Programme Specification[1]

1. Programme Title(s) and Code(s):

Programme Title	*UCAS Code*	*GU Code*
MEng Aeronautical Engineering	H410	H410-2204

2. Academic Session:

2018-19

3. SCQF Level (see Scottish Credit and Qualifications Framework Levels):

11

4. Credits:

600

5. Entrance Requirements:

Please refer to the current undergraduate prospectus at: http://www.gla.ac.uk/undergraduate/prospectus/

6. ATAS Certificate Requirement (see Academic Technology Approval Scheme):

ATAS Certificate not required

7. Attendance Type:

Full Time

8. Programme Aims:

Aeronautical Engineering is an advanced engineering discipline concerned with the theory, design, manufacture and testing of flight vehicles. These range from fixed-wing aircraft and rotary-wing aircraft (helicopters and autogyros) to spacecraft. In aeronautical engineering, mathematics and physical laws are applied in order solve problems in the design of flight vehicles or to advance the theory of flight vehicles. Aeronautics, or Aerospace Engineering is a fascinating subject area, involving a diverse range of subjects including airscrew, jet and rocket propulsion, aerodynamics, flight mechanics, aircraft structures, aircraft handling qualities, aircraft instrumentation, space systems and flight testing. While many of the mathematical and physical subjects

[1] 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 full advantage is taken of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each course can be found in course handbooks and other programme documentation and online at www.gla.ac.uk/

The accuracy of the information in this document is reviewed periodically by the University and may be checked by the Quality Assurance Agency for Higher Education.

studied as an aeronautical engineer are highly advanced and specialized, the degree, is highly multi-disciplinary as a result of the nature of aircraft and spacecraft, and therefore of use in a wide range of employment. The analytical and problem solving skills of the aeronautical engineering graduate are well regarded by employers and researchers.

The MEng programme is an integrated Masters programme in Aeronautical Engineering designed as a preparation for professional practice. It provides an extended and enhanced programme of study beyond the BEng and is not simply a one year extension to the BEng. It is designed for the more able student. The programme of study is both broader and deeper than the corresponding BEng.

This degree programme aims to:

- present an integrated in depth multidisciplinary programme of study which will provide the student with knowledge and understanding of Aeronautical Engineering;
- provide opportunities for the student to study in depth a choice of specialist topics within the field of Aeronautical Engineering;
- provide an opportunity for students to develop transferable problem solving skills in Aeronautical Engineering in group and large scale individual project work;
- provide technical awareness in appropriate specialist applications of technology in the Aeronautical Engineering field;
- develop the student's mathematical rigour, accuracy and numerate skills appropriate for professional engineering;
- present and develop professional, ethical, economic and management issues relevant to the Aeronautical Engineering industry.

9. Intended Learning Outcomes of Programme:

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas.

Knowledge and Understanding:

Graduates will be able to:

- Use their knowledge and understanding of the appropriate mathematical, scientific and computational tools that underpin Aeronautical Engineering, to solve, in depth, analytical, design or theoretical problems in the field of Aeronautical Engineering;
- Apply their knowledge and understanding of physical laws, mathematics, numerical analysis and other relevant information in order to model Aeronautical Engineering and similar systems;
- Draw on materials from a range of courses and wider reading in Aeronautical Engineering principles and in related disciplines in order to solve problems in Aeronautical Engineering including demonstrating depth and breadth to their learning;
- Apply business and management techniques that are relevant to Aeronautical Engineering and Aeronautical Engineers;
- Explain the role of Aeronautical Engineers in society and the constraints within which their engineering judgement will be exercised;
- Explain the professional and ethical responsibilities of Aeronautical Engineers;
- Consider the national and international role of the Aeronautical Engineer and the impact of engineering solutions in a global context.

Skills and Other Attributes:

Graduates will be able to:

Subject-specific/practical skills

- Plan and execute safely a series of experiments in Aeronautical Engineering;
- Design, from requirement, market need or specification, a Aeronautical Engineering device or system, up to the preliminary design stage, and present this design via a series of poster, written and oral presentations from both group and individual work;
- Use laboratory and workshop equipment to generate data from Aeronautical Engineering systems with appropriate rigour;
- Analyse experimental results in depth and determine their strength and validity;
- Assess the safety and potential efficacy of a device or system;
- Prepare technical drawings and technical reports;
- Give in depth technical presentations in oral form, as posters or in written form;

- Write up experimental methods, results and conclusions, and carefully and clearly plot experimental or computational results and interpret experimental data by the use of regression, curve fitting and filtering, applying appropriate statistical analysis;
- Use scientific literature effectively and by drawing on their knowledge from lectures and wider reading around the subject be able to solve Aeronautical Engineering problems;
- Develop and update a research plan and adjust a work programme in order to conduct a major research project in academia or industry;
- Undertake a large scale supervised research project in academia or industry and present the results of this work in a written report and oral presentation to peers and staff;
- Work effectively in both individual and group projects;
- Explain in depth the managerial and economic factors facing a professional engineer;
- Document their solutions to Aeronautical Engineering problems so that others can follow and validate their work;
- Apply professional engineering practice and judgement in project work;
- Write computer programs and use computational tools and packages, selecting the appropriate "state of the art" tools to solve Aeronautical Engineering problems.

Intellectual skills

Graduates will be able to:

- Apply appropriate quantitative mathematical, scientific and engineering tools to the analysis of problems;
- Apply rigour in mathematics;
- Plan, conduct and report a programme of original research;
- Analyse and solve engineering problems;
- Design an Aeronautical Engineering system, component or process to meet a need;
- Be creative in the solution of problems and in the development of designs;
- Integrate knowledge and understanding of other scientific, mathematical, computational or engineering disciplines in order to support their engineering specialisation;
- Formulate and test hypotheses modifying the hypotheses depending on the data obtained;
- Evaluate designs, processes and products and make improvements;
- Integrate and evaluate information and data from a variety of sources;
- Take a holistic approach in solving problems and designing systems, applying professional judgements to balance risks, costs, benefits, safety, reliability, aesthetics and environmental impact.

Transferable/key skills

The skill set of the Aeronautical Engineer graduating from the MEng programme will be of use in a wide range of applications because of the multi-disciplinary nature of the subject. Their skills will be, by definition, transferable.

Graduates will be able to:

- Apply in depth problem solving and analytical thinking to a diverse range of problems;
- Use appropriate multi-disciplinary skills to solve Aeronautical Engineering problems, combining the breadth of knowledge gained through the degree;
- Demonstrate numeracy and literacy in written reports, project work and examinations;
- Work in a group project environment and contribute effectively to the group project, including working as a member of an interdisciplinary team;
- Work on an individual project involving self-directed research;
- Communicate effectively (in writing, verbally and through drawings);
- Apply mathematic skills (algebra, geometry, modelling, analysis);
- Transfer techniques and solutions from one field of engineering to another and to the Aeronautical field;
- Use information and communications technology;
- Manage resources and time effectively;
- Exercise team leadership;
- Learn independently in familiar and unfamiliar surroundings with open-mindedness and in the spirit of critical enquiry;
- Learn effectively for the purpose of continuing professional development and in a wider context throughout their career.

10. Typical Learning and Teaching Approaches:

Staff involved in the degree programme utilise a wide range of teaching methods that they deem the most appropriate for a particular course. These include:

- Lectures;
- External lectures from industry or clinicians;
- Feedback given to students during tutorials;
- Small group and large group tutorial sessions;
- Question and answer sessions during lectures or staff Office Hours;
- Guided reading of texts, journal articles etc., for individual and group projects;
- Completion of web-based exercises or computer based laboratory sessions;
- Laboratory sessions.

11. Typical Assessment Methods:

Assessment Methods to be used are:

- Written examinations (Summative assessment);
- Oral presentations of individual and group work;
- Individual written project report(s) of both individual and group projects;
- Group written project report(s) of group projects;
- Interview of group project manager and assessment of group project minutes;
- Poster presentation of group project work;
- Practical skills will be assessed through laboratory experiments, write-ups, coursework reports, project reports and presentations;
- Experimental, research and design skills will be assessed through laboratory experiments write-ups, coursework reports, project reports and presentations;
- Presentation skills through group presentations and poster presentations.

12. Programme Structure and Features:

MEng H410-2204

MEng Year 1

Compulsory Courses

Course Code	Course	Credits	Semester
ENG1002	Aerospace Engineering 1	10	1
ENG1003	Analogue Electronics 1	10	1
ENG1015	Design and Manufacture 1	10	2
ENG1026	Engineering Skills 1	10	1 & 2
ENG1033	Materials 1	10	1
ENG1062	Dynamics 1	10	2
ENG1063	Engineering Mathematics 1	40	1 & 2
ENG1065	Statics 1	10	1
ENG1066	Thermodynamics 1	10	2
		120	

MEng Year 2

Compulsory Courses

Course Code	Course	Credits	Semester
ECON1003	Microeconomics E1	10	2
ENG2002	Aerospace Design Project 2	10	2
ENG2037	Introduction to Aerodynamics 2	10	2
ENG2042	Mathematics AE2X	10	2
ENG2045	Power Electronics 2	10	1
ENG2053	Thermodynamics 2	10	2
ENG2077	Engineering Skills 2	10	1 & 2
ENG2081	Mechanics of Structures 2A	10	1
ENG2084	Dynamics 2	10	2

ENG2085	Fluid Mechanics 2	10	1
ENG2086	Engineering Mathematics 2	20	1
		120	

MEng Year 3

Compulsory Courses

Course Code	Course	Credits	Semester
ENG3001	Aerodynamics and Fluid Mechanics 3	20	1 & 2
ENG3006	Aircraft Design 3	10	2
ENG3015	Control 3	10	2
ENG3034	Instrumentation and Data Systems 3	10	2
ENG3036	Simulation of Engineering Systems 3	10	1
ENG3039	Dynamics 3	10	1
ENG3042	Propulsion and Turbomachinery 3	10	1
ENG3059	Aircraft Performance 3	10	1
ENG3060	Flight Mechanics 3	10	2
ENG3062	Aircraft Structural Analysis and Design 3	10	2
ENG3081	Aircraft Structures and Materials 3	10	1
		120	

MEng Year 4

Compulsory Courses

Course Code	Course	Credits	Semester
ENG4014	Aerospace Design Project 4M	20	1 & 2
ENG4020	Aircraft Structures and Materials 4	10	1
ENG4023	Aircraft Vibration and Aeroelasticity 4	10	2
ENG4037	Computational Fluid Dynamics 4	10	2
ENG4067	Flight Dynamics 4	10	1
ENG4074	High Speed Aerodynamics 4	10	2
ENG4085	Integrated System Design Project 4	20	1 & 2
ENG4102	Physics of Fluids 4	10	1
		100	

Optional Courses (choose 20 credits)

Course Code	Course	Credits	Semester
ENG4042	Control 4	20	1
ENG4079	Industrial Aerodynamics 4	10	2
ENG4088	Lasers and Electro-Optic Systems M4	20	1
ENG4118	Robotics 4	20	2
ENG4121	Space Flight Dynamics 4	10	1
ENG4173	Renewable Energy 4	10	1
ENG4175	Autonomous Vehicle Guidance Systems 4	10	2
ENG4179	Advanced Thermal Engineering 4	20	1
ENG4184	Navigation Systems 4	10	1
ENG4185	Radar and Electro-Optic Systems 4	10	2
ENG4194	Aerospace Propulsion 4	10	2
ENG4196	Rotorcraft Aeromechanics 4	10	2

MEng Year 5

Compulsory Courses

Course Code	Course	Credits	Semester
ENG5014	Aircraft Handling Qualities and Control 5	10	2
ENG5041P	Individual Project 5	60	1
LAW1011	Elements of Law for Engineers	10	2
		100	

Optional Courses (choose 40 credits)

Course Code	Course	Credits	Semester

ENG5009	Robust Control 5	10	2
ENG5017	Autonomous Vehicle Guidance Systems	10	2
ENG5019	Composite Airframe Structures	10	2
ENG5031	Fault Detection, Isolation and Reconfiguration	10	2
ENG5048	Introduction to Wind Engineering	10	2
ENG5072	Radar and Electro-Optic Systems M	10	2
ENG5081	Spacecraft Systems 2	10	2
ENG5220	Real Time Embedded Programming	20	2
ENG5263	Aeroelasticity and Aeroacoustics 5	10	2
ENG5265	Rotorcraft Aeromechanics M	10	2
ENG5278	Advanced Aerodynamics 5	10	2
ENG5280	Turbulent Flows 5	10	2
ENG5303	Advanced Thermal Engineering 5	10	2
ENG5307	Computational Fluid Dynamics 5	10	2
ENG5313	Aerospace Propulsion M	10	2

Regulations

This programme will be governed by the relevant regulations published in the University Calendar. These regulations include the requirements in relation to:

(a) Award of the degree

(b) Progress

(c) Early exit awards

http://www.gla.ac.uk/services/senateoffice/calendar/

13. Programme Accredited By:

Accredited by the Royal Aeronautical Society (RAeS) and the Institution of Mechanical Engineers (IMechE) to CEng level.

14. Location(s):

Glasgow

15. College:

College of Science and Engineering

16. Lead School/Institute:

Engineering [REG30300000]

17. Is this programme collaborative with another institution:

No

18. Awarding Institution(s):

University of Glasgow

19. Teaching Institution(s):

University of Glasgow

20. Language of Instruction:

English

21. Language of Assessment:

English

22. Relevant QAA Subject Benchmark Statements (see Quality Assurance Agency for Higher Education) and Other External or Internal Reference Points:

This Programme Specification is informed by the QAA Benchmark Statement for Engineering http://www.qaa.ac.uk/en/Publications/Documents/Subject-benchmark-statement-Engineering-.pdf It is also informed by the Engineering Council Publication "UK Standard for Professional Engineering Competence (UK-SPEC)" http://www.engc.org.uk/engcdocuments/internet/Website/UK-SPEC third edition (1).pdf and the requirements of the Royal Aeronautical Society (http://www.raes.org.uk/) and the Institution of Mechanical Engineers (http://www.imeche.org.uk/)

23. Additional Relevant Information (if applicable):

Support for students is provided by the Postgraduate/Undergraduate Adviser(s) of Studies supported by University resources such LEADS (www.gla.ac.uk/myglasgow/leads/), Counselling & Psychological Services (www.gla.ac.uk/services/counselling/), the Disability Service (www.gla.ac.uk/services/studentdisability/) and the Careers Service (www.gla.ac.uk/services/careers/).

24. Online Learning:

No

25. Date of approval:	07/08/2018