselves and support others to improve the overall performance of a team.

C. MSc in Business and Strategic Leadership

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Demonstrate the ability to identify appropriate management frameworks for an issue or situation under consideration and apply tools and techniques accurately.

ILO 10. Display practical capabilities in self-directed research, data gathering, data analysis and interpretation, report writing and presentation skills.

ILO 11. Produce a high quality thesis and critically evaluate the interpretations of the data and to effectively communicate the results.

4. How is the course taught?

The course is taught with a mixture of lectures, case studies, experiential exercises primarily. The method of teaching includes face to face, use of webinars and webcasts.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8.

Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. **Postgraduate Diploma Business and Strategic Leadership**

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	**Credits**
COMPULSORY MODULES:	
1-9	100
ELECTIVE MODULES[1]:	
Two elements from 10-18 (agreed by client during contract negotiations)	20
TOTAL:	120

B. MSc Business and Strategic Leadership

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	
1-9 19 20	100 AO 80
ELECTIVE MODULES:	
Two elements from 10-18 (agreed by client during contract negotiations)	20
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

As this is a corporate (closed) course elective modules, exact dates and venues have to be agreed with the client.

Given the applied nature of the programme modules take place roughly every 2 to 3 months, exact dates have to be agreed with the organisation. There is no set pattern for the delivery location but at least one module is run at Cranfield and the University aim to facilitate requests for visits to organisations of interest to the client.

7. Course Level Assessment Strategy[4]

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. The initial modules introduce students to the rigour of academic writing, and assessments are in the form of essays and reports. These will be of varying lengths, recognising that writing articles of a short length can actually be more challenging and can develop different skills relevant to professional practice. The length of each assessment task is clearly stated within the module descriptor and the requirements for each will be discussed by the module leader. Some modules will include a number of formative tasks including group discussions, case studies, and oral presentations. Formative feedback is given verbally within the classroom following discussions and presentations, and written feedback given for submitted assignments.

Students have opportunities to develop their communication skills, as they are required to give both group and individual presentations. The ability to work effectively in groups is a highly desirable skill and this is developed throughout the course, specifically through the two group projects. The taught components precede the research project, so assessment can be used to develop skills required for the thesis phase. The Group Project Challenge and Action Learning help develop skills in reviewing literature, developing appropriate research methods, collecting and analysing data, and drawing appropriate conclusions. This builds the skills necessary for the individual thesis, where students are generally expected to be more self-directed in their learning, whilst being guided by an academic supervisor. The 10,000-word thesis is expected to be both academically rigorous and beneficial to their organisation in terms of addressing a specific business issue.

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules – BBC Cohort 2 – 3 streams – O, P, Q occurrences

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number	STREAM	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments[9] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	1	MXS/PD1 O20	Personal Development 1	Chia-Yu Kou-Barrett	16	15	10	N		21/01/21	14/06/21	40	ICW	100				04/10/21	
	2	MXS/PD1 P20	Personal Development 1	Chia-Yu Kou-Barrett	16	15	10	N		28/01/21	28/06/21	40	ICW	100				11/10/21	
	3	MXS/PD1 Q20	Personal Development 1	Chia-Yu Kou-Barrett	16	15	10	N		04/02/21	05/07/21	40	ICW	100				18/10/21	
2	1	MXS/FAC O20	Finance and Accounting	Keith Parker	16	15	10	N		19/04/21	23/04/21	40	ICW	100				07/06/21	

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear androgogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	STREAM	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
	2	MXS/FACP20	Finance and Accounting	Keith Parker	16	15	10	N		04/05/21	07/05/21	40	ICW	100				21/06/21	
	3	MXS/FACQ20	Finance and Accounting	Keith Parker	16	15	10	N		10/05/21	14/05/21	40	ICW	100				28/06/21	
3	1	MXS/SMGO20	Strategic Management 1	John Glen	16		10	N		17/01/22	20/01/22	40	GCW	100				28/02/22	
	2	MXS/SMGP20	Strategic Management 1	John Glen	16		10	N		24/01/22	27/01/22	40	GCW	100				07/03/22	
	3	MXS/SMGQ20	Strategic Management 1	John Glen	16		10	N		21/01/22	03/02/22	40	GCW	100				14/03/22	
4	1	MXS/OBVO20	Organisational Behaviour	Deirdre Anderson	16	15	10	N		05/07/21	08/07/21	40	ICW	100				06/09/21	
	2	MXS/OBVP20	Organisational Behaviour	Deirdre Anderson	16	15	10	N		12/07/21	15/07/21	40	ICW	100				13/09/21	
	3	MXS/OBVQ20	Organisational Behaviour	Deirdre Anderson	16	15	10	N		19/07/21	22/07/21	40	ICW	100				20/09/21	
5	1	MXS/PD2O21	Personal Development 2	Richard Kwiatkowski	16	15	10	N		10/01/22	20/06/22	40	ICW	100				05/09/22	
	2	MXS/PD2P21	Personal Development 2	Richard Kwiatkowski	16	15	10	N		20/01/22	28/06/22	40	ICW	100				12/09/22	
	3	MXS/PD2Q21	Personal Development 2	Richard Kwiatkowski	16	15	10	N		27/01/22	05//07/22	40	ICW	100				19/09/22	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	STREAM	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
6	1	MXS/CMG O20	Change Management	Sergio Pellegrinelli	16	15	10	N		01/03/21	04/03/21	40	ICW	100				19/04/21	
	2	MXS/CMG P20	Change Management	Sergio Pellegrinelli	16	15	10	N		08/03/21	11/03/21	40	ICW	100				26/04/21	
	3	MXS/CMG Q20	Change Management	Sergio Pellegrinelli	16	15	10	N		22/03/21	25/03/21	40	ICW	100				03/05/21	
7	1	MXS/LDS O21	Leadership	Jacqueline Drake	16		10	N		06/06/22	09/06/22	40	ICW	100				11/07/22	
	2	MXS/LDS P21	Leadership	Jacqueline Drake	16		10	N		13/06/22	16/03/22	40	ICW	100				18/07/22	
	3	MXS/LDS Q21	Leadership	Jacqueline Drake	16		10	N		20/06/22	23/06/22	40	ICW	100				25/07/22	
8	1	MXS/GPA O21	Group Project Challenge and Action Learning	Philippa Thurgur	16	15	20	N		29/11/21	02/12/21	40	GCW GPRES ICW	60 20 20				03/10/22 10/10/22 24/10/22	
	2	MXS/GPA P21	Group Project Challenge and Action Learning	Philippa Thurgur	16	15	20	N		06/12/21	09/12/21	40	GCW GPRES ICW	60 20 20				17/10/22 24/10/22 07/11/22	
	3	MXS/GPA Q21	Group Project Challenge and Action Learning	Philippa Thurgur	16	15	20	N		13/12/21	16/12/21	40	GCW GPRES ICW	60 20 20				24/10/22 31/11/22 14/11/22	
9	1	MXS/SM2 O21	Strategic Management 2	Kevin Morrell	16		10	N		07/03/22	20/01/22	40	GPRES	100				25/04/22	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	STREAM	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
	2	MXS/SM2 P21	Strategic Management 2	Kevin Morrell	16		10	N		14/03/22	17/03/22	40	GPRES	100				03/05/22	
	3	MXS/SM2 Q21	Strategic Management 2	Kevin Morrell	16		10	N		21/03/22	24/03/22	40	GPRES	100				03/05/22	
10	1	M-T/LCS O21	Leading Corporate Sustainability	Rosina Watson	16		10	Y		13/09/21	16/09/21	40	ICW	100				01/11/21	
	2	M-T/LCS P21	Leading Corporate Sustainability	Rosina Watson	16		10	Y		20/09/21	23/09/21	40	ICW	100				08/11/21	
	3	M-T/LCS Q21	Leading Corporate Sustainability	Rosina Watson	16		10	Y		27/09/21	30/09/21	40	ICW	100				15/11/21	
11		MXM/MKT	Strategic Marketing	Emma Macdonald	16		10	Y		Not running		40	ICW	100					
12		MXM/SOM Oc	Strategic Operations Management	Abdelkader Aoufi	16		10	Y		Not running		40	GCW	100					
13		M-M/DVSC	Driving Value through the Supply Chain	Mike Bernon	16		10	Y		Not running		40	ICW	100					
14		M-M/SHR	Strategic Human	Frank Horwitz	16		10	Y		Not running		40	ICW	100					

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	STREAM	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
15		MXM/ECBS	Economics and Business Strategy	Catarina Figueira	16		10	Y		Not running		40	GCW	100					
16		M-M/LSO	Leading Sales Organisations	Javier Marcos	16		10	Y		Not running		40	ICW	100					
17	1	M-M/-MSI O21	Managing Strategic Innovation	Mike Sutliff	16		10	Y		25/04/22	27/04/22	40	GCW	100				06/06/22	
	2	M-M/-MSI P21	Managing Strategic Innovation	Mike Sutliff	16		10	Y		03/05/22	05/05/22	40	GCW	100				13/06/22	
	3	M-M/-MSI Q21	Managing Strategic Innovation	Mike Sutliff	16		10	Y		09/05/22	12/05/22	40	GCW	100				20/06/22	
18		MXS-CCC	Customer Centricity	Stan Maklan	16		10	N		Not running		40	GCW	100					
19	1	MXS/RMS O21	Research Methods	Mikko Arevuo	16	15	0	N		11/07/22	24/10/22	N/A	AO					N/A	
	2	MXS/RMS P21	Research Methods	Mikko Arevuo	16	15	0	N		18/07/22	07/11/22	N/A	AO					N/A	
	3	MXS/RMS Q21	Research Methods	Mikko Arevuo	16	15	0	N		25/07/22	14/11/22	N/A	AO					N/A	
20	1	MXS/THS O21	Thesis	Mikko Arevuo	0		80	N		24/10/22	30/05/23	50	THESIS	100				30/05/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	STREAM	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
													Independent Assessment		Multi-part Assessment			Submission dates	
									Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[10]	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
	2	MXS/THS P21	Thesis	Mikko Arevuo	0		80	N		07/11/22	30/05/23	50	THESIS	100				30/05/23	
	3	MXS/THS Q21	Thesis	Mikko Arevuo	0		80	N		14/11/22	30/05/23	50	THESIS	100				30/05/23	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
MXM/MKT	Strategic Marketing	Executive MBA	Business and Strategic Leadership
MXM/SOM	Strategic Operations Management	Executive MBA	Business and Strategic Leadership
M-M/DVSC	Driving Value through the Supply Chain	MBA	Executive MBA; Business and Strategic Leadership
M-M/SHR	Strategic Human Resource Management in the 21st Century	MBA;	Executive MBA ; Business and Strategic Leadership
M-M/MSI	Managing Strategic Innovation	MBA;	Executive MBA ; Business and Strategic Leadership
MXM/ECBS	Economics and Business Strategy	Executive MBA	Business and Strategic Leadership
M-M/LSO	Leading Sales Organisations	MBA	Executive MBA; Business and Strategic Leadership
M-T/LCS	Leading Corporate Sustainability	MSc Management	Management and Human Resource Management, Management and Corporate Sustainability, Business and Strategic Leadership, Management and Leadership, Food Systems and Management, Environment Management for Business, Global Environmental Change

8. How are the ILOs assessed?

The following assessment types are utilised:

Taught module assessment on the course is predominantly through assignment. Assignments are set by individual module co-ordinators for the certificate and diploma subjects. The thesis is based 100% on the written submission which falls within the University guidelines that an MSc thesis should be >30% of the overall assessment weighting. This weighting will also impress on students the importance of the written thesis and reinforce their understanding that a poor thesis (R&R or failing) cannot be compensated for by an exceptional presentation.

The use of assignments as opposed to exams which require the application of knowledge to their own organisation produces more tangible benefits inside the organisation, and helps to ensure they have moved from knowledge accumulation to learning. The move to splitting assessments for personal development and the group project is to support the need to learn throughout these subjects and ensure application of learning to themselves or the group theme.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

	PgCert				PgDip				MSc		
Award ILOs Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8	ILO9	ILO10	ILO11
1			X				X	X			
2	X				X						
3	X	X			X						
4	X	X	X		X			X			
5		X	X			X		X			
6	X	X	X	X	X	X					
7		X			X	X	X				
8			X	X	X	X	X	X	X	X	
9	X	X			X	X			X		
10	X				X		X				
11	X				X						
12	X				X						
13	X				X						
14	X				X				X		
15	X				X						
16	X			X	X						
17									X	X	
18	X	X		X	X		X		X	X	
19									X	X	
20									X	X	X

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels

are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. <u>What opportunities are graduates likely to have on completing the course?</u>

This is a closed corporate course with all participants directly sponsored onto the programme by their organisation. These participants have been selected for capability and leadership development and on completing the course can expect to be promoted to significant and/or senior roles.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: February 2021

1. What is the course?

Course information

Course Title	Computational and Software Techniques in Engineering with options in: Computational Engineering Design (CED) Computational Intelligence for Data Analytics (CIDA) Computer and Machine Vision (CMV) Software Engineering for Technical Computing (SETC)
Course code	MSCSTFTC, MSCSTPTC, MSSTBFTC (ESTIA variant), PDCSTFTC, PDCSTPTC, PDSTBFTC, PCCSTFTC, PCCSTPTC, PCSTBFTC
Academic Year	2022/2023
Valid entry routes	MSc
Additional exit routes	PgDip, PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield and Biarritz, France (in respect of the ESTIA variant)
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Computational Engineering Sciences
Course Director	Dr Irene Moulitsas
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	**No**
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - up to three years
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by The School of Aerospace, Transport and Manufacturing, Aerospace Theme, Centre for Computational Engineering Sciences where the research interests include:

- Computer Vision
- Machine Learning
  Artificial Intelligence
- Computational Engineering
- High Performance Computing
- Scientific Computing
- Software Engineering
- Mathematical Modelling
- Computational Fluid Dynamics

Cranfield University interacts with the following institutions and in the following ways:

A variant of the course is delivered partly at ESTIA, Institute of Technology, an engineering school based in Biarritz, France. ESTIA (École Supérieure des Technologies Industrielles Avancées) has been sending students to study the Cranfield MSc in Computational and Software Techniques in Engineering since 1989. The ESTIA variant allocates 10 credits for the 'C++ Programming' module as opposed to Attendance Only the Cranfield option. This is balanced by ESTIA students not taking the Management for Technology module. Some modules of the course are delivered on-site by Cranfield staff. Students can elect to undertake an individual project locally.

The course has a strong association with a number of EU academic institutions that regularly supply students onto the MSc through the European Partnership Programme. Students follow the course as part of a double degree arrangement with their home institution whereby the final year of their five year programme is replaced with the MSc here at Cranfield. Successful completion of the MSc allows the student to graduate from both Universities. The strongest of these associations is with ESTIA. They send typically 30 students each year onto the MSc. ESTIA students can only register for the CED and CMV options.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

Computational Engineering Design, Computer and Machine Vision, and Software Engineering for Technical Computing are accredited by the Institution of Engineering and Technology (IET) until August

2025 on behalf of the Engineering Council as meeting the requirements for Further Learning for registration as a Chartered Engineer (CEng). Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- Equip graduates with the knowledge, understanding and skills required to enable them to meet the demand of an evolving workplace that requires highly qualified engineers possessing core software engineering skills together with competency in mathematical analysis techniques.

Develop suitably trained and qualified engineers, scientists and mathematicians enabling them to apply the analytical, computational and software skills to the solution of practical engineering IT problems in industrial, commercial and governmental organisations.
More specifically, for each of the options of this course:

- Computational Engineering Design

Computational engineering design plays a fundamental role in the design and manufacture of a diverse range of products for global industries, including automotive, aerospace, oil, defence and health. This option is ideal for those with engineering and applied mathematical backgrounds, and those with mathematical and computational sciences training, who wish to develop and complement their existing skill sets. You will gain programming techniques and practical skills necessary to develop and employ core CAD and CAE solution software relevant to design and physical simulations in diverse industrial settings.

- Computational Intelligence for Data Analytics

Computationally intelligent data handling algorithms are crucial in a wide range of sectors that require fast and automated decision-making. These industries typically include financial, manufacturing, aerospace, automotive and defence. The option aim is to develop a solid base of computer science skills and focused expertise, necessary to develop fast algorithms capable of dealing with a range of complex problems where intelligent decision-making or future predictions are based on understanding of data collections. You will focus on the enabling technologies aspects of the study area, namely high performance and cloud computing and algorithm development related to machine learning and data analytics.

- Computer and Machine Vision

Computer and Machine Vision (CMV) systems are playing a vital role in today's digital economy. The flow of data from an ever-increasing network of cameras, sensors, devices and autonomous systems require intelligent vision and signal analysis techniques for decision making. This option focuses on aerial and robotic vision-based systems and covers the theory and application of signal processing and CMV algorithms for the analysis, interpretation and processing of data. You will gain programming experience and practical skills in computer vision software and further apply them in fields such as computer vision, robotics, autonomous vehicles, condition monitoring, medical devices, remote sensing and data visualisation.

- Software Engineering for Technical Computing

With today's sophisticated and powerful computer environments, the techniques needed to develop and produce the software to run on these systems are themselves becoming increasingly complex. This option provides a unique insight into the development of computer applications across modern computing environments, from multi-core CPUs to specialist GPUs to cloud computing. The core modules provide the basis of this course and act as a starting point for specialist modules to then be introduced. The various computational technology platforms are covered, giving you both theoretical and hands-on experience of programming.

This programme is intended for the following range of students:

- UK students with an honours degree in Engineering, Computer Science, Mathematics, Physics.
- Mature students with at least 5 years relevant industrial experience.

- Students studying at recognised EU Universities with at least 4 years of relevant academic study.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Critically evaluate the selection of computer languages, software tools, and technologies

ILO 2. Apply appropriate computer languages, software tools, and technologies to help solve practical problems of a computational nature in engineering solutions.

ILO 3. Create original software solutions to engineering problems using industry standard libraries, packages, and software engineering tools.

ILO 4. Compose written reports and/or prepare and deliver oral presentations to effectively communicate proposals, solutions, technical developments, and results.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Plan and implement assigned projects under time pressure, and undertake self-directed learning when necessary.

ILO 6. Assemble a body of relevant technical literature and discuss and evaluate each work with respect to a technical problem.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO7. Propose, plan, and implement an independent research project on a relevant technical topic, with limited supervision.

ILO 8. Critically evaluate project results, discuss findings, and relate their contribution to other works in the field.

4. How is the course taught?

Students will be supported in their learning and personal development by:

- A comprehensive set of carefully prepared lecture notes that form the basis for the teaching. This is perhaps the most valuable resource and reference point for the student starting a new module. Secondly, many lectures are given in conjunction with some form of programming. Students are encouraged, given time and practical assistance to develop their software skills.
  The library resources and search facilities here at Cranfield. A thorough introduction to these resources and demonstrations of information retrieval skills is provided at the beginning of the course. The library facilities are extensive and there is a good representative selection of, physical and online, books and periodicals relevant to the course. Where an article, book or periodical is not available, it can usually be obtained elsewhere via inter-library loans. Books, software and other resources are purchased by the group when it is necessary for one of the projects.

- A programme of seminars given by external and internal speakers is also provided for the Cranfield based students. These reflect the course, sponsoring companies and associated research carried out in the group enabling the students to get an appreciation of related work going on in industry and other universities.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 7. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Computational Engineering Design option, based at Cranfield

Description	Credits
COMPULSORY MODULES:	
ELECTIVE MODULES:	
60 credits from modules 2a, 3 – 6, 7a, 8, 9	60
TOTAL:	60

Computational Engineering Design option, based at ESTIA

Description	Credits
COMPULSORY MODULES:	
ELECTIVE MODULES:	
60 credits from modules 1b, 2b, 4 – 6. 7b, 8, 9	60
TOTAL:	60

Computational Intelligence for Data Analytics option

Description	Credits
COMPULSORY MODULES:	
ELECTIVE MODULES:	
60 credits from modules 3, 17, 18, 19, 23-26	60
TOTAL:	60

Computer and Machine Vision option, based at Cranfield

Description	Credits

COMPULSORY MODULES:	
ELECTIVE MODULES:	
60 credits from modules 2a, 3, 4, 11-15	60
TOTAL:	60

Computer and Machine Vision option, based at ESTIA

Description	**Credits**
COMPULSORY MODULES:	
ELECTIVE MODULES:	
60 credits from modules 1b, 2b, 4, 11 - 15	60
TOTAL:	60

Software Engineering for Technical Computing option

Description	**Credits**
COMPULSORY MODULES:	
ELECTIVE MODULES:	
60 credits from modules 2a, 3, 4 , 17 – 21	60
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules and group project as detailed below:

Computational Engineering Design option, based at Cranfield

Description	**Credits**
COMPULSORY MODULES:	
2a, 3 – 6, 7a, 8, 9 Group Project 10	80 40
ELECTIVE MODULES:	
None	
TOTAL:	120

Computational Engineering Design option, based at ESTIA

Description	**Credits**
COMPULSORY MODULES:	

1b, 2b, 4 – 6, 7b, 8, 9 Group Project 10	80 40
ELECTIVE MODULES:	
None	
TOTAL:	120

Computational Intelligence for Data Analytics option

Description	**Credits**
COMPULSORY MODULES:	
3, 17, 18, 19, 23-26 Group project 27	80 40
ELECTIVE MODULES:	
None	
TOTAL:	120

Computer and Machine Vision option, based at Cranfield

Description	**Credits**
COMPULSORY MODULES:	
2a, 3, 4, 11-15 Group Project 16	80 40
ELECTIVE MODULES:	
None	
TOTAL:	120

Computer and Machine Vision option, based at ESTIA

Description	**Credits**
COMPULSORY MODULES:	
1b, 2b, 4, 11 - 15 Group Project 16	80 40
ELECTIVE MODULES:	
None	
TOTAL:	120

Software Engineering for Technical Computing option

Description	**Credits**
COMPULSORY MODULES:	
2a, 3, 4 , 17 – 21 Group Project 22	80 40
ELECTIVE MODULES:	

None	
TOTAL:	120

C. MSc

Students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Computational Engineering Design option, based at Cranfield

Description	**Credits**
COMPULSORY MODULES:	
1a, 2a, 3 – 6, 7a, 8, 9 Group Project 10 Individual Research Project 28	80 40 80
ELECTIVE MODULES:	
None	
TOTAL:	200

Computational Engineering Design option, based at ESTIA

Description	**Credits**
COMPULSORY MODULES:	
1b, 2b, 4 – 6, 7b, 8, 9 Group Project 10 Individual Research Project 28	80 40 80
ELECTIVE MODULES:	
None	
TOTAL:	200

Computational Intelligence for Data Analytics option

Description	**Credits**
COMPULSORY MODULES:	
1a, 3, 17, 18, 19, 23-26 Group Project 27 Individual Research Project 28	80 40 80
ELECTIVE MODULES:	
None	
TOTAL:	200

Computer and Machine Vision option, based at Cranfield

Description	**Credits**
COMPULSORY MODULES:	
1a, 2a, 3, 4, 11-15 Group Project 16 Individual Research Project 28	80 40 80

ELECTIVE MODULES:	
None	
TOTAL:	200

Computer and Machine Vision option, based at ESTIA

Description	Credits
COMPULSORY MODULES:	
1b, 2b, 4, 11 - 15 Group Project 16 Individual Research Project 28	80 40 80
ELECTIVE MODULES:	
None	
TOTAL:	200

Software Engineering for Technical Computing option

Description	Credits
COMPULSORY MODULES:	
1a, 2a, 3, 4 , 17 – 21 Group Project 22 Individual Research Project 28	80 40 80
ELECTIVE MODULES:	
None	
TOTAL:	200

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee);[3] [4]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:

[3] For students who were registered before 1 August 2015, the requirement to obtain a minimum mark for a taught assessment will not apply for taught assessment taken before 31 August 2015 (unless the assessment was designated as a "key assessment" under the previous Assessment Rules).

[4] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

a. if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
b. if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
c. it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.

- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 11 calendar months. ESTIA students register for the course in September and are expected to complete the course within 11 calendar months.

This course is also offered on a part-time basis. Students would instead take two to three years to complete the MSc.

Each module is taught over a period of one or two weeks. Practical work forms an important part of the teaching and so a significant amount of time is devoted to hands-on sessions with a software package or development environment. This also facilitates independent learning on the part of the student.

7. Course Level Assessment Strategy[5]

The following assessment types are utilised:

The course uses a range of assessment types that are challenging and enable the students to develop and demonstrate a range of skills. Students can expect to have written examinations, individual and group coursework assessments, individual and group projects, and finally individual and group presentations. This approach has been adopted in order to provide the student with a balanced mix of theory, application and development of soft skills.

Since in this course practical application is key to development of understanding and skills acquisition, in all modules students will engage with an interactive learning activity which incorporates formative feedback. The majority of subjects are assessed by a combination of practical assignment and written report. The reports are of varying lengths, recognising that writing articles to a short length can be more challenging for some.

While the majority of the assignments are assessing individual work, a small number of coursework is carried out in pairs, to allow the students to become comfortable with working effectively in a team, undertaking different roles and responsibilities. As part of the formative assessment of group work, each pair will provide a peer review of their performance and contribution.

When a subject has large theory content, where recalling facts to support judgement is crucial, it is assessed by exam.

[5] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Students have opportunities to develop their communication skills, as they are required to give group and individual presentations. Formative feedback from members of staff, as well as peer review feedback amongst students, is given immediately after the resentations.

The group project that follows the taught component will assess the ability to apply the acquired knowledge from the taught modules to create and execute a research programme in a larger, multi-disciplinary team working environment, as well as the ability to evaluate results and present the research outcome.

Further application of the knowledge and its understanding, the ability to assemble a technical literature review and plan and implement a research project, is also assessed through the individual research project. Students are generally expected to be more self-directed in their learning during this research project and guidance will be provided through face to face or electronically enabled (via teleconferencing) contact with the supervision team.

Course modules

The following modules outline all parts of the programme leading to MSc Computational & Software Techniques in Engineering . Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
1a	N-CST-CPPAO	C++ Programming (AO)	Dr Irene Moulitsas	32		0	N	27/09/2022	27/09/2022	07/10/2022		AO					N/A	At the next available opportunity which may not

[6] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[7] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[8] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[9] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[10] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[11] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[12] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																		be until the course runs the following year
1b	N-CST-CPPI	C++ Programming (Integrated)	Dr Irene Moulitsas	32		10	Y	27/09/2022	27/09/2022	07/10/2022	40	GCW Integrated assessment with N-CST-CMI	100				FT28/11/2022PT12/12/2022	At the next available opportunity which may not be until the course runs the following year
2a	N-CST-CM	Computational Methods	Dr Irene Moulitsas	32		10	Y	27/09/2022	27/09/2022	07/10/2022	50	GCW	100				FT 21/11/2022PT 05/12/2022	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
2b	N-CST-CMI	Computational Methods (Integrated)	Dr Irene Moulitsas	32		10	N	27/09/2022	27/09/2022	07/10/2022	40	GCW Integrated assessment with N-CST-CPPI	100				FT 28/11/2022PT12/12/2022	At the next available opportunity which may not be until the course runs the following year
3	G-MTI Occ B22	Management for Technology	Dr Richard Adams	27		10	Y	09/01/2023	09/01/2023	13/01/2023	50	RP	100				FT23/01/2023 PT06/02/2023	
4	N-CST-VIS	Visualisation *Occ B ESTIA*	Dr Peter Sherar Dr Stuart Barnes	35		10	N	Occ A06/02/2023 *Occ B13/02/2023*	Occ A06/02/2023 *Occ B13/02/2023*	Occ A10/02/2023 *Occ B17/02/2023*	50 *40*	ICW *ICW*	100 *100*				Occ A FT 27/03/2023PT 11/04/2023 *Occ B 11/04/2022*	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
5	N-CST-CSM04	Geometric Modelling and Design *Occ B ESTIA*	Dr Peter Sherar	35		10	N	Occ A10/10/2022 *Occ B10/10/2022*	Occ A10/10/2022 */ Occ B10/10/2022*	Occ A14/10/2022 */ Occ B14/02/2022*	50 *40*	ICW *ICW*	100 *100*				Occ A FT12/12/2022 PT03/01/2023 *Occ B03/01/2023*	At the next available opportunity which may not be until the course runs the following year
6	N-CST-DEPD	Digital Engineering and Product Design *Occ B ESTIA*	Dr Peter Sherar	35		10	N	Occ A24/10/2022 *Occ B24/10/2022*	Occ A24/10/2022 *Occ B24/10/2022*	Occ A28/10/2022 *Occ B28/10/2022*	50 *40*	ICW *ICW*	100 *100*				Occ A FT 23/01/2023PT06/02/2023 *Occ B 06/02/2023*	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
7a	N-CST-CES	Computational Engineering – Structures	Dr Iman Dayyani	30		10	N	21/11/2022	21/11/2022	30/11/2022	50	EX	100				06/01/2023	At the next available opportunity which may not be until the course runs the following year
7b	N-CST-CESE	Computational Engineering – Structures ESTIA	Professor Karl Jenkins	20		10	N	23/01/2023	23/01/2023	03/02/2023	40	ICW	100				27/03/2023	At the next available opportunity which may not be until the course runs the following year
8	N-CST-CE	Computational Engineering – Fluids	Professor Karl Jenkins	35		10	Y	Occ A30/01/2023	Occ A30/01/2023	Occ A03/02/2023	50 *40*	ICW *ICW*	100 *100*				Occ A FT 27/02/2023PT13/03/2023	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
		Occ B (ESTIA)						*Occ B06/02/2023*	*Occ B06/02/2023*	*Occ B10/02/2023*							*Occ B 03/04/2023*	
9	N-CST-COD	Computational Optimisation Design Occ B (ESTIA)	Dr Atif Riaz	35		10	Y	Occ A 17/10/2022 *Occ B 17/10/2022*	Occ A 17/10/2022 *Occ B 17/10/2022*	Occ A 21/10/2022 *Occ B 21/10/2022*	Occ A 50 *Occ B* 40	ICW	100				FT 03/01/2023 PT16/01/2023 16/01/2023	At the next available opportunity which may not be until the course runs the17ollowing year
10	N-CST-GPCED	Applications of Computational Engineering Design (Group Project)	Dr Tom Teschner	21		40	N	Occ A 27/02/2023	Occ A 27/02/2023	Occ A 26/04/2023	50 50 50	GCWG PRES RP *GCWG PRES*	50% 30% 20% *50%*				Occ A FT & PT 19/04/2023 19/04/2023 26/04/2023 02/05/2023	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
		Occ B (ESTIA)	Professor Karl Jenkins					*Occ B23/01/2023*	*Occ B23/01/2023*	*Occ B 12/05/2023*	50 50 50	*RP*	*30%* *20%*				*05/05/2023* *12/05/2023Occ B*	
11	N-CST-SA04	Signal Analysis	Dr Seemal Asif	35		10	N	10/10/2022	10/10/2022	14/10/2022	50	ICW	100				FT 28/11/2022 PT 12/12/2022	At the next available opportunity which may not be until the course runs the following year
12	N-CST-DSP	Digital Signal Processing	Dr Yifan Zhao	35		10	N	24/10/2022	24/10/2022	28/10/2022	50	ICW	100				FT16/12/2022 PT09/01/2023	At the next available opportunity which

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																		may not be until the course runs the following year
13	N-CST-DIP 1	Image Processing and Analysis	Dr Yifan Zhao	35		10	N	28/11/2022	28/11/2022	02/12/2022	50	ICW	100				FT 09/01/2023 PT 23/01/2023	At the next available opportunity which may not be until the course runs the19ollowing year
14	N-CST-DIP 2	Computer Vision	Dr Stuart Barnes	35		10	N	05/12/2022	05/12/2022	09/12/2022	50	ICW	100				FT 06/02/2023 PT20/02/2023	At the next available opportunity which may not be until the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																		course runs the20ollowing year
15	N-CST-ML	Machine Learning for Computer Vision	Dr Seemal Asif	35		10	N	23/01/2023	23/01/2023	27/01/2023	50	ICW	100				FT27/02/2023 PT13/03/2023	At the next available opportunity which may not be until the course runs the20ollowing year
16	N-CST-ADSIP	Applications of Computer Vision (Group Project)	Dr Seemal Asif	21		40	N	27/02/2023	26/04/23	26/04/2023	50 50 50	GCW GPRES RP	50 30 20				19/04/2023 19/04/2023 26/04/2023 02/05/2023FT & PT	At the next available opportunity which may not be until the course runs the

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																		following year
17	N-CST-SSPP	Small-scale Parallel Programming	Dr Salvatore Filippone	35		10	N	23/01/2023	23/01/2023	27/01/2023	50	ICW	100				FT27/02/2023 PT13/03/2023	At the next available opportunity which may not be until the course runs the following year
18	N-CST-CC	Cloud Computing	Dr Stuart Barnes	35		10	N	14/11/2022	14/11/2022	18/11/2022	50	ICW	100				FT09/01/2023 PT23/01/2023	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
19	N-CST-HPTC	High Performance Technical Computing	Dr Irene Moulitsas	35		10	N	05/12/2022	05/12/2022	09/12/2022	50	ICW	100				FT06/02/2023 PT20/02/2023	At the next available opportunity which may not be until the course runs the following year
20	N-CST-RASD	Requirements Analysis and System Design	Dr Stuart Barnes	35		10	N	17/10/2022	17/10/2022	21/10/2021	50	Integrated Assessment GCW	100				FT16/12/2022 PT17/01/2023	At the next available opportunity which may not be until the course runs the following year
21	N-CST-	Software Testing and	Dr Jun Li	35		10	N	24/10/2022	24/10/2022	28/10/2022								At the next available

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
	STQA	Quality Assurance																opportunity which may not be until the course runs the following year
22	N-CST-GPHEC	Applications in Practical High-End Computing (Group Project)	Dr Irene Moulitsas	21		40	N	27/02/2023	27/02/2023	26/04/2023	50	GCW GPRES RP	50 30 20				19/04/2023 26/04/2023 02/05/2023FT & PT	At the next available opportunity which may not be until the course runs the23ollowing year
23	N-CST-AJAP	Advanced Java and Advanced Python	Dr Stuart Barnes	35		10	N	27/09/2022	27/09/2022	07/10/2022	50	GCW	100				FT24/10/2022 PT07/11/2022	At the next available opportunity which may not

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																		be until the course runs the24ollowing year
24	N-CST-MLBD	Machine Learning and Big Data	Dr Stuart Barnes	35		10	N	24/10/2022	24/10/2022	28/10/2022	50	GCW	100				FT05/12/2022 PT03/01/2023	At the next available opportunity which may not be until the course runs the24ollowing year
25	N-CST-AI	Artificial Intelligence	Dr Jun Li	35		10	Y	06/02/2023	06/02/2023	10/02/2023	50	ICW	100				FT27/03/2023 PT11/04/2023	At the next available opportunity which may not be until the course

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
																		runs the following year
26	I-MNU-A1048	Internet of Things	Dr Sandeep Jagtap	35		10	Y	21/11/2022	21/11/2022	25/11/2022	50	ICW	100				FT04/01/2023 PT18/01/2023	At the next available opportunity which may not be until the course runs the25ollowing year
27	N-CST-GPAPCI	Applications in Computational Intelligence (Group Project)	Dr Jun Li	21		40		27/02/2023	27/02/2023	02/05/2023	50 50 50	GCW GPRES RP	50 30 20				19/04/2023 19/04/2023 26/04/2023 02/05/2023	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[6]	Total hours delivered by Visiting Lecturers[7]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[8] - 40% or 50%	Type of Assessment	Weighting within module[9] (%) of Independent	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[11]	Assessment Submission and/or exam date[12]	Assessment / Exam Retake date
28	N-CST-THES80	Individual Research Project	Dr Irene Moulitsas	20		80	N	01/05/2023	01/05/2023	03/09/2023	50 50	THESIS IPRES	90 10				FT& PT 17/08/2023 17/08/2023	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
G-MTI	Management for Technology	MSc in Thermal Power	
N-CST-CPPI	C++ Programming (Integrated)	Computational and Software Techniques in Engineering	Aerospace Computational Engineering
N-CST-CMI	Computational Methods (Integrated)	Computational and Software Techniques in Engineering	Aerospace Computational Engineering
N-CST-CES	Computational Engineering Structures	Computational and Software Techniques in Engineering	Shared teaching with N-AICS-FEM, Finite Element Methods
I-MNU-A1048	Internet of Things	Engineering and Management of Manufacturing Systems	

8. How are the ILOs assessed?

The course uses a range of formative and summative assessment types that are challenging and enable the students to develop and demonstrate a range of skills.

For the taught component students can expect to have written examinations, individual and group coursework assessments, as well as individual and group presentations.

The group project is assessed with a group coursework report, collaborative software development, a group oral and poster presentation, as well as peer review to assess personal contribution to course work.

The individual research project is assessed by a thesis, a technical oral presentation and a poster presentation.

This approach has been adopted in order to provide the student with a balanced mix of theory, practical application to a problem and development of skills to present technical results in a written or oral forms. All tasks are undertaken both on an individual level and through team work to prepare the students to work effectively independently as well as in a team.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. PGCert

The Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4
01a				
01b	GCW	GCW	GCW	GCW
02a	GCW	GCW	GCW	GCW
02b	GCW	GCW	GCW	GCW
03				EX
04	ICW	ICW	ICW	ICW
05	ICW	ICW	ICW	ICW
06	ICW	ICW	ICW	ICW
07a	EX	EX	EX	EX
07b	ICW	ICW	ICW	ICW
08	ICW	ICW	ICW	ICW
09	ICW	ICW	ICW	ICW
11				ICW
12		ICW	ICW	ICW
13		ICW	ICW	
14	ICW	ICW	ICW	ICW
15	ICW	ICW	ICW	ICW
17	ICW	ICW	ICW	ICW
18	ICW	ICW	ICW	ICW
19	ICW	ICW	ICW	ICW
20	GCW	GCW	GCW	GCW
21	GCW	GCW	GCW	GCW
23	ICW	ICW	ICW	ICW
24	GCW	GCW	GCW	GCW
25	ICW	ICW	ICW	ICW
26	ICW	ICW	ICW	ICW

B. PGDip

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO5	ILO6
10	GCW GPRES RP	GCW GPRES
16	GCW GPRES RP	GCW GPRES

Award ILOs / Module No.	ILO5	ILO6
22	GCW GPRES RP	GCW GPRES
27	GCW GPRES RP	GCW GPRES

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO7	ILO8
28	THESIS	THESIS IPRES

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)
Two modules with an integrated assessment	C++ Programming (Integrated) 1b Computational Methods (Integrated) 2b	GCW	100
Two modules with a integrated assessment	Requirements Analysis and System Design (20) Software Testing and Quality Assurance (21)	GCW	100

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

This Masters course in 'Computational and Software Techniques in Engineering', with its blend of skills-based and subject-specific material equips students with the generic hands-on skills and up-to-date knowledge adaptable to the wide variety of applications in the general field of computational engineering.

Typically students seek employment in the engineering software market. Enquiries regarding availability of potential employees are received from many quarters, both in the EU and elsewhere. There is considerable demand for personnel with expertise in engineering software development and for those who have strong technical programming skills in industry standard languages and tools. Graduates of the course, in demand by CAD/CAE vendors, commercial engineering software developers, automotive, telecommunications, medical and other industries and research organisations, have been particularly successful in finding long-term employment.

Some students may go on to register for PhD degrees, many, on the basis of their MSc research project. Thesis topics are most often supplied by individual companies on in-company problems with a view to employment after graduation - an approach that is being actively encouraged by a growing number of industries.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2021

1. What is the course?

Course information

Course Title	MSc in Computational Fluid Dynamics
Course code	MSCFDFTC, MSCFDPTC, PDCFDFTC, PDCFDPTC, PCCFDFTC, PCCFDPTC
Academic Year	2022/2023
Valid entry routes	MSc
Additional exit routes	PgDip & PgCert
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Aerospace
Centre	Centre for Computational Engineering Sciences
Course Director	Dr Tom Teschner
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)
Benchmark Statement(s)	Not Applicable
Registration Period(s) available	Full-time MSc - one year, Part-time MSc - three years,
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing, Aerospace Theme, Computational Engineering Sciences Centre, where the research interests include:

- Fluid dynamics of single phase, multi-phase and multi-species flows.
- Steady and unsteady aerodynamics.
- Transition and turbulence.
- Heat transfer.
- Numerical methods development.
- Scientific and high performance computing.
- Computational fluid dynamics with the applications in aerospace, automotive, environmental, energy, micro and nanotechnology, nuclear, bio-medical, chemical and defence sectors.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)
This MSc course is accredited by the Institution of Mechanical Engineers (IMechE) on behalf of the Engineering Council as further learning for CEng until August 2026 and the Royal Aeronautical Society (RAeS) on behalf of the Engineering Council as further learning for CEng until August 2026. Candidates must hold a CEng accredited BEng/BSc (Hons) undergraduate first degree to comply with full CEng registration requirements.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- Provide a comprehensive training programme in Computational Fluid Dynamics (CFD) which will enhance the skills of the graduate student through a detailed introduction to the fundamentals of CFD together with an insight into the applications of CFD.
- Provide a unique opportunity for cross-disciplinary education and knowledge transfer in the computational fluids engineering via integration of a very broad range of applications into course curriculum.
- Produce graduates capable of solving computational fluid problems in a broad range of engineering areas, delivering high standard of computational expertise to a diverse range of employers.
- Provide a CPD opportunity through the part-time course option for qualified engineers wishing to extend their knowledge of CFD or incorporate CFD into their practice.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) are provided as exit routes only.

This programme is intended for the following range of students:

- Recent graduates wishing to extend their knowledge and skills in the above areas.
- Qualified engineers wishing to apply their skills in new areas.
- Qualified engineers working with CFD in a particular area wishing to extend their knowledge and enhance their practice by knowledge transfer from different application areas.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Formulate the governing equations of fluid mechanics, evaluate their mathematical properties and differentiate their formulations for steady and unsteady, compressible and incompressible, inviscid and viscous flows.

ILO 2. Construct numerical schemes for model partial differential equations and assess the principles of numerical analysis, stability, approximation accuracy, convergence properties through the computed numerical solution.

ILO 3. Assess different state-of-the-art CFD methods as used in engineering practice and research and development for incompressible and compressible flows.

ILO 4. Evaluate the limitations of methods and techniques for the simulation of turbulent and transitional flows and thus build appropriate modelling frameworks for engineering-scale applications.

ILO 5. Measure the potential sources of, and differentiate between, error and uncertainty in numerical simulations. Manage software and computer tools and set-up error and uncertainty quantification strategies. Systematically and consistently implement the strategies in order to ensure credibility of the CFD simulation process.

ILO 6. Construct grids for practical CFD applications, systematically assess their quality, robustness and efficiency with respect to the CFD solver. Evaluate the CFD results by using various visualisation and post-processing software and gain fruitful insight of the flow properties.

B. Postgraduate Diploma

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 7. Create grids, numerically solve the governing equation on the grid and post process the results using various commercial CFD software packages for practical engineering applications.

ILO 8. Manage the planning, conducting and reporting of a CFD project for practical scientific and engineering fluid flow problems, carry out comprehensive research literature survey and systematically analyse one or more aspects of Computational Fluid Dynamics.

C. MSc

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 9. Prepare a framework of research and application, where the challenges associated with a particular topic of research are critically evaluated with novelty arising from the taught material and through the stat-of-the-art approaches found in the literature of the corresponding subject.

4. How is the course taught?

Students will be supported in their learning and personal development by:

The course material is delivered through a combination of lectures, tutorials and hands-on lab sessions. Where possible lectures feature a strong interactive element. In addition, several modules have a guest industrial speaker who specialises in that field in industry.

Assignments should be noted separately in the description of the course teaching methods. The assessment the students are required to complete i.e.7 individual assignments, attend 1 attendance only module;1 group project and 1 individual research project (for an MSc) are used not only as means of summative assessment but also as means of formative assessment guiding the students through various aspects of Computational Fluid Dynamics via the application of techniques learned to practical problems.

The learning support builds on the standard mechanisms provided by the University including library facilities, specialised IT provision (Linux workstations) etc. The course uses the Canvas virtual learning environment with all materials delivered in electronic form and electronic communication tools (e.g. forums) used to enhance the discussion of the course materials.

In addition to standard learning support facilities the course utilises a number of specialised facilities, namely:

- A dedicated HPC (High Performance Computing) cluster used in the taught component and thesis work
- NFLC plane used in taught component to illustrate aircraft manoeuvres
- Windtunnel facilities used for demonstrations
- Virtual Reality computer lab for the visualisation of simulation data.

Group project and computer lab sessions are designed to enhance transferable skills related to teamwork and communication (written and verbal). Through the group project the student will develop interpersonal skills, necessary to develop solutions of industrial type problems. The group project will be supported by several activities i.e. lectures dedicated to the applications of CFD science and engineering, specialist computer software demonstrations and training, industrial talks and lectures, presentation of project management with role-playing activities. These activities will relate to a thematic topic of the group project e.g. aerospace, automotive and energy. For students that cannot efficiently performed group activities i.e. part time students; they have the option of taking the project dissertation instead of the group project. The project dissertation is completed individually.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 8. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 3, 4, 7	30

ELECTIVE MODULES:	
30 credits from 1, 2, 5, 6	30
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-7 Module 9 (Group Project) or Module 11 (Project Dissertation)	80 40
ELECTIVE MODULES:	
N/A	
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-8 Module 9 (Group Project) or Module 11 (Project Dissertation) Module 10 (Individual Research Project)	80 40 80
ELECTIVE MODULES:	
N/A	
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [3]

[3] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they

- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

The course starts with the induction week where the students are introduced to the teaching team, fundamentals of CFD software, programming and HPC.

Full-time students register for the course in September and are expected to complete the course within 12 calendar months. The taught component runs from October until February. Between February and April the group project and related activities take place. The individual research project runs from April/May until end of August.

Part-time students register for the course in September and are expected to complete the course within 3 years selecting the modules to be taken each year in consultation with the Course Director. Part-time students have the option to either take the group project or the project dissertation.

Allocation of group projects is performed in December/January, Individual research project topics are provided in January and allocations is completed within February.

7. Course Level Assessment Strategy[4]

The assessment tasks are challenging and enable students to demonstrate a full range of skills and attributes. Majority of the taught modules will be assessing skills and knowledge using Individual Course Works (ICWs). The intention is to examine students' comprehension of theoretical knowledge and their ability in applying practical skills in problem solving.
The group project (GPs) will provide students the opportunity to work within a team of engineers to design and develop solution for a particular problem. It will assess the ability to create and execute a research programme in a team working environment as well as the ability to evaluate results and present the research outcome. Effective project management is key part of the group project. Part- time students who are unable to complete the group project will undertake a project dissertation.
Further knowledge and application will be assessed by the individual research projects (IRPs). It will also assess as well as develop research skills in terms of the ability to assemble a technical literature review and the ability to plan and implement an independent research project.

retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

[4] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to **MSc.** Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers[6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments[9] (100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
1	N-CFD-IFM	Introduction to Fluid Mechanics and Heat Transfer	Dr Laszlo Konozsy	20		10	N	03/10/2022	03/10/2022	07/10/2022	50	ICW	100				FT 28/10/2022 PT 11/11/2022	At the next available opportunity which may not be until the course runs the following year
2	N-CFD-NMHPC	Numerical Methods and High Performance Computing	Dr Panagiotis Tsoutsanis	30		20	N	17/10/2022	17/10/2022	21/10/2022	50	ICW	100				FT 16/12/2022 PT 06/01/2023	At the next available opportunity which may not be until the course runs the following year

[5] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[6] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[7] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[8] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[9] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[10] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[11] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
3	N-CFD-GG	Grid Generation / CAD	Dr Tom Teschner	20		10	N	31/10/2022	31/10/2022	04/11/2022	50	ICW	100				FT 02/12/2022 PT 16/12/2022	At the next available opportunity which may not be until the course runs the following year
4	N-CFD-DAPP	Data Analysis and Uncertainty	Dr Tom Teschner	20		10	N	14/11/2022	14/11/2022	18/11/2022	50	ICW	100				FT 05/01/2023 PT 16/01/2023	At the next available opportunity which may not be until the course runs the following year
5	N-CFD-NMCF	Numerical Modelling for Compressible Flows	Dr Panagiotis Tsoutsanis	20		10	Y	23/01/2023	23/01/2023	27/01/2023	50	ICW	100				FT 24/02/2023 PT0 10/03/2023	At the next available opportunity which may not be until the course runs the following year
6	N-CFD-NMIF	Numerical Modelling for Incompressible Flows	Dr Laszlo Konozsy	20		10	Y	09/01/2023	09/01/2023	13/01/2023	50	ICW	100				FT 10/02/2023 PT 24/02/2023	At the next available opportunity which may not be until the course runs the following year
7	N-CFD-CTM	Turbulence Modelling	Dr Panagiotis Tsoutsanis	35		10	N	28/11/2022	28/11/2022	02/12/2022	50	ICW	100				FT 06/01/2023 PT 20/01/2023	At the next available opportunity which may not be until the course runs the following year
8	N-CFD-REDAO	The Role of Experimental Data in CFD	Dr Tom Teschner	10		0	N	20/02/2023	20/02/2023	24/02/2023	N/A	AO	N/A				ATTENDANCE ONLY	N/A

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[5]	Total hours delivered by Visiting Lecturers [6]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[7] - 40% or 50%	Type of Assessment	Weighting within module[8] (%) of Independent assessments	Weighting within module of multi-part assessments [9](100%)	Type of Assessment	Weighting of individual elements of multi-part	Assessment Submission and/or exam date[11]	Assessment / Exam Retake date
9	N-CFD-GRPP	Group Project	Dr Tom Teschner	20		40	N	06/02/2023	06/02/2023	07/04/2023	50	GPROJ GPRES	85 15				26/04/2023 28/04/2023	At the next available opportunity which may not be until the course runs the following year
10	N-CFD-RP	Individual Research Project	Dr Tom Teschner	10		80	N	28/04/2023	28/04/2023	01/09/2023	50	THESIS IPRES	85 15				25/08/2023 01/09/2023	At the next available opportunity which may not be until the course runs the following year
11	N-CFD-D	Project Dissertation (for part time only)	Dr Tom Teschner	20		40	N	06/02/2023	06/02/2023	07/04/2023	50	ICW IPRES	85 15				26/04/2023 28/04/2023	At the next available opportunity which may not be until the course runs the following year

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	Module title	Course that owns the module	Other course(s)/ programme(s) that use the module
N-CFD-NMCF	Numerical Modelling for Compressible Flows	Computational Fluid Dynamics	Aerospace Computational Engineering
N-CFD-NMIF	Numerical Modelling for Incompressible Flows	Computational Fluid Dynamics	Aerospace Computational Engineering

8. How are the ILOs assessed?

The following assessment types are utilised:

The course uses a range of assessment types. Students are assessed through 7 individual assignments, 1 group project and 1 individual research project.

This approach has been adopted in order to achieve a careful balance between the delivery of fundamental knowledge and CFD skills which is better assessed through a individual assignment and individual research thesis development of interpersonal skills within a “live” industrial problem and project based learning through the group project.

Majority of the assignments utilised in the course are based on practical CFD problems with emphasis on developing CFD skills and critical evaluation capability.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

The Postgraduate certificate has a total of 60 credits, this is offered as exit route, the student should be able to achieve 60 credits from module 1 to 7.

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6
1	ICW					
2		ICW				
3						ICW
4		ICW			ICW	
5	ICW	ICW	ICW			
6	ICW	ICW	ICW			
7	ICW	ICW	ICW	ICW		

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8
1	ICW							
2		ICW						
3						ICW		
4		ICW			ICW			
5	ICW	ICW	ICW					
6	ICW	ICW	ICW					
7	ICW	ICW	ICW	ICW				
9							GPROJ GPRES	GPROJ GPRES
11							ICW IPRES	ICW IPRES

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8	ILO9
1	ICW								
2		ICW							
3						ICW			
4		ICW			ICW				
5	ICW	ICW	ICW						
6	ICW	ICW	ICW						
7	ICW	ICW	ICW	ICW					
9							GPROJ GPRES	GPROJ GPRES	
10							THESIS IPRES	THESIS IPRES	THESIS IPRES
11							ICW IPRES	ICW IPRES	

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	Modules Covered	Assessment	
		Type	Weight (%)

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning

and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

Based on feedback from 2014/15 graduates, 90% of our graduates are in a full-time employment in industry or academia within 6 months of the course completion. Our graduates are employed in a broad range of industries where computational expertise is required. Currently our graduates are employed among others by aerospace, computer hardware, automotive, measurement equipment, mining, process systems and engineering consultancy companies. A proportion of our graduates pursue careers in academia through further PhD studies.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	MSc in Connected and Autonomous Vehicle Engineering (Automotive)
Course code	MSCAVFTC; PDCAVFTC; PCCAVFTC;
Academic Year	2022/23
Valid entry routes	MSc
Additional exit routes	PGDip, PGCert
Mode of delivery	Full-Time
Location(s) of Study	Cranfield University
School(s)	School of Aerospace, Transport and Manufacturing
Theme	Transport Systems
Centre	Advanced Vehicle Engineering
Course Director	Dr Daniel Auger
Awarding Body	Cranfield University
Is this an AP Contract course?	No
Is this course offered as a Cranfield Mastership?	No
Apprenticeship Standard the course is mapped to	N/A
Is the Degree apprenticeship integrated or non-integrated?	N/A
Is the Mastership offered as an open and/or closed course?	N/A
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 (Masters)

Benchmark Statement(s)	Not applicable
Registration Period(s) available	Full-time MSc - one year
Course Start Month(s)	September

Institutions delivering the course

This course is delivered by the School of Aerospace, Transport and Manufacturing's Advanced Vehicle Centre where the research interests include:

Vehicle Electrification
Automated Driving
Advanced Control
Multi-domain Modelling
Novel Engine Technology
Vehicle Braking Systems

Cranfield University interacts with the following institutions and in the following ways:

N/A

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

The course is not currently accredited by any professional bodies.

2. What are the aims of the course?

Cranfield University offers this course in order to:

1. Meet employer demand for postgraduate engineers who have strong applied analytical skills in areas relevant to connected and autonomous vehicle engineering to meet the challenging market and legislative demands for vehicle safety, performance and sustainability.
2. Provide a primary training and dissemination route for Cranfield University's increasing research portfolio in the area of connected and autonomous vehicle technologies for road vehicles and civil off-highway applications.
3. Supply to the automotive industry and intelligent mobility sectors (and associated supply chain) high calibre post graduate engineers with the technical qualities, transferable skills and independent learning ability to make them effective in organisations that design and develop automotive products.

This programme is intended for the following range of students:

1. UK, EU or international students with a 1st class or 2nd class UK honours degree (or equivalent) in an engineering related discipline (including most maths or science disciplines).
2. Qualifying Double Degree students from the EU

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Connected & Autonomous Vehicle Engineering (Automotive)

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Evaluate the fundamental characteristics of a road vehicle in the context of connected and autonomous vehicle engineering.

ILO 2. Compose and evaluate business strategies within the context of connected and autonomous vehicle engineering.

ILO 3. Formulate, plan and organise work within a group design project relating to connected and autonomous vehicles.

ILO 4. Select, apply and optimize appropriate technologies to address design and/or business problems within a limited range of disciplines relevant to connected and autonomous vehicle engineering.

B. Postgraduate Diploma in Connected & Autonomous Vehicle Engineering (Automotive

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 5. Select and apply appropriate technologies from the realm of electronic systems engineering to address design and/or business problems in the context of connected and autonomous vehicle engineering.

ILO 6. Select and apply appropriate technologies from the realm of robotics and control to address design problems in the context of connected and autonomous vehicle engineering.

ILO 7. Assess and evaluate human factors, safety, ethics and regulatory challenges associated with connected and autonomous vehicle engineering

C. MSc in Connected & Autonomous Vehicle Engineering (Automotive)

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 8. Propose, plan and implement a time-bound programme of individual advanced research or development to address a technical or operational requirement within the context of CAV engineering.

ILO 9. Apprise an audience of senior decision makers on the findings of a substantial body of work through a brief presentation and responsive discussion in the context of CAV engineering.

4. How is the course taught?

Students will be supported in their learning and personal development by:

Lectures, mixed-mode learning sessions, formative feedback, practicals, assignments (typically embodying problem-based learning), a group design project and an individual research project. Where appropriate, online learning, Virtual Learning Environments and Technology Enhanced Learning are used.

The course draws extensively from across the university, using the knowledge of staff from within three schools: SATM, CDS and SOM.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate

The accumulation of 60 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	N/A
Fundamentals of Road Vehicle Engineering (module 1) Technology Strategy and Business Models (module 10) Group Design Project (module 11)	10 10 20
ELECTIVE MODULES:	
Module 0 20 credits from remaining modules 2-9	0 20
TOTAL:	60

B. Postgraduate Diploma

The accumulation of 120 credits (or more) through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-10 Group Project (module 11)	100 20
ELECTIVE MODULES:	
Module 0	0
TOTAL:	120

C. MSc

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	Credits
COMPULSORY MODULES:	
Modules 1-10 Group Project (module 11) Thesis (module 12)	100 20 80
ELECTIVE MODULES:	
Module 0	0
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria

The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;

- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [1]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
  - it is not permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

[1] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

6. How is the course structured?

Full-time students register for the course in September and are expected to complete the course within 12 calendar months.

Subject to teaching room availability, each module is taught over two weeks, with the second week largely free of structured teaching to allow time for more independent learning and reflection and/or assignment work.

7. Course Level Assessment Strategy[2]

In all cases, the chosen methods of assessment have been chosen for greatest constructive alignment with the associated intended learning outcomes. For the majority of taught modules, individual coursework allows the greatest 'time on task' and deep learning, but for some, an examination is the best fit. The course contains a group project and an individual research project: these are assessed with individual reports and presentations. (The group project also has a group-assessed element.) Again, this is aligned with the learning outcomes for the modules and the overall course.

[2] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

Course modules

The following modules outline all parts of the programme leading to MSc. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[3]	Total hours delivered by Visiting Lecturers[4]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[5] - 40% or 50%	Type of Assessment	Weighting within module[6] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[8]	Assessment Submission and/or exam date[9]	Assessment / Exam Retake date
0	N-CAV-IND	Introduction	Daniel Auger	18	0	N		26/09/22	26/09/22	01/10/22	N/A	A/O	N/A					
1	N-AP-VDP	Vehicle Design Propulsion , and Performance	Glenn Sherwood	30		10		26/09/22	03/10/22	07/10/22	50	ICW	100%				14/10/22	13/09/23
2	N-CAV-PPADM	Path Planning, Autonomy and Decision Making	Hyo-Sang Shin	28		10	N	23/01/23	06/02/23	15/02/23	50	ICW	100%				17/02/23	17/09/23

[3] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[4] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[5] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%..
[6] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[7] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[8] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[9] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[3]	Total hours delivered by Visiting Lecturers [4]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[5] - 40% or 50%	Type of Assessment	Weighting within module[6] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[8]	Assessment Submission and/or exam date[9]	Assessment / Exam Retake date
3	N-CAV-SPV	Sensors, Perception and Visualisation	Ivan Petrunin	28		10	N	17/10/22	31/10/22	04/11/22	50	ICW	100%				11/11/22	12/08/23
4	N-CAV-SYS	Systems Engineering	Tim Mackley	30		10	N	20/02/23	06/03/23	10/03/23	50	ICW	100%				20/03/23	28/06/23
5	N-AP-AM04	Embedded Vehicle Control Systems	Stefano Longo	30		10	Y	23/01/23	23/01/23	27/01/23	50	ICW	100%				03/02/23	03/07/23
6	N-CAV-TSO	Transport Systems Optimisation	Abbas Fotouhi	30		10	N	14/11/22	28/11/22	02/12/22	50	EX	100%				04/01/23	21/09/23
7	N-CAV-HF	Human Factors, Human-Computer Interaction and ADAS System	Lisa Dorn	30		10	N	03/10/22	17/10/22	21/10/22	50	ICW	100%				28/10/22	10/07/23
8	N-CAV-NSC	Networked Systems and Cybersecurity	Phil Nobles	30		10	N	06/02/23	20/02/23	24/02/23	50	ICW	100%				02/03/23	25/07/23
9	N-CAV-ESR	Ethics, Safety and Regulation	Colin Pilbeam	30		10	N	19/12/23	09/01/23	18/01/23	50	ICW	100%				20/01/23	17/07/23
10	N-CAV-TSBM	Technology Strategy and	Mikko Arevuo	16		10	N	31/10/22	14/11/22	18/11/22	50	GCW	100%				25/11/22	13/09/23

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[3]	Total hours delivered by Visiting Lecturers [4]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[5] - 40% or 50%	Type of Assessment	Weighting within module[6] (%) of Independent assessments	Weighting within module of multi-part assessments	Type of Assessment	Weighting of individual elements of multi-part assessment[8]	Assessment Submission and/or exam date[9]	Assessment / Exam Retake date
		Business Models																	
11	N-CAV-GP	CAVE (Auto) Group Project	Marco Cecott	35		20	N	20/03/23	20/03/23	28/04/23	50 50	GCW GPRES	70% 30%				28/04/23 28/04/23	05/04/24	
12	N-AP-AE13	Individual Research Project	Abbas Fotouhi	10		80	Y	01/05/23	01/05/23	31/08/23	50 50	THESIS IPRES	80% 20%				21/08/23 29/08/23-31/08/23	01/09/24	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
N-AP-VDP	Vehicle Design, Propulsion and Performance	MSc in Automotive Engineering	MSc in Automotive Mechatronics
N-AP-AM04	Embedded Vehicle Control Systems	MSc in Automotive Mechatronics	MSc in Automotive Mechatronics
N-AP-AE13	Individual Research Project	MSc in Automotive Engineering	MSc in Automotive Mechatronics

8. How are the ILOs assessed?

The following assessment types are utilised:

Individual coursework (assignments), examinations, group coursework, group project work, individual project work.

This approach has been adopted because:

The assessment approaches have been chosen to best suit the type of knowledge and skills they relate to. In many cases, individual coursework and project work allows deep engagement with the subject allowing the full spectrum of module-level ILOs to be assessed. Some ILOs specifically relate to group project work, and group assessment is used accordingly. For a few modules, time-bound examinations felt to be a good way to assess module ILOs.

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4
1	EX			
2				ICW
3				ICW
4				ICW
5				ICW
6				EX
7				ICW
8				ICW
9				ICW
10		GCW		

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3	ILO 4
11			GCW GPRES	

B. Postgraduate Diploma

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO5	ILO6	ILO7
2		ICW	
3	ICW	ICW	
4	ICW	ICW	
5	ICW		
6	EX		EX
7			ICW
8	ICW	ICW	
9			ICW

C. MSc

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO8	ILO9
12	THESIS	IPRES

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. <u>What opportunities are graduates likely to have on completing the course?</u>

Graduates in this course are likely to be able to undertake roles in industry or commercial sectors such as the following:

Engineering/technical roles relating to the deep technical skills taught on the project. (These could be with traditional automotive OEMs and their supply chain or within the emerging 'intelligent mobility' sector.) Examples of entry level job titles might be 'engineer/technologist', 'senior engineer/technical specialist' or 'technical specialist'. Work would include development of particular technologies in the CAV field or integration of such technologies into CAV systems.

Commercial and technical sales roles relating to connected and autonomous vehicles. Typical jobs titles here might be 'application engineer', 'technical consultant' or 'sales engineer'.

Graduates will be well equipped to progress to senior management and technical roles within the automotive and intelligent mobility sectors.

Graduates will also be well equipped for roles in applied research within universities and similar organisations.

COURSE SPECIFICATION

Cranfield University: Course Specifications

Course specifications outline the content and structure of a course leading to an award of Cranfield University. This version of the course specification has been approved by Education Committee and every effort has been made to ensure the accuracy of the information.

Date of first publication/latest revision: March 2022

1. What is the course?

Course information

Course Title	Counterterrorism Programme
Course code	**MSc, PgDip, PgCert Counterterrorism;** MSCTMFTC, MSCTMPTC, PDCTMFTC, PDCTMPTC, PCCTMFTC, PCCTMPTC, **MSc, PgDip, PgCert Counterterrorism, Risk Management and Resilience;** MSCRRFTC, MSCRRPTC, PDCRRFTC, PDCRRPTC, PCCRRFTC, PCCRRPTC **Short Course for Credit;** SPCTMPTC
Academic Year	2022/23
Valid entry routes	MSc, PgDip, PgCert
Additional exit routes	PgDip, PgCert, MSc
Mode of delivery	Full-time, Part-time
Location(s)[1] of Study	Cranfield, Shrivenham
School(s)	Cranfield Defence and Security
Theme	Defence and Security
Centre	Cranfield Forensic Institute
Course Director	Programme Director: Professor Andrew Silke; Counterterrorism Course Director: Dr Anastasia Filippidou; Counterterrorism, Risk Management and Resilience Course Director: Professor Andrew Silke
Awarding Body	Cranfield University
Is this an AP Contract course?[2]	No
Is this course offered as a Cranfield Mastership?	No

[1] If any part of this course is delivered at another site, please note which one(s) here
[2] AP Contract courses are provided by Cranfield University to the MoD as part of the Academic Provider contract

Apprenticeship Standard the course is mapped to	n/a
Is the Degree apprenticeship integrated or non-integrated?	n/a
Is the Mastership offered as an open and/or closed course?	n/a
Teaching Institution	Cranfield University
Admissions body	Cranfield University
Entry requirements	Standard University entry requirements
UK Qualifications Framework Level	QAA FHEQ Level 7 Masters
Benchmark Statement(s)	n/a
Registration Period(s) available	Part-time: 2 years (PgDip and PgCert) or 3 years (MSc) Full-time: 1 year MSc, PgDip and PgCert
Course Start Month(s)	October

Institutions delivering the course

This course is delivered by the Cranfield Forensic Institute within Cranfield Defence and Security where the research interests include:

Counterterrorism, risk and resilience, security technology, forensic archaeology and anthropology, ballistics, explosives, forensic and security imagining.

Cranfield University interacts with the following institutions and in the following ways:

- Pool Reinsurance - research project titles.

Cranfield University remains fully responsible for the quality of the delivery of the course.

Accreditation by Public, Statutory or Regulatory Bodies (PSRBs)

This course is not accredited by any external bodies.

2. What are the aims of the course?

Cranfield University offers this course in order to:

- help prepare students for both academic and non-academic careers (including those related to security, policing, military, government policy, and international work), bringing together a unique mix of different subjects, combining modules from soft and hard sciences. The skills students gain will reflect the modules selected.

- provide students with fundamental knowledge, core expertise and advanced, evidence-based methodological tools and approaches necessary to understand, analyse, prevent and mitigate terrorism.

Postgraduate Diploma (PgDip) and Postgraduate Certificate (PgCert) exit routes are provided for

students who wish to access only parts of the course provided.

This programme is intended for the following range of students:

- graduates with relevant first degrees
- other graduates working in relevant professional fields of study, including those connected to policing, criminal justice, military, security, preventing violent extremism, countering violent extremism, intelligence and defence sectors
- practitioners in fields related to counterterrorism, risk management and risk mitigation.

Some elements of the programme are delivered at the UK Defence Academy in Shrivenham, which is a Ministry of Defence (MoD) site. All applicants to courses that are wholly or partially delivered at Shrivenham must complete the UK Government's Baseline Personnel Security Standard (BPSS) prior to registration, or must already hold a security clearance to this level or higher. BPSS clearance applications will be shared during the application process with the MoD, which has ultimate discretion over admission to the Shrivenham site. If a student is not able to access the Shrivenham site they will be unable to select any modules which are based at Shrivenham.

3. What should students expect to achieve in completing the course?

Award intended learning outcomes (ILOs) (skills and knowledge).

A. Postgraduate Certificate in Counterterrorism

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Critically examine and appraise the major theoretical, academic and substantive debates relating to terrorism and counterterrorism.

ILO 2. Develop the analytical skills to critically research, evaluate and assess models and explanations of terrorism, and the range of counterterrorism options to these.

ILO 3. Construct and formulate arguments and analysis and communicate these effectively in a form suitable for specific target audiences.

B. Postgraduate Diploma in Counterterrorism

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Critically evaluate the design and impact of counterterrorism policies and initiatives

ILO 5. Examine and critically assess several case studies of major terrorism and counterterrorism campaigns.

ILO 6. Assemble and evaluate a wide range of evidence from a range of disciplines that impacts on terrorism and counterterrorism and be able to do this working independently or as part of a group.

ILO 7. Systematically engage with and critique the evidence base for understanding terrorism and which underlies counterterrorism initiatives and policies.

C. MSc in Counterterrorism

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 8. Complete a significant piece of independent research on a chosen topic within the area of terrorism or counterterrorism.

ILO 9. Critically evaluate different research methodologies and select appropriate research strategies and materials.

ILO 10. Appraise and identify recommendations for policy, practice and/or future research.

D. Postgraduate Certificate in Counterterrorism, Risk Management and Resilience

In completing this course, and achieving the associated award, a diligent student should be able to:

ILO 1. Critically examine and appraise the major theoretical, academic and substantive debates relating to terrorism and counterterrorism.
ILO 2. Critically research, evaluate and assess risk management and mitigation theory and techniques with regard to terrorism and related threats
ILO 3. Construct and formulate arguments and analysis and communicate these effectively in a form suitable for specific target audiences.

E. Postgraduate Diploma in Counterterrorism, Risk Management and Resilience

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 4. Critically evaluate the design and impact of counterterrorism policies and initiatives
ILO 5. Critically evaluate risk and crisis management tools, processes, and frameworks and relate risk and crisis management frameworks to contemporary resilience strategies.
ILO 6. Assemble and evaluate a wide range of evidence from a range of disciplines that impacts on terrorism and counterterrorism and be able to do this working independently or as part of a group.
ILO 7. Examine and critically analyse mitigation and resilience approaches to a range of terrorist threats, tactics and strategies.

F. MSc in Counterterrorism, Risk Management and Resilience

In addition to the intended learning outcomes outlined above, a diligent student would also be expected to:

ILO 8. Complete a significant piece of independent research on a chosen topic within an area of terrorism, risk management and resilience.
ILO 9. Critically evaluate different research methodologies and select appropriate research strategies and materials.
ILO 10. Appraise and identify recommendations for policy, practice and/or future research.

4. How is the course taught?

Students will be supported in their learning and personal development by:

Teaching methods vary from module to module but include lectures, seminars, tutorials, workshops and individual supervision. The emphasis is on student participation and small group work within a supportive learning environment. Student learning is supported by lecture notes, module handbooks and suggested reading. Direct class contact is supplemented by on-line interactive programme materials, individual reading and preparation for assignments. Learning resources include IT and access to electronic databases

Our education philosophy is led by the basic principles of:

- research led teaching – through a course team that are active researchers or practitioners
- learning through assessment methods - we view assessment as part of the learning process, with a variety of assessment methods extending the curriculum and transferable skills

The main instrument of teaching and learning in the taught phase modules remains the traditional lecture, incorporating the effective use of visual aids and supported by high quality written material where appropriate. Tutorial sessions centring on a particular subject area or involving more wide-ranging

discussions are also an important feature of the course. Additionally, there is a growing move to reduce the amount of teacher-centred learning and allow students to take the initiative in the learning process. Thus some modules include a requirement for each student to make an oral presentation to the rest of the class on a specific subject that is then assessed by the staff present. Students are required to present their written work in a variety of forms, including the conventional essay as well as laboratory reports and expert witness statements. In the case of MSc students this includes presenting the results of their individual research project in the format of a thesis. The emphasis is always on clear, concise and accurate presentation. This ensures that students are continually encouraged to think about report writing and are given frequent opportunities to improve their techniques as they progress through the course. Some modules employ role play to demonstrate how theory is put into practice, including table top exercises where students work in small groups to risk manage and mitigate a range of different terrorism scenarios.

In addition to the teaching methods outlined, students will be supported in their learning and personal development by:

- Good staff student relations. Staff endeavour to be enthusiastic and helpful. The Programme Director will address any immediate issues of concern that a student or students may have in connection with the course.
- All students are provided with a personal tutor who is available to support the student and advise on academic issues and provide pastoral care. Students are encouraged to meet with their personal tutors at least twice during the taught phase of the course. Additional meetings are scheduled as required.
- After the taught phase pastoral care largely transfers to the student's individual research project supervisor, who they are encouraged to meet with regularly.

5. What do students need to achieve in order to graduate?

Notwithstanding University Regulations and the authorities and powers exercised by examiners, students will normally need to demonstrate achievement in the elements of the course, as laid out in Section 6. Courses are structured through the accumulation of credit, where 1 credit represents 10 notional learning hours.

In brief, students will normally need to achieve the following in order to be awarded the qualifications:

A. Postgraduate Certificate in Counterterrorism

The accumulation of 60 credits[3] through the assessment of taught modules as detailed below:

Description	Credits
COMPULSORY MODULES:	**30**
Introductory Studies Understanding Terrorism and Counterterrorism Applied Counterterrorism	0 20 10
ELECTIVE MODULES:	**30**
30 credits from Strategies, Ideologies and Tactics of Terrorism Protecting Critical National Infrastructure Cyber Terrorism Chemical, Biological and Nuclear Terrorism Terrorism Risk Management and Mitigation Risk, Crisis, and Resilience	 10 10 10 10 20 10

[3] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

Counterterrorism and Intelligence	10
Negotiating with Violent Extremist Terrorist Organisations	10
Terrorism and the Law	10
Investigation and Evidence Collection	10
Reasoning for Forensic Science	10
Analytical Techniques	20
Courtroom Skills	10
Introduction to Fire Investigation	10
Introduction to Firearms Investigations and Forensic Ballistics	10
Firearms Investigations	10
Forensic Ballistic Investigations	10
Counter-Improvised Explosive Devices Capability	10
Forensic Exploitation and Intelligence	10
TOTAL:	**60**

B. Postgraduate Diploma in Counterterrorism

The accumulation of 120 credits[4] through the assessment of taught modules as detailed below:

Description	**Credits**
COMPULSORY MODULES:	**40**
Introductory Studies	0
Understanding Terrorism and Counterterrorism	20
Applied Counterterrorism	10
Strategies, Ideologies and Tactics of Terrorism	10
ELECTIVE MODULES:	**80**
80 credits from	
Protecting Critical National Infrastructure	10
Cyber Terrorism	10
Chemical, Biological and Nuclear Terrorism	10
Terrorism Risk Management and Mitigation	20
Risk, Crisis, and Resilience	10
Counterterrorism and Intelligence	10
Negotiating with Violent Extremist Terrorist Organisations	10
Terrorism and the Law	10
Investigation and Evidence Collection	10
Reasoning for Forensic Science	10
Analytical Techniques	20
Courtroom Skills	10
Introduction to Fire Investigation	10
Introduction to Firearms Investigations and Forensic Ballistics	10
Firearms Investigations	10
Forensic Ballistic Investigations	10
Counter-Improvised Explosive Devices Capability	10
Forensic Exploitation and Intelligence	10

[4] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

TOTAL:	**120**

C. MSc in Counterterrorism

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

Description	**Credits**
COMPULSORY MODULES:	**120**
Introductory Studies	0
Understanding Terrorism and Counterterrorism	20
Applied Counterterrorism	10
Strategies, Ideologies and Tactics of Terrorism	10
Thesis	80
ELECTIVE MODULES:	**80**
80 credits from	
Protecting Critical National Infrastructure	10
Cyber Terrorism	10
Chemical, Biological and Nuclear Terrorism	10
Terrorism Risk Management and Mitigation	20
Risk, Crisis, and Resilience	10
Counterterrorism and Intelligence	10
Negotiating with Violent Extremist Terrorist Organisations	10
Terrorism and the Law	10
Investigation and Evidence Collection	10
Reasoning for Forensic Science	10
Analytical Techniques	20
Courtroom Skills	10
Introduction to Fire Investigation	10
Introduction to Firearms Investigations and Forensic Ballistics	10
Firearms Investigations	10
Forensic Ballistic Investigations	10
Counter-Improvised Explosive Devices Capability	10
Forensic Exploitation and Intelligence	10
TOTAL:	**200**

D. Postgraduate Certificate in Counterterrorism, Risk Management & Resilience

The accumulation of 60 credits[5] through the assessment of taught modules as detailed below:

Description	**Credits**
COMPULSORY MODULES:	**40**
Introductory Studies	0
Understanding Terrorism and Counterterrorism	20
Terrorism Risk Management and Mitigation	20

[5] Senate Regulations require a minimum of 60 learning credits to be accumulated for the Award of PgCert. The number of learning credits for individual courses is set during course validation.

ELECTIVE MODULES:	**20**
20 credits from	
Applied Counterterrorism	10
Strategies, Ideologies and Tactics of Terrorism	10
Protecting Critical National Infrastructure	10
Cyber Terrorism	10
Chemical Biological Radiological and Nuclear Terrorism	10
Risk Crisis and Resilience	10
Counterterrorism and Intelligence	10
Terrorism and the Law	10
Courtroom Skills	10
Introduction to Fire Investigation	10
Counter-Improvised Explosive Devices	10
Forensic Exploitation and Intelligence	10
TOTAL:	60

E. Postgraduate Diploma in Counterterrorism, Risk Management & Resilience

The accumulation of 120 credits[6] through the assessment of taught modules as detailed below:

Description	**Credits**
COMPULSORY MODULES:	**70**
Introductory Studies	0
Understanding Terrorism and Counterterrorism	20
Applied Counterterrorism	10
Strategies, Ideologies and Tactics of Terrorism	10
Terrorism Risk Management and Mitigation	20
Risk Crisis and Resilience	10
ELECTIVE MODULES:	**50**
50 credits from	
Protecting Critical National Infrastructure	10
Cyberterrorism	10
Chemical Biological Radiological and Nuclear Terrorism	10
Counterterrorism and Intelligence	10
Terrorism and the Law	10
Courtroom Skills	10
Introduction to Fire Investigation	10
Counter-Improvised Explosive Devices	10
Forensic Exploitation and Intelligence	10
TOTAL:	120

F. MSc in Counterterrorism, Risk Management & Resilience

In addition to the requirement for the Postgraduate Diploma outlined above, students must successfully complete the thesis. An MSc will be awarded on successful completion of 200 credits as outlined below:

[6] Senate Regulations require a minimum of 120 learning credits to be accumulated for the Award of PgDip. The number of learning credits is set during course validation.

Description	Credits
COMPULSORY MODULES:	**150**
Introductory Studies	0
Understanding Terrorism and Counterterrorism	20
Applied Counterterrorism	10
Strategies, Ideologies and Tactics of Terrorism	10
Terrorism Risk Management and Mitigation	20
Risk Crisis and Resilience	10
Research Project	80
ELECTIVE MODULES:	
50 credits from	
Protecting Critical National Infrastructure	10
Cyberterrorism	10
Chemical Biological Radiological and Nuclear Terrorism	10
Counterterrorism and Intelligence	10
Terrorism and the Law	10
Courtroom Skills	10
Introduction to Fire Investigation	10
Counter-Improvised Explosive Devices	10
Forensic Exploitation and Intelligence	10
TOTAL:	200

If a student does not meet the required standards for the award, the examiners for the programme may decide to offer a lower award associated with the programme, providing that a lower exit award exists and the student meets the requirements of that lower award.

Pass Criteria
The University operates standard pass criteria which can be found in the Senate Handbook on Assessment Rules.

In order to achieve your award, you are required to achieve:

- An overall average mark of ≥50%;
- An average mark of ≥50% across the taught assessment;
- All assessments need to be completed and the minimum mark attained: no more than one failure to complete an assessment (as defined in Section 2.3) will be permitted throughout the course of your studies (Please note that the board of examiners does not have discretion to overrule this limit, but can refer a case to Senate's Education Committee); [7]
- **For Taught Assessments,** the minimum mark for each individual taught assessment on the first attempt for the significant majority of the taught assessments, noting that:
  - if you fail to attain the minimum mark for **up to 30 learning credits**, you will be permitted to re-take all of those assessments (except for circumstances where a resit award capped at 50% would be insufficient to achieve an overall average mark of ≥50% across the taught assessments);
  - if, having failed to attain the minimum mark for 30 learning credits, you fail to obtain the minimum mark for **any additional learning credits** over the course of your studies you will be disqualified from the right to re-take the assessments: this will normally result in intended award

[7] Providing the minimum mark is met, a mark of 40-49% will be automatically compensated if a student's overall average taught assessment mark (including the failed assessment) is greater than 50%. Students are advised, however, that they retain the right to re-take an assessment with a mark of <40% (but should note that a re-take attempt will be capped at 50%), as long as they haven't failed more than 30 credits. At the discretion of the Board of Examiners or by Board of Examiners Chair's Actions a student may be permitted a re-take attempt of modules in the range of 40-49% only if the average mark of their other taught modules would not allow them to qualify for their award (<50%).

failure. (Please note the board of examiners may at its discretion overrule this limit, but this is not an automatic right);
    - it is <u>not</u> permissible for you to fail an elective module and then proceed to take a different elective module in its place.
- **For Substantial pieces of assessment** (corresponding to ≥40 credits, which are not part of the taught assessment average), the pass mark of ≥50% (where they exist);
- **For the thesis,** a mark of ≥50% in order to receive a pass (where it exists).

6. How is the course structured?

Full-time students register for the course in October and are expected to complete the course within 11 calendar months.

Part-time students register for the course in October and are expected to complete the course within 3 years.

Most modules are taught over one week. For some modules this will include sufficient time for parts of the module assessments such as individual or group presentations. Most assessments are completed after the residential element. The examination for Reasoning for Forensic Science and coursework is completed after the residential element of the module. The coursework for Courtroom Skills is submitted before the module with a practical assessment completed during the residential week

Each option within the course is based around a specific set of option-specific, compulsory modules (a "theme"), with a complementary series of associated role- specific modules. Students select modules across the whole programme according to their individual requirements and entry qualifications.

Students would normally commence their individual research project only on successful completion of the taught component of the course. It is expected that the individual research project will normally fall within the scope of the dominant theme established in the taught phase.

Part-time provision of the course works as a variant of the full-time course, but is offered in a more flexible mode of study. Students are able to "jump on and jump off" modules over a longer period and sit classes alongside full-time students. Part-time students are also allowed longer deadlines for the submission of coursework.

An illustrative journey pathway for a part-time student on the MSc Counterterrorism, Risk Management & Resilience could be to take the following modules:

First Year: Module 1 (Oct), Module 2 (Oct), Module 8 (Jan), Module 3 (Mar) (50 credits)

Second Year: Module 4 (Nov), Module 22 (Jan), Module 7 (Mar), Module 5 (April) (40 credits)

Third Year: Module 9 (Nov), Module 6 (Feb) Module 21 (Mar) Module 23 (Apr - Aug) (110 credits)

7. Course Level Assessment Strategy[8]

The course assessment tasks are challenging and are designed to enable students to demonstrate a full range of skills and attributes. Core modules introduce students to foundational theory and central issues (e.g. Understanding Terrorism and Counterterrorism; Applied Counterterrorism; Terrorism Risk Management and Mitigation) and will be assessed through essays, reports, MCQs, presentations and group debate. Reports and essays are of varying lengths, and recognise that writing articles or reports to a short length can be more challenging for some and can develop different skills relevant to professional

[8] Guidance to aid colleagues writing or updating a course-level assessment strategy for inclusion in the Course Specification can be found as Appendix K in either the Senate Handbook on Setting up a New Taught Course or the Senate Handbook on Managing Taught Courses https://intranet.cranfield.ac.uk/EducationServices/Pages/SenateHandbooksA-Z.aspx

practice. The length of each assessment task is clearly stated within the module descriptor. Students will write employability relevant reports and assessments to equip them with the skills they require to succeed as a professional working in a counterterrorism-relevant sector and to address specific award ILOs [e.g. MSc Counterterrorism ILOs 3, 4, 5, 6]; and for those working in risk management, mitigation & resilience sectors [e.g. MSc Counterterrorism, Risk Management & Resilience ILOs 2, 3, 5, 7].

Students then have opportunities to develop their communication skills, as they are required to give group presentation and individual presentations and participate in group debates. The ability to work effectively in groups is a highly desirable skill which is specifically identified in ILO 6 (MSc Counterterrorism & MSc Counterterrorism, Risk Management & Resilience). Feedback is given immediately after the group presentation and group debates.

Modules are supported by a number of formative tasks including group debates (e.g. Applied Counterterrorism; Chemical, Biological, Radiological and Nuclear (CBRN) Terrorism), MCQs (e.g. Cyberterrorism; Protecting Critical National Infrastructure), and oral presentations (e.g. Understanding Terrorism and Counterterrorism; Strategies, Ideologies and Tactics of Terrorism). Formative feedback is given verbally within the classroom following debates, and oral feedback provided by the tutor and peers for presentations. Students will also engage with interactive learning activity such as MCQs which incorporates formative feedback. For a range of modules (e.g. Understanding Terrorism and Counterterrorism; Applied Counterterrorism; Chemical, Biological, Radiological and Nuclear (CBRN) Terrorism; Strategies, Ideologies and Tactics of Terrorism; Terrorism Risk Management and Mitigation) class presentations and peer review informs performance, students are also generally encouraged to support each other by asking and answering questions via the VLE.

The taught components precede the research project, so assessment can be used to develop skills required for the individual research project. Students are generally expected to be more self-directed in their learning during the research project and guidance will be provided by a staff supervisor. The research project addresses ILOs 8-10 for both courses and takes the form of a Thesis on a subject directly relevant to the major theme of the course.

Course modules

The following modules outline all parts of the programme leading to **MSc**. Other awards associated with the course include some or all of these modules.

Module Number	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
1	R-CT-IS	Introductory Studies	Anastasia Filippidou	30	0	0	Y	03/10/22	03/10/22	07/10/22	N/A	AO	N/A	N/A			N/A	N/A
2	R-CT-UTC	Understanding Terrorism and Counterterrorism	Andrew Silke	40	0	20	N	24/10/22	24/10/22	28/10/22	50	ICW	100				FT 28/11/22 PT 12/12/22	Next available opportunity

[9] Please note that all contact hours are indicative and represent scheduled teaching, which is subject to minor changes and variation at short notice
[10] Visiting Lecturer = a member of staff (with RTS) but not on a permanent contract (does not include those acting as occasional guest speakers)
[11] A mark of 50% is required to pass the assessment however, where the stated minimum mark is 40%, a mark of 40-49% may be compensated by good performance in other modules providing that the overall average is ≥50%.
[12] For **independent assessments** please record type and weighting of each separate piece of assessment individually. 10 credit modules should be designed to allow assessment through a single independent summative assessment. Deviations will require approval by the School Director of Education
[13] For **multi-part assessments** please record the overall weighting of module which should be 100%. Multipart assessments should only be included in courses where there is a clear andragogical reason and where each element forms part of a continuous learning and assessment experience for students.
[14] Failure to submit an element of a **multi-part assessment** will **not** require remedial action if the absence of the marks for the assignment still results in a pass for the assessment (whether 40 or 50% as appropriate*)*. If, however, the absence of marks fails to meet the minimum mark for the module then **all** elements of the assessment must be re-taken.
[15] Please ensure you include submission dates for both FT and PT students and that you give details of the submission date for each individual element of a multi-part assessment.

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
3	R-CT-AC	Applied Counterterrorism	Andrew Silke	25	0	10	N	06/03/23	06/03/23	10/03/23	50	ICW	100				FT 11/04/23 PT 25/04/23	Next available opportunity
4	R-CT-SITT	Strategies, Ideologies and Tactics of Terrorism	Anastasia Filippidou	25	0	10	N	14/11/22	14/11/22	18/11/22	50	ICW	100				FT 19/12/22 PT 03/01/23	Next available opportunity
5	R-CT-PCNI	Protecting Critical National Infrastructure	Andrew Silke	25	0	10	N	17/04/23	17/04/23	21/04/23	40	ICW	100				FT 22/05/23 PT 05/06/23	Next available opportunity
6	R-CT-CT	Cyberterrorism	Andrew Silke	25	0	10	N	16/01/23	16/01/23	20/01/23	40	ICW	100				FT 20/02/23 PT 06/03/23	Next available opportunity
7	R-CT-CBRN	Chemical. Biological, Radiological and Nuclear (CBRN) Terrorism	Matthew Healy	25	0	10	N	20/02/23	20/02/23	24/02/23	40	ICW	100				FT 27/03/23 PT 10/04/23	Next available opportunity

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment								
												Independent Assessment		Multi-part Assessment			Submission dates		
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
8	R-CT-TRMM	Terrorism Risk Management and Mitigation	Mike Harris	40	0	20	N	30/01/23	30/01/23	03/02/23	50 Compulsory 40 Elective	ICW	100				FT 06/03/23 PT 20/03/23	Next available opportunity	
9	R-IDS-RR	Risk, Crisis and Resilience	Edith Wilkinson	25	0	10	N	21/11/22	21/11/22	25/11/22	40	ICW	100				FT 09/01/23 PT 23/01/23	Next available opportunity	
10	R-IDS-TCT	Counterterrorism and Intelligence	Anastasia Filippidou	20	0	10	N	05/12/22	05/12/22	09/12/22	40	ICW	100				FT 24/01/23 PT 07/02/23	Next available opportunity	
11	R-CT-NVETO	Negotiating with Violent Extremist and Terrorist Organisations	Anastasia Filippidou	20	0	10	N	09/01/23	09/01/23	13/01/23	40	ICW	100				FT 13/02/23 PT 27/02/23	Next available opportunity	
12	R-CT-TL	Terrorism and the Law	David Turns	20	0	10	N	06/02/23	13/02/23	17/02/23	40	ICW	100				FT 20/03/23 PT 03/04/23	Next available opportunity	

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13](100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
13	R-FP-IEC	Investigation and Evidence Collection	Hannah Moore	30	0	10	Y	17/10/22	17/10/22	21/10/22	50	GPRES	100				FT 21/11/22 PT 05/12/22	Next available opportunity
14	R-FP-RFS	Reasoning for Forensic Science	Peter Zioupos	25	0	10	Y	10/10/22	10/10/22	14/10/22	50	EX	100				W/c 12/12/22	W/c 20/03/23
15	R-FP-AT	Analytical Techniques	Fiona Brock	34	5	20	Y	31/10/22	31/10/22	11/11/22	50 50	ICW1 ICW2	50 50				ICW 1+2: FT 12/12/22 PT 04/01/23	Next available opportunity
16	R-FP-CS	Courtroom Skills	Peter Zioupos	25	0	10	Y	03/10/22	08/05/23	12/05/23	50 50	OR ICW	60 40				ALL 12/05/23 ALL 31/03/23	Next available opportunity
17	R-FP-IFI	Introduction to Fire Investigation	Mike Moulden	32	0	10	Y	23/01/23	23/01/23	27/01/23	50	ICW	100				FT 27/02/23 PT 13/03/23	Next available opportunity
18	R-FP-IFIFB	Introduction to Firearms Investigations and Forensic Ballistics	Kate Hewins	32	0	10	Y	28/11/22	28/11/22	02/12/22	50	ICW	100				FT 13/01/23 PT 27/01/23	Next available opportunity

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
19	R-FP-FI	Firearms Investigations	Kate Hewins	32	0	10	Y	16/01/23	16/01/23	20/01/23	50	ICW	100				FT 20/02/22 PT 06/03/22	Next available opportunity
20	R-FP-FBI	Forensic Ballistics Investigations	Kate Hewins	32	0	10	Y	13/03/23	13/03/23	17/03/23	50	ICW	100				FT 17/04/23 PT 02/05/23	Next available opportunity
21	R-FP-CEDC	Counter-Improvised Explosive Devices Capability	Mike Harris	28	0	10	Y	27/03/23	27/03/23	31/03/23	50	IPRES	100				02/05/23 Presentation submission date 30-31st May 2023 Oral presentation dates	Next available opportunity
22	R-FP-FEAI	Forensic Exploitation and Intelligence	Stephen Johnson	28	0	10	Y	03/04/23	03/04/23	06/04/23	50	ICW	100				FT 08/05/23 PT 22/05/23	Next available opportunity
23	R-CT-THESIS (A22)	Thesis	Edith Wilkinson	50	0	80	N	A22 03/05/23	A22 (FT): 03/05/23	25/08/23	50	THESIS	100				FT 25/08/23	N/A

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
									RP Day 1: 15/12/22 RP Day 2: 15/03/22									
23	R-CT-THESIS (B22)	Thesis	Edith Wilkinson	50	0	80	N	B22 04/10/22	PT 2020 cohort: 04/10/22 Project Day (PT 2020 intake): 4-5 Oct 22	04/10/23	50	THESIS	100				PT 04/10/23	N/A

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Module Number	Module code	Title	Module Leader	Contact hours[9]	Total hours delivered by Visiting Lecturers[10]	Credits	Is the module shared? Y/N	Calendar			Assessment							
												Independent Assessment		Multi-part Assessment			Submission dates	
								Module Start Date (eg Pre-course task)	Module Delivery Start Date	Module Delivery End Date	Minimum Mark[11] - 40% or 50%	Type of Assessment	Weighting within module[12] (%) of Independent assessments	Weighting within module of multi-part assessments[13] (100%)	Type of Assessment	Weighting of individual elements of multi-part assessment[14]	Assessment Submission and/or exam date[15]	Assessment / Exam Retake date
									Optional: 15 Dec and 15 Mar Workshops									
23	R-CT-THESIS (B23)	Thesis	Edith Wilkinson	50	0	80	N	B23: 04/10/23	B23 (PT 2021 cohort): 04/10/23 RP Day 1: 15/12/2023 RP Day 2: 15/03/23	04/10/24	50	THESIS	100				PT 04/10/24	N/A

***IFIFB is a pre-requisite for FI

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

***FI is a pre-requisite for FBI

Assessment Types: AO – Attendance only; ICW – Individual Coursework; GCW – Group Coursework; IPRES – Individual Presentation; GPRES – Group Presentation; IPRAC – Individual Practical; GPRAC – Group Practical; IPROJ – Individual Project (>20 credits); GPROJ – Group Project (>20 credits); EX – Examination ; RP – Reflective Portfolio; OR- Viva Voce examination; THESIS – Thesis; MULTI – Multi-part Assessment

Please list all modules that are used by another existing course.

Module code	**Module title**	**Course that owns the module**	**Other course(s)/ programme(s) that use the module**
R-CT-IS	Introductory Studies		
R-IDS-TCT	Counterterrorism and Intelligence	Counterterrorism Programme	Defence and Security Programme
R-FP-IEC	Investigation and Evidence Collection	Forensic Programme	
R-FP-RFS	Reasoning for Forensic Science	Forensic Programme	
R-FP-AT	Analytical Techniques	Forensic Programme	
R-FP-CS	Courtroom Skills	Forensic Programme	
R-FP-IFI	Introduction to Fire Investigation	Forensic Programme	Defence and Security Programme
R-FP-IFIFB	Introduction to Firearms Investigations and Forensic Ballistics	Forensic Programme	Defence and Security Programme
R-FP-FI	Firearms Investigations	Forensic Programme	
R-FP-FBI	Forensic Ballistics Investigations	Forensic Programme	
R-FP-CEDC	Counter-Improvised Explosive Devices Capability	Forensic Programme	Explosives Ordnance Engineering MSc
R-FP-FEAI	Forensic Exploitation and Intelligence	Forensic Programme	
R-FP-IS	Introductory Studies	Forensic Programme	Archeomaterials

8. How are the ILOs assessed?

The following assessment types are utilised:

Essays, exams, reports, oral presentations, and a research project.

All assessments in the Programme comply with guidelines on assessment set out by the University and are designed to assess the learning outcomes of the module. Modes of assessment are varied and innovative. Feedback is detailed and great lengths are taken to ensure that assessment tasks are clarified and clearly understood.

The focus is on best practice and awareness of current research. For some assignments, students are expected to take on a professional role and assessments involve critical evaluation and professional judgement through a balance of report writing (including expert witness statements, analytical reports and critical reviews) oral examinations (individual and group presentations) and written examinations.

To complete the course to the award of a Masters level qualification, students must progress through PgCert and PgDip modules and assessment to the final element of the programme, the research based dissertation. Students must pass this final element of the programme with a minimum mark of 50%.

This approach has been adopted because:

It enables the testing of different aspects of the student's knowledge and ability. Conventional essay work is used to test research skills and analytical ability, and is often based on a critical review of the literature. A wide range of data types and sources are used. While journals, conference papers and specialist textbooks are most frequently used, students are expected to use other sources such as government and industry publications, newspapers, television and internet sites when appropriate. Consequently, students have to demonstrate an awareness of the reliability of the source and the possibility of conflicting interests.

Professional skills are developed through oral presentations and writing analytical reports on case studies and practical work, with a particular emphasis on clear but concise presentation. Students can expect assessed coursework to be returned to them no longer than 20 working days following the deadline for handing in, according to University Regulations. Throughout the course both individual and group presentations and briefings are used to assess communication skills appropriate for a range of target audiences

Assessment and ILO Mapping

Complete the grid below by inserting in the boxes which assessments from the modules directly assess the Award ILOs.

(Module numbers should correspond with those used in the Course module table above.)

A. Postgraduate Certificate in Counterterrorism

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3
1			
2	ICW	ICW	ICW
3	ICW	ICW	
4	ICW		
5		ICW	ICW
6	ICW	ICW	ICW
7	ICW		ICW
8		ICW	ICW
9			ICW
10	ICW	ICW	ICW
11	ICW		ICW
12	ICW		ICW
13			GPRES
14			EX
15			ICW
16			OR ICW

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3
17		ICW	ICW
18			ICW
19			ICW
20			ICW
21			IPRES
22			ICW

B. Postgraduate Diploma in Counterterrorism

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 4	ILO 5	ILO 6	ILO 7
1				
2	ICW	ICW	ICW	ICW
3	ICW	ICW	ICW	ICW
4		ICW	ICW	ICW
5		ICW	ICW	
6	ICW			
7	ICW		ICW	ICW
8	ICW		ICW	ICW
9	ICW		ICW	
10			ICW	ICW
11	ICW	ICW	ICW	
12	ICW		ICW	ICW
13			GPRES	GPRES
14				
15			ICW	ICW
16			ICW	ICW
17				
18			ICW	ICW
19				ICW
20				ICW
21				IPRES
22			ICW	ICW

C. MSc in Counterterrorism

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 8	ILO 9	ILO 10
23	THESIS	THESIS	THESIS

D. Postgraduate Certificate in Counterterrorism, Risk Management and Resilience

Award ILOs / Module No.	ILO 1	ILO 2	ILO 3
1			
2	ICW		ICW
3	ICW	ICW	ICW
4	ICW		ICW
5		ICW	ICW
6	ICW	ICW	ICW
7	ICW	ICW	ICW
8		ICW	ICW
9		ICW	ICW
10	ICW		ICW
16			OR ICW
17			ICW
21		IPRES	IPRES
22			ICW

E. Postgraduate Diploma in Counterterrorism, Risk Management and Resilience

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 4	ILO 5	ILO 6	ILO 7
1				
2	ICW		ICW	
3	ICW		ICW	
4			ICW	
5		ICW	ICW	ICW

Award ILOs / Module No.	ILO 4	ILO 5	ILO 6	ILO 7
6	ICW	ICW		ICW
7	ICW	ICW	ICW	ICW
8	ICW	ICW	ICW	ICW
9	ICW	ICW	ICW	ICW
10			ICW	
16			OR ICW	
17				
21		IPRES		IPRES
22			ICW	

F. MSc in Counterterrorism, Risk Management and Resilience

In addition to those outlined above, the Award intended learning outcomes are assessed by the following module assessments:

Award ILOs / Module No.	ILO 8	ILO 9	ILO 10
23	THESIS	THESIS	THESIS

MSc Counterterrorism	MSc Counterterrorism, Risk Management & Resilience
Core Modules Introductory Studies Understanding Terrorism & Counterterrorism Applied Counterterrorism Strategies, Ideologies & Tactics of Terrorism Research Project (Thesis)	**Core Modules** Introductory Studies Understanding Terrorism & Counterterrorism Applied Counterterrorism Strategies, Ideologies & Tactics of Terrorism Terrorism Risk Management & Mitigation Risk, Crisis and Resilience Research Project (Thesis)
Elective Modules Protecting Critical National Infrastructure Cyber Terrorism CBRN Terrorism Terrorism Risk Management & Mitigation Risk, Crisis and Resilience Counterterrorism and Intelligence Negotiating with Violent Extremist and Terrorist Organisations Terrorism and the Law Investigation and Evidence Collection Reasoning for Forensic Science Analytical Techniques Courtroom Skills	**Elective Modules** Protecting Critical National Infrastructure Cyber Terrorism CBRN Terrorism Counterterrorism and Intelligence Courtroom Skills Introduction to Fire Investigation Counter-Improvised Explosive Devised Capability Forensic Exploitation and Intelligence Terrorism and the Law

Introduction to Fire Investigation Introduction to Firearms Investigations & Forensic Ballistics Firearms Investigations Forensic Ballistics Investigations Counter-Improvised Explosive Devised Capability Forensic Exploitation and Intelligence	

*

CROSS-MODULAR ASSESSMENT (including any assessment which rests outside an individual module)

Title	**Modules Covered**	**Assessment**	
		Type	Weight (%)
N/A			

9. How will the University assure the quality of the provision?

New course proposals are reviewed by a Course Validation Panel, comprising at least the following membership: normally one subject matter expert external to the School or University, at least 3 academic staff not associated with the proposal. The Panel may include 1 member of professional staff. Panels are supported by an appropriately trained Secretary who provides authoritative guidance on policy and procedure to the Panel. Proposals are reviewed in line with the UK Quality Code for Higher Education. New courses are ultimately approved by the University's Education Committee, on behalf of Senate.

Course changes are approved by the School's Director of Education on behalf of Education Committee and Senate. Significant changes to a course will be referred to a Course Review Panel at the discretion of the Director of Education.

The University has in place regular monitoring procedures for quality assurance including an Annual Reflective Review for each course and an in depth 6 year review of each School's (total) educational provision known as the Senate Review.

Each course has at least one External Examiner who monitors all aspects of the assessment process. This is in line with the guiding principles to meet the Expectations and Core Practices of the UK Quality Code for Higher Education. External examining is one of the principal means for maintaining UK threshold academic standards within autonomous higher education institutions.

Each course has a formally constituted Examination Board, which includes the External Examiner, and which is responsible for ensuring that awards are made within the Regulations of the University and that students are made awards on the basis of meeting the specified Intended Learning Outcomes of a course at the appropriate standard.

Each course has a formally constituted Course Committee which meets at least twice a year to discuss, inter alia, programme design and planning, the student experience (including feedback) and student progress.

Each course has an Industry Advisory Panel (or similar) which meets at least once a year to engage with external stakeholders on curriculum design and currency of course content.

Student feedback both qualitative and quantitative is collected for each module studied. In addition students are invited to participate in the University's annual New Student Survey and Student Satisfaction Survey along with the annual national Postgraduate Taught Student Experience Survey. The results of all feedback are considered by the Course Committee and additionally, in respect of the University and

national surveys, issues of quality are considered by and acted on where appropriate by the Education Committee, Senate, School and University Executives.

New Partnership arrangements are considered in two stages:

1. The University Executive is responsible for ensuring appropriate due diligence has been undertaken in respect of the University's legal, financial, reputational and ethical responsibilities.
2. A Partnership Delivery Approval Panel then considers whether the proposal meets the UK Quality Code for Higher Education. The delivery of new partnership provision is ultimately approved by the Universities Education Committee, on behalf of Senate.

Year one partnership reviews are undertaken one year after the initiation of a new partnership involving academic (award bearing) provision. The aim is to provide a supportive framework to assist the Sponsoring School and its new Partner Institution to work collaboratively to ensure that: the learning and teaching provision and associated student experiences are of a high standard; and that those responsible for delivering the provision are undertaking their respective roles and responsibilities in an appropriate way.

As part of the regular monitoring procedures for established collaborative partnerships, in addition to the Annual Reflective Review there is an Annual Operating Statement and a 5 year review known as a Focused Review which looks at each partnership in depth. Occasional site inspection visits are also made.

10. What opportunities are graduates likely to have on completing the course?

The courses should enhance students' post award employment prospects. We have entered an era where terrorism and counterterrorism have become critical issues for modern society. The courses will provide graduates with a rigorous, evidence-based qualification in this important area. This Counterterrorism qualification will assist graduates to start careers in a wide variety of fields, including those related to security, defence, risk management, policing, policy, and international work. Beyond this, the course will help assist the careers of graduates who are already working in these and related fields. The Counterterrorism, Risk Management & Resilience pathway is specifically tailored for students interested in developing a career in the risk management or insurance sectors with a focus on protective security against terrorism and related threats. This pathway should appeal particularly to candidates who are either serving or recently retired from government, military or policing agencies, or those who are already in the risk management or insurance space who want to specialise in counterterrorism risk management and protective security.