

## Programme Specification

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### MSc in Unmanned Aircraft Systems Design 2019/20

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of study	Full time
Duration	1 year
Accreditation details	Royal Aeronautical Society, Institution of Mechanical Engineers
Final award	Master of Science
Name of award	Unmanned Aircraft Systems Design
Interim Exit awards	Postgraduate Certificate Postgraduate Diploma
FHEQ level of final award	Level 7
UCAS code	N/A
QAA Subject Benchmark or other external reference	QAA Subject Benchmark – Engineering 2015; Accreditation of Higher Education Programmes, Edition 3, Engineering Accreditation Board Characteristic Statement: Master's Degree, QAA 2015
Director of Programme	Dr Scott Walker
Programme Coordinator	Dr Zhiwei-Hu
Date specification was written	22 <sup>nd</sup> April 2010
Date programme was validated	April 2019
Date specification last updated	December 2019

### Programme Overview

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#### Brief outline of the programme

The development of unmanned aircraft systems provides many challenges and is one of the major developing fields at present in the aerospace industry worldwide. This programme is designed to give students real experience of these challenges and to prepare them for careers in this exciting aspect of the aerospace industry.

The taught element of the programme consists of a maximum of 7 modules totalling 60 ECTS/120 CATS, of which 4 (37.5 ECTS/75 CATS) are compulsory. This is followed by a substantial research project leading to a dissertation (30 ECTS/60 CATS). The specific educational aims are outlined in Educational Aims of the Programme, below.

#### Learning and teaching

The different subject matter of the modules lends itself to different teaching and learning technique. These include lectures, tutorials, individual and group projects, assignments and practical exercises. You are encouraged throughout to contribute your own

professional experiences and thoughts to the learning of the whole class through a free exchange of ideas.

Many modules include assessed coursework assignments which require you to carry out a substantial study of selected topics, either as individuals or in groups, leading to considerable depth of understanding and specialist knowledge. Assessment is designed to show that you can rationally use taught material and have a fundamental understanding of the subject matter. Feedback on progress is given to students on all submitted work.

### **Assessment**

Testing of the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of problem solving exercises, assignments, laboratory reports, and individual and group projects.

The assessment on the programme is undertaken through a variety of methods, enabling students to experience different ways to demonstrate their learning and understanding.

Many modules include assessed coursework assignments, which require you to carry out a substantial study of selected topics, either as individuals or in groups, leading to considerable depth of understanding and specialist knowledge. Assessment is designed to show that you can rationally use taught material and have a fundamental understanding of the subject matter. Feedback on progress is given to students on all submitted work.

### **Special Features of the programme**

As a student of this programme you will be integrated into the Computational Engineering and Design Research Group and will, for example, be encouraged to attend research seminars and guest lectures related to your field of study. The programme includes Group Design Project (SESA6078) in which you will conduct the design, build and test of an unmanned aircraft platform.

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

As an accredited programme in the field of aerospace engineering it qualifies for the UK Government's Aerospace MSc Bursary Scheme. For further details of this scheme please see:

<http://www.raeng.org.uk/>

**Please note:** As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our [Disclaimer](#) to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's programme validation process, which is described in the University's quality handbook.

### **Educational Aims of the Programme**

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The Faculty of Engineering and Physical Sciences hosts a spectrum of exciting and challenging programmes at undergraduate and postgraduate levels. Within this particular postgraduate taught (PGT) programme of study, we aim to enable you to develop a thorough professional knowledge of Unmanned Aircraft Systems. It has been configured for graduates, or similarly qualified individuals, with an engineering, scientific or mathematical background, who desire specialisation in the design of Unmanned Systems for further research or career-based reasons.

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

This MSc has at its focus the Conception, Design, Integration and Operation (CDIO) of an Unmanned Aircraft System, either fixed- or rotary-wing. To achieve this, students will work in teams to undertake a Group Design Project. However individuals will have a clearly defined specialist role as part of this team and their contribution will be assessed individually, although a significant part of the project mark will relate to the successful collective success of the aircraft operation and testing.

The aims of the programme are to give you:

- An advanced knowledge of Unmanned Aircraft Systems, with particular emphasis on the aircraft design.
- An understanding of the use, and an appreciation of the limitations, of computational analysis and design tools in the development of Unmanned Aircraft Systems.
- Enhance your transferable skills, including critical analysis, problem solving, project management, decision making, leadership, and communication by oral, visual and/or written means.
- Equip you with specialist knowledge, scientific and technical expertise and research skills for further research and/or application in the design of unmanned aircraft systems.

The MSc programme provides opportunities for you to achieve and demonstrate the learning outcomes described below.

## Programme Learning Outcomes

The programme provides opportunities for you to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas detailed below. The programme learning outcomes have been developed with reference to the Subject Benchmark Statement for engineering (<https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-engineering-15.pdf>) and the Characteristics Statement for Master's Degrees ([https://www.qaa.ac.uk/docs/qaa/quality-code/master's-degree-characteristics-statement.pdf?sfvrsn=6ca2f981\\_10](https://www.qaa.ac.uk/docs/qaa/quality-code/master's-degree-characteristics-statement.pdf?sfvrsn=6ca2f981_10)). The former of these is aligned with the Engineering Council publication Accreditation of Higher Education Programmes (AHEP): UK Standard for Professional Engineering Competence (third edition) ([https://www.engc.org.uk/engcdocuments/internet/Website/Accreditation%20of%20Higher%20Education%20Programmes%20third%20edition%20\(1\).pdf](https://www.engc.org.uk/engcdocuments/internet/Website/Accreditation%20of%20Higher%20Education%20Programmes%20third%20edition%20(1).pdf))).

## Knowledge and Understanding

Having successfully completed this programme you will be able to demonstrate knowledge and understanding of:

	<b>Science and mathematics</b> Engineering is underpinned by science and mathematics, and other associated disciplines, as defined by the relevant professional engineering institution(s). On graduation you will have achieved:
SM7	A comprehensive understanding of the relevant scientific principles of Unmanned Aircraft Systems Design
SM8	A critical awareness of current problems and/or new insights most of which is at, or informed by, the forefront of aerodynamic and computation
SM9	Understanding of concepts relevant to Unmanned Aircraft Systems Design, some from outside engineering, and the ability to evaluate them critically and to apply them effectively, including in engineering projects

	<b>Design</b> Design at this level is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real and complex problems. On graduation you will have the knowledge, understanding and skills to:
D9	Knowledge, understanding and skills to work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies
D10	Knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations

	<b>Economic, legal, social, ethical and environmental context</b> Engineering activity can have impacts on the environment, on commerce, on society and on individuals. On graduation you will have the skills to manage your activities and to be aware of the various legal and ethical constraints under which you are expected to operate, including:
EL8	Awareness of the need for a high level of professional and ethical conduct in engineering
EL9	Awareness that engineers need to take account of the commercial and social contexts in which they operate
EL10	Knowledge and understanding of management and business practices, their limitations, and how these may be applied in the context of Unmanned Aircraft Systems Design
EL11	Awareness that engineering activities should promote sustainable development and ability to apply quantitative techniques where appropriate
EL12	Awareness of relevant regulatory requirements governing engineering activities in the context of Unmanned Aircraft Systems Design
EL13	Awareness of and ability to make general evaluations of risk issues in the context of Unmanned Aircraft Systems Design, including health & safety, environmental and commercial risk

	<b>Engineering practice</b> This is the practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. On graduation you will have achieved:
P9	A thorough understanding of current Unmanned Aircraft Systems Design practice and its limitations, and some appreciation of likely new developments
P11	Understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader
P12	Advanced level knowledge and understanding of a wide range of engineering materials and components

### **Teaching and Learning Methods**

Acquisition of core knowledge and understanding is through lectures, seminars, tutorials, field and laboratory classes, computer classes, workshops, and independent study and research. You are encouraged from an early stage to supplement and consolidate your understanding and knowledge by independent study.

### **Assessment methods**

Testing of the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of problem solving exercises, laboratory reports design exercises, essays and individual and group projects.

### **Skills**

Having successfully completed this programme you will be able to:

	<b>Engineering analysis</b> Engineering analysis involves the application of engineering concepts and tools to the solution of engineering problems. On graduation you will have achieved:
EA5	Ability to use fundamental knowledge to investigate new and emerging technologies

EA6M	Ability both to apply appropriate engineering analysis methods for solving complex problems in engineering and to assess their limitations
EA7	Ability to collect and analyse research data and to 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

	<b>Design</b> Design at this level is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real and complex problems. On graduation you will have the knowledge, understanding and skills to:
D11	Ability to generate an innovative design for products, systems, components or processes to fulfil new needs

	<b>Engineering practice</b> This is the practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. On graduation you will have achieved:
P10	Ability to apply engineering techniques taking account of a range of commercial and industrial constraints

	<b>Additional general skills</b> On graduation you will have developed transferable skills, additional to those set out in the other learning outcomes, that will be of value in a wide range of situations, including the ability to:
G1	Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities
G2	Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
G3	Monitor and adjust a personal programme of work on an on-going basis
G4	Exercise initiative and personal responsibility, which may be as a team member or leader

	<b>Discipline Specific Skills</b> On completion of the Unmanned Aircraft Systems Design Science programme you will be able to:
	Design and conduct an appropriate programme of work to set objectives for research in the context of Unmanned Aircraft Systems Design
	Use scientific and technical literature in support of research
	Apply fundamental knowledge and understanding of essential facts, concepts and principles relevant to Unmanned Aircraft Systems Design in researching complex problems

### **Teaching and Learning Methods**

Intellectual skills are developed through the teaching and learning activities. Analysis and problem solving skills are further developed through regular problem sheets issued by module lecturers and through small group teaching. Experimental, research and design skills are further developed through coursework exercises, laboratory work, and design and research projects. Individual feedback is provided on all work submitted. Appreciation of the practical applications of these skills is provided by interaction with industry through visiting lectures and industrial visits.

### **Assessment methods**

Analysis and problem solving skills are assessed through unseen written examinations and problem based exercises. Experimental, research and design skills are assessed through laboratory reports, coursework exercises, project reports and oral presentations. Skills are formatively assessed through written reports and oral presentations, practical and laboratory reports. Summative assessment is through unseen examinations, extended essays, written reports and oral presentations, and completion of a research project.

## Programme Structure

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The University uses the European Credit Transfer Scheme (ECTS) to indicate the approximate amount of time a typical student can expect to spend in order to complete successfully a given module or programme, where 1 ECTS indicates around 20 nominal hours of study. Previously, Credit Accumulation and Transfer Scheme (CATS) points were used for this purpose where 1 CATS credit was 10 nominal hours of study. The University credit accumulation and transfer scheme is detailed in the University Calendar (<https://www.southampton.ac.uk/calendar/sectioniv/index.page>).

The programme involves 90 ECTS/180 CATS distributed between taught and research components. The taught component consists of modules worth 60 ECTS/120 CATS, of which at least 45 ECTS/90 CATS are at level 7. Details of the compulsory and optional modules for this programme are shown in Appendix 1. Any of these modules can form part of a Postgraduate Certificate, requiring at least 30 ECTS/60 CATS to be completed successfully. A Postgraduate Diploma requires 60 ECTS/120 CATS to be completed successfully. The MSc requires successful completion of 90 ECTS/180 CATS, of which 30 ECTS/60 CATS are due to the research project.

The MSc programme lasts for 12 months. The first 8 months are spent mainly on the taught component, with lectures divided into two 12-week periods (Semesters 1 and 2), with exams at the end of each semester. The final four months are spent full-time on a research project, for which some preparation is undertaken in Semester 2. It is important that you commence project work before the Semester 2 exams to allow yourself maximum time, especially where practical work is involved.

The MSc award depends on passing the examinations and on successful completion of a dissertation on the project.

Each module is a self-contained part of the programme of study and carries a credit rating. Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

### Typical course content

You will study a number of core and optional subjects during both semesters (see Appendix 1 for details). These provide sound preparation for the final part of the degree, the Research Project.

A full list of taught modules can be found at

[http://www.southampton.ac.uk/engineering/postgraduate/taught\\_courses/engineering.page](http://www.southampton.ac.uk/engineering/postgraduate/taught_courses/engineering.page)

Research projects may concern any of the areas covered by the programme. The research project is intended to bring together the full range of skills in the programme and to provide you with an opportunity to build on all of the learning outcomes described above, while demonstrating in-depth knowledge and understanding of one or more of the areas covered by the programme. It involves information gathering and handling, critical analysis and evaluation, and presentation skills. The key requirement, however, is that the project must contain your own ideas and proposals: it should not simply be a technical design carried out to existing standards, but a problem with an element of novelty requiring the application of new information and concepts.

The programme follows university guidelines for inclusivity and flexibility and provides an array of teaching and learning approaches that will enable any student who meets the entry requirements to access the curriculum and demonstrate achievement of all the intended learning outcomes.

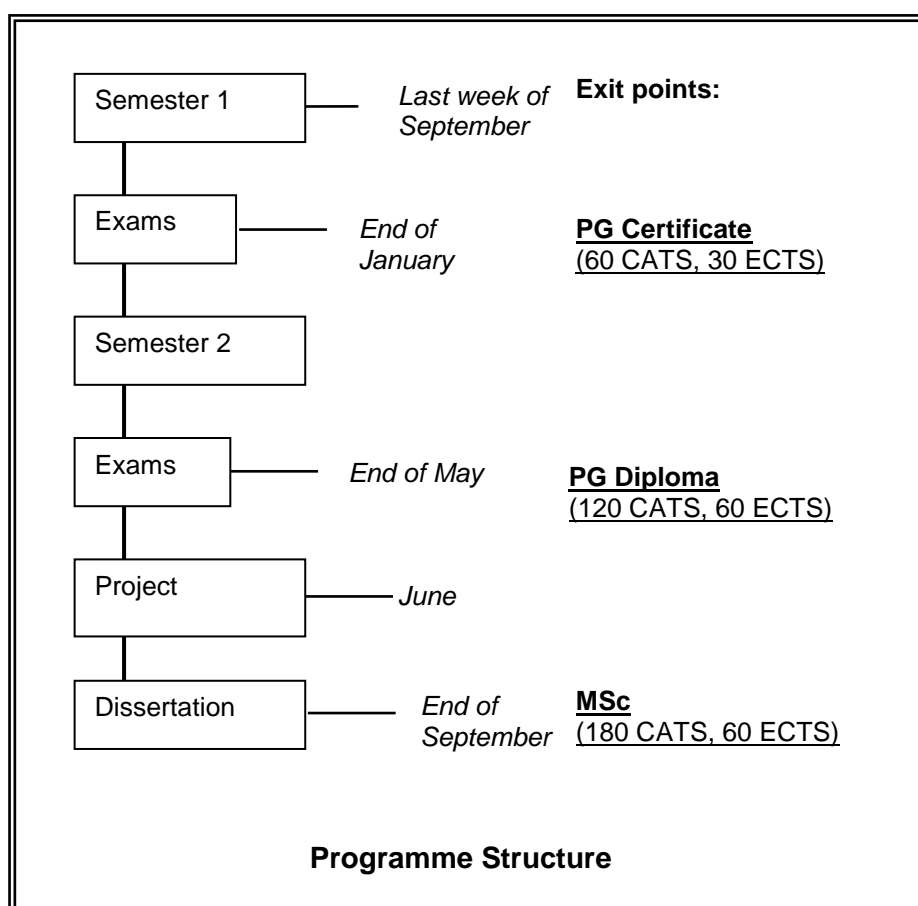
## Progression Requirements

The programme follows the University's regulations for [Progression, Determination and Classification of Results: Postgraduate Master's Programmes](#). Any exemptions or variations to the University regulations, approved by AQSC are located in [section VI of the University Calendar](#).

## Intermediate exit points

You will be eligible for an interim exit award if you complete part of the programme but not all of it, as follows:

Qualification	Minimum overall credits in ECTS/CATS credits	Minimum ECTS/CATS credits required at level of award
Postgraduate Diploma	at least 60/120	45/95
Postgraduate Certificate	at least 30/60	20/40



## Programme outcomes for different exit points

Level 7 (MSc)	Much of the study undertaken at Masters level reflects research at the forefront of Unmanned Aircraft Systems Design. You will have shown originality in the application of knowledge, and you will understand how the boundaries of knowledge are advanced through research. You will be able to deal with complex issues both systematically and creatively, and show originality in tackling and solving problems individually and as part of a team. You will have the qualities needed for employment in circumstances requiring sound judgement, personal responsibility and initiative, in complex and unpredictable professional environments.
PG Dip	You will have attained knowledge of research being undertaken by academic staff at the forefront of Unmanned Aircraft Systems Design. You will have shown that you are capable of applying knowledge to solve problems, and you

	will understand how the boundaries of knowledge are advanced through research. You will be able to deal with complex issues both systematically and creatively, and be able to contribute to solving problems individually and as part of a team. You will have the qualities needed for employment in circumstances requiring sound judgement and personal responsibility under the guidance of others, in complex and unpredictable professional environments.
PG Cert	You will have been exposed to research being undertaken by academic staff at the forefront of Unmanned Aircraft Systems Design. You will have gained experience in applying knowledge to solve problems, and you will understand how the boundaries of knowledge are advanced through research. You will be able to deal with complex issues by following existing procedures, and will be able to contribute to solving problems individually and as part of a team. You will have some of the qualities needed for employment in circumstances requiring sound judgement and personal responsibility under the guidance of others, in complex and unpredictable professional environments.

### Additional Costs

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. Costs that students registered for this programme typically also have to pay for are included in Appendix 2.

### Support for Student Learning

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There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular School or discipline area.

The University provides:

- [library resources](#), including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.
- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- [IT support](#) through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- [Enabling Services](#) offering support services and resources via a triage model to access crisis management, mental health support and counselling.
- assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia)
- the [Student Services Centre \(SSC\)](#) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- [Career Destinations](#), advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV
- Other support that includes [health services](#) (GPs), [chaplaincy](#) (for all faiths) and 'out of hours' support for students in Halls (18.00-08.00) a [Centre for Language Study](#), providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides



- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

Associated with your programme you will be able to access:

- Induction programme for orientation, introduction of the programme and staff, and dissemination of materials.
- Student Coursebook, including guidance on selection of study programmes.
- Administrative and academic material on the School, Programme and individual module web sites and/or Blackboard.
- A personal academic tutor to assist with organisational and personal matters. This role is taken over by the project supervisor when the research project starts.
- Careers advice and dissemination of available job advertisements.
- Personal email account and email access to staff via University system.
- Relevant specialist software on University clusters of computers.
- Formal progress monitoring during research project.
- Support for international students.

## **Methods for Evaluating the Quality of Teaching and Learning**

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You will have the opportunity to have your say on the quality of the programme in the following ways:

- Completing anonymous student evaluation questionnaires for each module of the programme.
- Acting as a student representative on various committees, e.g. Staff Student Liaison Committees, School Programmes Committee OR providing comments to your student representative to feedback on your behalf.
- Serving as a student representative on School Scrutiny Groups for programme validation.
- Taking part in programme validation meetings by joining a panel of students to meet with the School Scrutiny Group.

The ways in which the quality of your programme is checked outside the University, are:

- Regular module and programme reports which are monitored by the School
- Programme validation, normally every five years.
- External examiners, who produce an annual report.
- Professional body accreditation/inspection.
- A national Research Assessment Exercise (our research activity contributes directly to the quality of your learning experience).
- Institutional Review by the Quality Assurance Agency.

The ways in which the quality of your programme is checked inside the University, are:

- Discipline, Part, education and project boards, convening regularly during each academic year, which consider the outcomes of each module's delivery and evaluation.
- Moderation of examination papers, coursework and projects, both internally and externally.
- Annual examiners' meetings and examiners' boards.
- Annual programme and module reviews considering your feedback from all sources, feedback from teaching panels, external examiners and other bodies and student performance.
- Periodic meetings of the School Industrial Advisory Board.
- Response to results from the National Student Survey.

- Revalidation by the University at least every five years.

Note that quality assurance of part of the programme taken abroad, where applicable, is subject to the quality procedures of the relevant institutions. These procedures are subject to periodic monitoring by members of staff of the Faculty of Engineering and Physical Sciences.

### ***Taught component***

Each of the modules that make up the programme will be taught at the University of Southampton. The academic coordinator of the module (Module Lead) is responsible for ensuring appropriate content of modules and quality of delivery.

Assessment procedures for each module will be administered by the Faculty of Engineering and Physical Sciences (or the Faculty owning the specific module) in accordance with University policy.

### ***Research component***

Each research project will be supervised by a member of academic staff. A second assessor will be allocated who will normally be an academic or senior consulting engineer from within the Faculty. The supervisor and co-supervisor conduct a formal progress review with the student, normally during July.

### ***External Examiner***

In accordance with standard University practice, the examination setting and marking procedures will be evaluated by the External Examiner at all stages. The External Examiner will be a senior academic from a UK University actively involved in teaching and research. He/she will serve a period of office of normally 3 years.

## **Career Opportunities**

This programme will prepare you well for a career in the unmanned aircraft industry, either in the UK or abroad. Alternatively, the programme provides an excellent platform for further study leading towards a PhD in this area of research.

## **External Examiners(s) for the programme**

**Name:** Dr Matthew Strickland

**Institution:** University of Strathclyde

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their personal tutor in the first instance.

**Please note:** This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook online at <http://www.southampton.ac.uk/studentservices/academic-life/faculty-handbooks.page> and at

### **Revision History**

- 1 Created 20 April 2010
- 2 Revised 16 December 2010
- 3 Revised 21 January 2011
- 4 Checked August 2012 – A Tatnall
- 5 Regulations updated March 2013 – D Mead
- 6 Updated to reflect new curriculum structure July 2013 – G Roberts\_CQA\_251113
- 7 Updated June 2014 (G Roberts), CQA\_DM prog'n regs name 130614
- 8 Update to Programme Overview (CMA changes) – September 2015
- 9 Updated (SD Prior) August 2016
- 10 CQA textual updates August 2016 including GDP module code change (re 'Vehicle' replaced by 'Aircraft' – UASD GDP) –November 2016
- 11 Updated to reflect 201819 version and removal of Admissions Criteria – CQA March 2018
- 12 Updated Faculty name to Faculty of Engineering and Physical Sciences July 2018
- 13 Updated for validation – S Walker – April 2019
- 14 Updated – S Walker – December 2019

# MSc in Unmanned Aircraft Systems Design

## Appendix 1

### Programme Structure

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The list below reflects the modules that are planned to be offered in 2019-20, and is subject to minor alteration from year to year. Each module has an ECTS/CATS value of 7.5 ECTS/15 CATS or 15 ECTS/30 CATS at level 6 or 7. A maximum of 15 ECTS/30 CATS can be taken at level 6.

A 7.5 ECTS/15 CATS module has a total load of 150 notional hours, typically made up of 36 lectures, laboratory work, self-learning and assessment. Some modules are assessed based solely on examinations, others involve significant project work. Syllabuses indicate the broad outline of content for each subject. Detailed elements of content may change from year to year depending on the emphasis deemed necessary by the lecturer and the need to keep modules up to date.

Over Semester 1 and 2, students must study modules totalling 60 ECTS/120 CATS, with a minimum of 45 ECTS/90 CATS at level 7.

#### ***Mandatory modules***

The modules in the table below are mandatory for this theme and total 37.5 ECTS/75 CATS points. All modules are level 7 except as indicated.

The research component (FEEG6012) of the MSc consists of a Core module of 30 ECTS (60 CATS) which is a research dissertation.

Module Code	Module Title	ECTS/CATS credits	Semester
FEEG6006	Systems Reliability	7.5/15	1
FEEG6009	Design Search & Optimisation	7.5/15	2
SESA3030	Aerospace Control Systems (Level 6)	7.5/15	1
SESA6078	Unmanned Aircraft Systems Design Group Design Project	15/30	1 & 2

#### ***Optional modules***

Please select a total of 22.5 ECTS from the following lists of level 6 & 7 modules. Only one level 6 module may be selected. Please bear in mind the balance of modules between the semesters.

The following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

#### **Level 6 options**

Module Code	Module Title	ECTS/CATS credits	Semester
FEEG3001	Finite Element Analysis in Solid Mechanics (Level 6)	7.5/15	1
SESA3026	Aircraft Structural Design	7.5/15	2
SESA3033	Wing Aerodynamics	7.5/15	2
SESM3030	Control & Instrumentation	7.5/15	1

## Level 7 options

Module Code	Module Title	ECTS/CATS credits	Semester
FEEG6005	Applications of CFD	7.5/15	1
FEEG6010	Advanced Finite Element Analysis	7.5/15	2
SESA6064	Aircraft Structures	7.5/15	2
SESA6073	Powered Lift	7.5/15	2
SESA6075	Aircraft Propulsion	7.5/15	1
SESA6077	Aeroelasticity	7.5/15	1
SESG6035	Advanced Sensors and Condition Monitoring	7.5/15	1
SESG6039	Composites Engineering Design & Mechanics	7.5/15	1
SESM6037	Automotive Propulsion	7.5/15	2

Note: It is possible that module prerequisites may be omitted at the discretion of the module lecturer depending on previous experience.

## Appendix 2:

### Additional Costs

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme typically also have to pay for the items listed in the table below.

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at [www.calendar.soton.ac.uk](http://www.calendar.soton.ac.uk).

Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
Approved Calculators		<p>Students will require a scientific calculator. This will need to be purchased by the student.</p> <p>Students may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University specifies permissible models from time to time and these may be purchased from any source.</p>
Stationery		You will be expected to provide your own day-to-day stationary items, e.g. pens, pencils, notebooks, etc.).
Textbooks		<p>Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source.</p> <p>Some modules suggest reading texts as <b>optional</b> background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module.</p>

Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
<b>Equipment and Materials</b>	Design equipment and materials:	Standard construction/modelling materials will be provided where appropriate, unless otherwise specified in a module profile.  For customisation of designs/models calling for material other than standard construction/ modelling materials, students will bear the costs of such alternatives.
	Excavation equipment and materials:	
	Field Equipment and Materials:	A number of essential items will be provided to you e.g.: field notebook(s); compass-clinometer; geological hammer; steel tape measure; map case; pocket lens (x 10); safety helmet; safety goggles; bottle of dilute hydrochloric acid. If items provided are lost replacements can be purchased from:  However, you will need provide yourselves with a ruler; a pair of compasses; set squares; protractor; pencils (including coloured); eraser; calculator, penknife. These can be purchased from any source.
	Laboratory Equipment and Materials:	
	Photography:	
	Recording Equipment:	
<b>Clothing</b>	Lab Coats	

Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
	Protective Clothing:  Hard hat; safety boots; hi-vis vest/jackets;	
	Fieldcourse clothing:	You will need to wear suitable clothing when attending fieldcourses, e.g. waterproofs, walking boots. You can purchase these from any source.
	Wet Suits	
	Uniforms	
<b>Printing and Photocopying Costs</b>		<p>In some cases, coursework and/or projects may be submitted electronically. Where it is not possible to submit electronically students will be liable for printing costs, which are detailed in the individual Module Profile and can be found in Appendix 2.</p> <p>Reasonable expenses for travel and materials of up to £300 may be reclaimed through the School of Engineering Student Office. For project costs in excess of £300 students should discuss possible sources of funding with their supervisor and should not proceed with any expenditure until a further funding source has been agreed. The printing costs associated with dissertation are the responsibility of the student (FEEG6012).</p> <p>Students are expected to cover the costs associated with the printing and binding of reports, including any drawings and graphic presentations. Two copies will need to be submitted. Depending on the quality of printing and binding chosen students can expect to pay approximately £25-30 per copy, totalling approximately £50-60 for both copies (FEEG6012).</p>



Main Item	Sub-section	PROGRAMME SPECIFIC COSTS
Optional Visits (e.g. museums, galleries)		Some modules may include additional optional visits. You will normally be expected to cover the cost of travel and admission, unless otherwise specified in the module profile. For costs related to study abroad please see the relevant module profile.