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**Programme Specification**

**Title of Course:**  MSc Aerospace Engineering

**Date Specification Produced:** October 2012

**Date Specification Last Revised:** October 2016

This Programme Specification is designed for prospective students, current students, academic staff and potential employers. It provides a concise summary of the main features of the programme and the intended learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the teaching, learning and assessment methods, learning outcomes and content of each module can be found in Student Handbooks and Module Descriptors.

**SECTION 1: GENERAL INFORMATION**

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| **Title:** | MSc Aerospace Engineering |
| **Awarding Institution:** | Kingston University, London |
| **Teaching Institution:** | Kingston University, London |
| **Location:** | Roehampton Vale |
| **Programme Accredited by:** | Royal Aeronautical Society in May 2014 |

**SECTION 2: THE PROGRAMME**

1. **Programme Introduction**

This programme is designed to broaden and deepen students’ knowledge of the aerospace industry and gain a strategic overview of aerospace engineering and management issues. It will help students to develop a wider perspective and understanding of the concerns facing the aerospace engineering industry, and includes subjects such as entrepreneurship, business, finance, research techniques and green environmental issues. Students will gain a broad understanding of the practical requirements of aerospace engineering, as well as knowledge of the subjects that are specific to aerospace engineering, such as modules in Aerospace Stress Analysis and Advanced Materials, Computational Fluid Dynamics (CFD) for Aerospace Applications and an Aerospace Group Design Project. They will also study subjects that are complementary to their academic discipline: Engineering Projects & Risk Management, Advanced CAD/CAM, and Green Engineering and Energy Efficiency. Engineering Research Techniques, Entrepreneurship and Quality Management is a core module of this course. It develops students’ business and management skills, and the skills to conduct a research project.

A substantial thesis is a core element for the group design project which provides students the challenge of undertaking a real-world design problem in an engineering environment. They will be encouraged to develop their research skills, self-initiative and decision making in a multidisciplinary team within an engineering organisation with real industrial constraints. The group work also allows students to apply what they learn from the taught modules to real world contexts, to evaluate methodologies and to develop their critical thinking and creativity. Students will develop the ability to show originality in the application of knowledge and to advance their knowledge through research. Our postgraduates will gain professional, analytical and management skills necessary for employment. Transferable skills such as communication, IT, teamwork, planning, decision-making, independent learning ability and problem-solving will contribute to their employability skills.

Kingston University is the biggest provider of undergraduate Aerospace Engineering courses in the UK. Kingston upon Thames has a strong historical heritage linking to Sopwith Aviation. The Hawker factory produced legendary aircraft including the Sopwith Camel and Hawker Hurricane. There is a strong link between our academic staff research and teaching. Our teaching teams have been actively involved in the research of computational fluid dynamic, aerodynamics and advanced materials. The University has well-equipped laboratories including two teaching flight simulators, a Learjet business aircraft, large scale low-speed wind tunnels, materials testing, rapid prototyping and high performance computing facilities.

1. **Aims of the Programme**

#### The main aims of MSc Aerospace Engineering course are to:

* Provide a “period of further learning” which is a requirement of the Royal Aeronautical Society for Chartered Engineer status for students with an accredited BEng.
* Further the students’ knowledge and understanding of subjects within the broad areas of materials, computational aerodynamics, structures and aerospace design.
* Enable students to develop a wider perspective and understanding of the issues facing the aerospace engineering industries and in particular to study subjects such as business, finance, management, environmental issues more broadly and in greater depth than in the BEng (Hons) programme.
* Develop an awareness of work in a multi-disciplinary team within an engineering organisation within real industrial constraints.
* Demonstrate a range of transferable skills including written, oral and graphical communication, independent learning, analytical skills, and engineering based computing skills.
* To develop research and investigative skills, and a critical, research-oriented approach to the study of relevant areas of aerospace engineering.

The aims of the Postgraduate Diploma and the Postgraduate Certificate are the same as those for the MSc except that, since the PgDip and PgCert student is not required to submit a project, he/she will not have the same opportunity to engage in the in-depth research which the Dissertation requires. The PG Diploma or PG Certificate will not satisfy the requirements for a “period of further learning”.

1. **Intended Learning Outcomes**

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes in the following areas. The programme outcomes are referenced to the QAA subject benchmarks for Aerospace Engineering and the Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008), and relate to the typical student.

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| **Programme Learning Outcomes** | | | | | | |
|  | **Knowledge and Understanding**  **On completion of the course students will be able to:** |  | **Intellectual skills – able to:**  **On completion of the course students will be able to:** | |  | **Subject Practical skills**  **On completion of the course students will be able to:** |
| A1 | Demonstrate knowledge and understanding of aerospace engineering subjects. | B1 | Submit areas studied to critical analysis and evaluation | | C1 | Select and apply computer-based and other advanced technologies to a wide range of aerospace engineering applications |
| A2 | Apply modelling techniques and analytical methods to solve engineering problems. | B2 | Analyse problems and issues, taking due account of any incompleteness of data or information, and arrive at well-reasoned and supportable conclusions | | C2 | Select and use appropriate software tools for the design and analysis of aerospace components and systems. |
| A3 | Demonstrate applications of design principles and analysis tools to solve aircraft design problems. | B3 | Carry out independent data collection and synthesise it so as to resolve problems/issues | | C3 | Demonstrate an in-depth understanding of the aerospace engineering business environment, including legal aspects, and apply modern operations and financial management techniques and good practices in a range of contexts. |
| A4 | Demonstrate knowledge of entrepreneurship, management and environmental issues in engineering. | B4 | Design and develop a programme of independent research and data collection/analysis | |  |  |
| A5 | Demonstrate a range of engineering skills. | B5 | Carry out a focused critical literature review | |  |  |
|  |  | B6 | Develop original thought | |  |  |
| **Key Skills** | | | | | | |
|  | **Self Awareness Skills** |  | **Communication Skills** | |  | **Interpersonal Skills** |
| AK1 | Take responsibility for own learning and plan for and record own personal development | BK1 | Express ideas clearly and unambiguously in writing and the spoken work | | CK1 | Work well with others in a group or team |
| AK2 | Recognise own academic strengths and weaknesses, reflect on performance and progress and respond to feedback | BK2 | Present, challenge and defend ideas and results effectively orally and in writing | | CK2 | Work flexibly and respond to change |
| AK3 | Organise self effectively, agreeing and setting realistic targets, accessing support where appropriate and managing time to achieve targets | BK3 | Actively listen and respond appropriately to ideas of others | | CK3 | Discuss and debate with others and make concession to reach agreement |
| AK4 | Work effectively with limited supervision in unfamiliar contexts |  |  | | CK4 | Give, accept and respond to constructive feedback |
|  |  |  |  | | CK5 | Show sensitivity and respect for diverse values and beliefs |
|  | **Research and information Literacy Skills** |  | **Numeracy Skills** | |  | **Management & Leadership Skills** |
| DK1 | Search for and select relevant sources of information | EK1 | Collect data from primary and secondary sources and use appropriate methods to manipulate and analyse this data | | FK1 | Determine the scope of a task (or project) |
| DK2 | Critically evaluate information and use it appropriately | EK2 | Present and record data in appropriate formats | | FK2 | Identify resources needed to undertake the task (or project) and to schedule and manage the resources |
| DK3 | Apply the ethical and legal requirements in both the access and use of information | EK3 | Interpret and evaluate data to inform and justify arguments | | FK3 | Evidence ability to successfully complete and evaluate a task (or project), revising the plan where necessary |
| DK4 | Accurately cite and reference information sources | EK4 | Be aware of issues of selection, accuracy and uncertainty in the collection and analysis of data | | FK4 | Motivate and direct others to enable an effective contribution from all participants |
| DK5 | Use software and IT technology as appropriate |  |  | |  |  |
|  | **Creativity and Problem Solving Skills** |  |  | |  |  |
| GK1 | Apply scientific and other knowledge to analyse and evaluate information and data and to find solutions to problems |  |  | |  |  |
| GK2 | Work with complex ideas and justify judgements made through effective use of evidence |  |  | |  |  |
| **Teaching/learning methods and strategies** | | | | | | |
| The range of learning and teaching strategies includes   * Formal lectures, * Laboratory and computing classes, * Seminars, * Group work, * Tutorial and blended learning. | | | | | | |
|  | | | |  | | |
| **Assessment strategies** | | | | | | |
| The assessment strategies employed in the Fields include the following:   * Written Examinations/Tests * Reports * Research Project * Oral presentations | | | | | | |
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1. **Entry Requirements**

**1. The minimum entry qualifications for the field are:**

Applicants for the MSc are normally required to have a good honours degree (2.2) or academic equivalent.

**2. Typical entry qualifications set for entrants to the field are:**

Applicants for the MSc for all fields should normally have a good honours degree accredited in partial fulfilment of the academic requirements for Chartered Engineering Status

Any other student admitted joining the course would normally have a minimum 2.2 honours or academic equivalent, with some working experience in the industry.

Kingston University overseas students are currently required to have the following minimum English language standard:

• IELTS = 6.5, with 6.0 in reading and writing, 5.5 in speaking and listening

• TOEFL = 88, with 20/30 in speaking, reading and writing, 17/30 in listening.

• Pearson Test of English = 61 with 56 in reading and writing, 51 in speaking and listening

For further information, including other acceptable qualifications (such as WAEC and NECO from Nigeria and Ghana, and Indian CBSE) and pre-sessional English courses; see the KU website:

<http://www.kingston.ac.uk/international/studying-at-kingston/language-requirements/>

1. **Programme Structure**

This programme is offered in full-time/part-time mode, and leads to the award of MSc Aerospace Engineering. Entry is normally at level 7 with a first degree or equivalent qualifications (See section D). The course features two intakes per year (September and January) and the academic year is divided into two semesters, plus the summer period from May until the end of September, which is normally spent on group project. Taught modules consist of core and optional modules, which are delivered in week-block mode.

**E1. Professional and Statutory Regulatory Bodies**

Royal Aeronautical Society

**E2. Work-based learning, including sandwich programmes**

The full time course is an intense 12 month programme which does not allow for work placements within the course. However, the programme can be undertaken on a part time basis which enables students to reflect upon their own personal experience of working in an applied setting, to focus on aspects of this experience so that they can clearly relate to theoretical concepts and to evaluate the relationship between theory and practice.

**E3. Outline Programme Structure**

This field is part of the University’s Postgraduate Credit Framework. Single modules in the framework are valued at 30 credits and the field may contain a number of multiple modules. Typically a student must complete 120 credits at each level. The minimum requirement for a Postgraduate Certificate is 60 credits, for a Postgraduate Diploma 120 credits and a Masters degree 180 credits. In some instances the Certificate or Diploma may be the final award and Certificates and Diplomas may be offered to students who only complete specified parts of a Masters degree. All students will be provided with the appropriate regulations.

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| **Level 7** | | | | |
| **Compulsory modules** | **Module code** | **Credit**  **Value** | **Level** | **Teaching Block** |
| Engineering Research Techniques, Entrepreneurship and Quality Management | ME7711 | 30 | 7 | 1&2 |
| Computational Fluid Dynamics for Aerospace Applications | AE7724 | 30 | 7 | 1 |
| Aerospace Stress Analysis and Advanced Materials | AE7723 | 30 | 7 | 2 |
| Aerospace Group Design Project | AE7720 | 60 | 7 | 2 |
| **Option modules** |  |  |  |  |
| Engineering Projects & Risk Management | ME7712 | 30 | 7 | 1&2 |
| Green Engineering and Energy Efficiency | ME7725 | 30 | 7 | 1& 2 |
| Advanced CAD/CAM | ME7722 | 30 | 7 | 1&2 |
| Students exiting the programme with 60 credits are eligible for the award of PgCert  Students exiting the programme with 120 credits are eligible for the award of PgDip | | | | |

1. **Principles of Teaching Learning and Assessment**

The principles of teaching, learning and assessment are in line with the University's strategy, 'Led by Learning'. The fields are designed to give students a balanced portfolio of theoretical and practical experience, embracing diversity and individuality.

Taught materials and knowledge gained from the practical and case studies embedded within each module give students specialised knowledge, tools and techniques. It will equip them with the skills and methods for extracting and synthesising the information. These activities promote rigour, curiosity, excellence, originality and breadth of knowledge.

They must then further explore and exploit the information given, research and define outcomes accurately to produce detailed solutions and innovative work for each module and project dissertation.

It is recognised that team work is a very important aspect in industry and this is implemented in the modules. The course ensures that the students are exposed to team working through group presentations, joint report writing, joint research and lab work, promoting consideration, courtesy and collegiality.

The course teams are aware of the need for effective communication, both written and verbal, and take pride in the fact that the courses provide, in this regard, a means of preparing the students for their longer term career plans and Continuous Professional Development (CPD.) Apart from the project itself, each student has to deliver verbal presentations during the modules, normally to the student’s peer group and module leader. Students are also helped with verbal communication skills through seminars, tutorials and discussion groups. Most modules are assessed by written assignments which are designed to improve students’ research and evaluation skills.

A combination of assessment methods will be used throughout the course. These elements include module assignments, module examinations, in-class tests, experiment reports, industrial visit reports, seminars, verbal presentations and the project dissertation. Each module leader is responsible for ensuring that the method of assessment reflects the aims and learning objectives of the module, is demanding and stimulating and at the appropriate Master level. The level and content of courses are relevant and satisfy the Engineering Council's guidance and criteria.

The course uses formative assessment opportunities to provide students with essential feedback. Early feedback can help students to improve their motivation and academic performance. This teaching and learning strategy is implemented through small group tutorials, seminars, group feedback sessions, draft reports with intermediate feedback, peer assessment in group work, project plans, reflective blogs and face-to-face meetings with supervisor.

The programme embraces the use of Technology Enhanced Learning (TEL) to engage students actively. Some of the most widely used technologies in problem-solving activities are computer simulations and modelling which encompass Finite Elements Analysis (FEA), Computational Fluid Dynamics (CFD), Computer Aided Design (CAD) in the curriculum. Digital tools such as a team’s work file syncs DropBox, cloud-based project management tool Gantter, Tumblr Aerospace blog, Facebook study group, online assessment and YouTube videos are used to enhance the quality of student learning experience.

Research Informed Teaching (RIT) is an important component of our commitment to academic excellence by bringing the findings from staff research into the curriculum contents and using assignments which involve elements of research processes. The curriculum is designed around inquiry-based activities where students can explore their research aspirations and propose new hypotheses. They also learn about the latest staff research findings from lectures within the modules such as Aerospace Stress Analysis and Advanced Materials, Computational Fluid Dynamics for Aerospace Applications, Finite Element Analysis and experimental studies of aerospace composite materials, Large Eddies Simulations of complex and compressible turbulent flows, fire simulation, drag reduction using Nano paint coating, and prediction of turbulent transition of wavy boundary layers.

1. **Support for Students and their Learning**

Students are supported by:

* A Module Leader for each module
* A Course Director to help students understand the programme structure
* Personal Tutors to provide academic and personal support
* A placement tutor to give general advice on placements
* Technical support to advise students on IT and the use of software
* A designated programme administrator
* An induction week at the beginning of each new academic session
* Staff Student Consultative Committee
* Study Space – a versatile on-line interactive intranet ~~an~~ learning environment
* A substantial Study Skills Centre that provides academic skills support
* Student support facilities that provide advice on issues such as finance, regulations, legal matters, accommodation, international student support etc.
* Disabled student support
* The Students’ Union
* Careers and Employability Service
* Study Skills Center S3

At level 7, the course director or group project supervisor acts as the personal tutor throughout their course. The Personal Tutor Scheme (PTS) is embedded in the provision through one-to-one and group meetings with the Course Director. It aims to help students to make the transition to Master’s degree level and to encourage them in fulfilling their academic /research aspirations. The first group meeting will last half an hour during the induction week. It will be followed by several sessions of one-to-one meetings lasting about 15 minutes. The project supervisor will also see students weekly during the group project meetings over the summer period that provides plenty of opportunities for face-to-face contact. For the part-time level students, one-by-one contacts can be conducted by emails or by phone. Personal tutor will act as the default referee and encourage students to keep in touch.

1. **Ensuring and Enhancing the Quality of the Course**

The University has several methods for evaluating and improving the quality and standards of its provision. These include:

* External examiners
* Boards of study with student representation
* Annual review and development
* Periodic review undertaken at the subject level
* Student evaluation
* Moderation policies

1. **Employability Statement**

Students who successfully complete the MSc will have acquired significant research, analytical and transferable skills in the broader issues relating to aerospace engineering and should therefore have substantially enhanced their prospects of gaining employment and progressing their career in the aerospace industry. They will have a systematic understanding of knowledge in subjects that are both specific and complementary to aerospace engineering. The programme is built on a comprehensive application of techniques such as advanced computer-based design, Computational Fluid Dynamics (CFD) and Finite Elements Analysis (FEA). It enables students to also gain management and business skills necessary for employment.

The group design project provides a challenge to the candidates to undertake a real world problem because most projects are industrially orientated in a virtual environment. During the project students will be expected to apply the knowledge and skills learnt during the course to achieve agreed deliverables, whilst satisfying any given constraints and demonstrating originality in solving problems. They will have to demonstrate the exercise of initiative and personal responsibility. Key skills in communication, presentation, research, problem analysis, project planning, decision making and solution justification are all part of the learning objectives defined in the field which fosters the development of their employability skills.

Postgraduates of this course have taken up posts in a variety of employment settings including Amsafe Armour, Solion Solar Energy, Easjet, Lufthansa, Flybe, Hawkerhind and Precision Press Parts Corp. Some postgraduates have continued their studies in PhD research projects. The employability skills taught in the course are outlined in section F.

1. **Approved Variants from the Postgraduate Regulations**

There is no variant to the PR.

1. **Other sources of information that you may wish to consult**

Engineering Council UK-SPEC:

<http://www.engc.org.uk/professional-qualifications/standards/uk-spec>

Royal Aeronautical society Accreditation Handbook:

<http://aerosociety.com/Assets/Docs/Membership/ACC%20Handbook%20V%208c%20May%202012.pdf>

Kingston University Web site:

http://www.kingston.ac.uk/postgraduate-course/aerospace-engineering-msc/

**Development of Programme Learning Outcomes in Modules**

This map identifies where the programme learning outcomes are assessed across the modules for this programme. It provides an aid to academic staff in understanding how individual modules contribute to the programme aims, and a means to help students monitor their own learning, personal and professional development as the programme progresses and a checklist for quality assurance purposes.

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|  |  |  | **Level 7** | | | | | | |
|  | **Module Code** |  | ME7711 | AE7724 | AE7723 | AE7720 | ME7712 | ME7725 | ME7722 |
| **Programme Learning Outcomes** | **Knowledge & Understanding** | A1 |  | S | S | S |  |  |  |
| A2 | F/S | S | S | S/F | S | S | S |
| A3 |  | S/F | S/F | S/F |  |  |  |
| A4 | S | F | F | F/S |  | F/S |  |
| A5 | F/S | F | F | F | F | F/S | F |
| **Intellectual Skills** | B1 | S | S | S | S | S | S | S |
| B2 | S | S | S | S | S | S | S |
| B3 | S/F | S | S | S | S | S | S |
| B4 | F | F | F | S/F | S | S/F | S |
| B5 | S/F | F | F | S |  | S |  |
| B6 | F | F | F | F | F | S/F | S |
| **Practical Skills** | C1 | F | F | F | S/F | S | S | S |
| C2 | F | S | S | S | S | S | S |
| C3 | S |  |  | F |  |  |  |
| **Self Awareness Skills** | AK1 | F | F | F | F | F | F | S |
| AK2 |  | F | F | F | F | F | S |
| AK3 | S/F | F | F | F | S | S/F | S |
| Ak4 | S/F | F | F | F/S | S | S/F | F |

**S**  indicates where a summative assessment occurs.

**F** where formative assessment/feedback occurs.

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|  |  |  | **Level 7** | | | | | | |
|  | **Module Code** |  | ME7711 | AE7724 | AE7723 | AE7720 | ME7712 | ME7725 | ME7722 |
| **Programme Learning Outcomes** | **Communication Skills** | BK1 | S | F | S | S | S | S | S |
| BK2 | S | F | S | S | S | S | S |
| BK3 | F | S | F | F/S | F | F | F |
| **Interpersonal Skills** | CK1 | F | F | F | F/S | S | F/S | S |
| CK2 | F | F | F | F | F | F/S | F |
| CK3 | F | F | S | F/S | F | F/S | F |
| CK4 | F | F | F | F | F | F/s | F |
| CK5 | F | F | F | F | F | F/S | F |
| **Research and information Skills** | DK1 | S | S | F | F/S | S | F/S | S |
| DK2 | S | S | F | F/S | S | S | S |
| DK3 | S |  |  |  |  | S |  |
| DK4 | S | S | S | S | S | S | S |
| **Numeracy Skills** | EK1 | F | F | F | F/S | S | S/F | F |
| EK2 | F | S | S | S | S | S/F | F |
| EK3 | F | S | S | S | S | S/F | F |
| Ek4 |  | S | S | S | S | S/F | F |
| **Management & Leadership Skills** | FK1 | F/S | F |  | F | S | S | S |
| FK2 | F/S | F |  | F | S | S | S |
| FK3 | F | F | S | S | S | S | S |
| FK4 |  | S |  | F | F | F | F |
| **Creativity & Problem Solving Skills** | GK1 |  | F | S | S | S | S | S |
| GK2 |  | F | S | S | S | S | S |

**S**  indicates where a summative assessment occurs.

**F** where formative assessment/feedback occurs.

**Appendix 3 MSc Aerospace Engineering Structure**

**Modules - 120 Credits**

**ME7711**

**Engineering Research Techniques, Entrepreneurship and Quality Management**

**30 Credits**

**AE7724**

**Computational Fluid Dynamics for Aerospace Applications**

**30 Credits**

**AE7723**

**Aerospace Stress Analysis and Advanced Materials**

**30 Credits**

**Project - 60 Credits**

**AE7720**

**Aerospace Group Design Project**

**60 Credits**

**Optional Modules - 30 Credits**

**ME7712**

**Engineering Projects & Risk Management**

**30 Credits**

**ME7722**

**Advanced CAD/CAM**

**30 Credits**

**ME7725**

**Green engineering and Energy Efficiency**

**30 Credits**

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**Technical Annex**

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| **Final Award(s):** | MSc Aerospace Engineering |
| **Intermediate Award(s):** | PgDip, PgCert |
| **Minimum period of registration:** | 1 year FT and 2 years PT |
| **Maximum period of registration:** | 2 year FT and 4 years PT |
| **FHEQ Level for the Final Award:** | MSc |
| **QAA Subject Benchmark:** | Engineering |
| **Modes of Delivery:** | FT and PT |
| **Language of Delivery:** | English |
| **Faculty:** | Science, Engineering & Computing |
| **School:** | Aerospace & Aircraft Engineering |
| **JACS code:** |  |
| **UCAS Code:** | N/A |
| **Course Code:** | N/A |
| **Route Code:** | N/A |
|  |  |