****

**Programme Specification**

**Title of Course:** MSc Aerospace Systems

**Date Specification Produced:** March 2014

**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**

|  |  |
| --- | --- |
| **Title:** | MSc Aerospace Systems |
| **Awarding Institution:** | Kingston University, London |
| **Teaching Institution:** | Air Warfare School |
| **Location:** | RAFC Cranwell |
| **Programme Accredited by:** | N/A |

**SECTION 2: THE PROGRAMME**

1. **Programme Introduction**

The MSc Aerospace Systems provides specialist education at postgraduate level in advanced avionics and aerospace concepts for operationally experienced officers from the RAF and other military services from the UK and abroad. The programme is designed to enhance the defence procurement process by providing intelligent customers.

The programme is 45 weeks of allocated time and consists of 4 directly assessed modules, 7 indirectly assessed modules and a major research project. The modules consist of lectures, problem analysis sessions, background reading and individual and group coursework. The time allocation for these activities varies between the modules and a breakdown of the allocation is given in the module descriptions.

During the allocated hours of student learning, students are encouraged to develop a life-long learning approach to gaining new knowledge and skills. The coursework for modules entails critical reading of professional literature and writing structured reports. The student’s communication and team working skills are further developed in individual modules by the students giving oral presentations and working in groups.

1. **Aims of the Programme**

The MSc Aerospace Systems aims to:

* + - Equip students with an in depth understanding of the principles of the MOD procurement cycle;
    - Enhance a graduate’s job performance to enable him/her to contribute effectively to the knowledge base of their department;
    - Provide the specialised knowledge and skills required to carry out flight trials;
    - Give a strategic and integrating perspective of the major factors influencing the design of the next generation of military systems.

1. **Programme Learning Outcomes**

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, intellectual skills and subject practical skills as outlined in the following tables. The learning outcomes are referenced to the QAA subject benchmarks for Engineering (2010) and the Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008).

| **Programme Learning Outcomes** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  | **Knowledge and Understanding**  **On completion of the course, students will be able to:** |  | **Intellectual skills**  **On completion of the course, students will be able to:** |  | **Subject Practical skills**  **On completion of the course, students will be able to:** |
| A1 | Understand basic mathematical techniques and basic physics principles | B1 | Critically assess the capabilities of commercial communication and imaging satellites | C1 | Communicate effectively in accordance with the Defence Writing guidelines |
| A2 | Understand basic statistical techniques and principles | B2 | Establish the parameters for ballistic missile defence and evaluate the threat from space systems | C2 | Plan and conduct a flight trial using appropriate data recording methods and Human Factors (HF) assessments, and analyse flight trial data using statistical techniques |
| A3 | Outline the major aspects of the acquisition processes of the UK, France/Germany, USA and Israel | B3 | Discuss the roles of the major stakeholders within the UK acquisition process | C3 | Present a balanced solution to a real-world problem posed by MOD and DE&S sponsors |
| A4 | Understand the application and limitations of EW sensor system technology | B4 | Critically assess the performance of analogue and digital communications systems, including propagation methods, data rates, compression methods and Signal-to-Noise Ratio (SNR) | C4 | Communicate solutions and conclusions effectively |
| A5 | Understand the operation of warheads and guided weapons | B5 | Assess the data requirements of different information types/media and analyse high-level software requirements, including safety-critical software |  |  |
| A6 | Identify, research and analyse real-world problems which may be solved using academic concepts and methods | B6 | Critically assess the performance of radar systems, including resolution, noise-limited range, performance in clutter, SNR and range and velocity accuracy |  |  |
|  |  | B7 | Critically assess the performance of RF EW systems, including Electronic Support Measures, Electronic Countermeasures and Missile Warning Systems |  |  |
|  |  | B8 | Critically assess the resolution, range and SNR of a variety of EO systems |  |  |
|  |  | B9 | Critically assess optical communication and LASER systems |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Programme Learning Outcomes** | | | | | |
|  | **Knowledge and Understanding**  **On completion of the course, students will be able to:** |  | **Intellectual skills**  **On completion of the course, students will be able to:** |  | **Subject Practical skills**  **On completion of the course, students will be able to:** |
|  |  | B10 | Critically assess the performance, effectiveness, suitability and development of navigation systems for military applications |  |  |
|  |  | B11 | Critically assess platform functionality in terms of range, loiter, manoeuvrability, performance, stability and payload, with due regard to the key design drivers of modern aircraft and missiles |  |  |
|  |  | B12 | Evaluate examples of real-world system integration problems, with respect to cost and implementation problems |  |  |
|  |  | B13 | Consider a wide range of possible solutions, evaluate their potential, select and apply appropriate methods and techniques to solve the problem |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 orally and in writing | CK1 | Work effectively with others in a group |
| AK2 | Recognise own academic strengths and weaknesses, reflect on performance 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 effectively, agreeing and setting realistic targets, accessing support and managing time to achieve targets | BK3 | Listen actively and respond appropriately to ideas of others | CK3 | Discuss and debate with others and make concessions to reach agreement |
| AK4 | Work effectively with limited supervision | BK4 | Prepare reports in prescribed and recommended forms | CK4 | Give, accept and respond to constructive feedback |
|  | **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 these 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 schedule and manage the resources |
| DK3 | Apply the ethical and legal requirements in the access and use of information | EK3 | Interpret and evaluate data to inform and justify arguments | FK3 | Show the ability to successfully complete and evaluate a task or project, revising the plan where necessary |
| DK4 | Accurately cite and reference information sources using the recommended standard method | 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 ICT 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 |  |  |  |  |

1. **Entry Requirements**

Students are selected from various academic backgrounds. That background may be formal qualification, eg an appropriate first degree, or can have been gained through non-formal means, such as military experience. A pivotal component is clear evidence of commitment.

1. **Programme Structure**

This programme is offered only in full-time mode, and leads to the award of MSc Aerospace Systems. All of the modules are core, although flexibility is offered in the choice of projects.

**E1. Professional and Statutory Regulatory Bodies**

This programme is not accredited by a professional body, but it can be used as evidence of further learning for students with an accredited undergraduate degree in applying for Chartered Engineer status.

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

Not applicable to this course.

**E3. Outline Programme Structure**

This field is part of the University’s Postgraduate Credit Framework. Modules in the framework are valued in accordance with the table below. 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 exceptional circumstances 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 in accordance with the Post-Graduate Credit Framework.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Programme Structure** | | | | |
| **Modules** | **Module code** | **Credit**  **Value** | **Level** | **Teaching Block** | |
| Intro Maths and Physics | AWS01 | 0 | - | 1 | |
| Effective Communications | AWS02 | 0 | - | 1 | |
| Statistics | AWS03 | 0 | - | 1 | |
| Space | AWS04 | 0 | - | 1 | |
| Acquisition Practices | AWS05 | 0 | - | 1 | |
| Electronic Warfare | AWS06 | 0 | - | 1 | |
| Weapons | AWS107 | 0 | - | 1 | |
| Sensors | AE7101 | 30 | 7 | 1 | |
| Telecommunications & Information Systems | AE7102 | 30 | 7 | 1 | |
| Applied Aerospace | AE7103 | 30 | 7 | 2 | |
| Aerospace Practices | AE7104 | 30 | 7 | 2 | |
| Personal Project | AE7100 | 60 | 7 | 2 | |

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 programme is designed to give students a balanced portfolio of theoretical and practical experience, embracing diversity and individuality.

The aerospace systems field has many unique features which facilitate a range of approaches to teaching and learning and distinguish it from other postgraduate fields. It is delivered as a full time residential course and the students undertaking it bring with them a wide range of operational experience. This allows extensive use of group based learning activities.

The students are able to undertake a number of visits to industrial and military establishments throughout the UK and abroad. This gives them first hand exposure to the very latest developments and allows them to compare the approaches used by different organisations. Students have access to classified and commercially confidential material and to experts within industry and the MOD.

The teaching and learning methods consist primarily of directed reading, formal lectures, problem analysis sessions, group work and individual coursework. The formal lectures are used to introduce course material and to identify priorities for self-study. Substantial course notes typically support the formal lectures. The problem analysis sessions allow students to work on problems and design exercises under the guidance of academic staff. This helps to consolidate the material covered in the lectures, and aims to equip students with the skills and methods required for extracting and synthesising information; promoting rigour, curiosity, excellence, originality and breadth of knowledge.

Group work is undertaken in syndicates that operate throughout the programme. Syndicate members are selected by the programme team to ensure that a range of backgrounds is represented within each syndicate. The syndicates undertake many exercises, some of which are formally assessed, as outlined in the module descriptions. A member of the programme team monitors each syndicate and provides regular feedback to the group and individuals within it.

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 is 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 is at the appropriate level.

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 seminars, group feedback sessions, draft reports with intermediate feedback, peer assessment in group work, project plans and face-to-face meetings with supervisor.

***Research-informed Teaching***

Students are encouraged to develop their own research skills which are a fundamental part of the curriculum throughout all levels of the programme. They also visit a number of industrial sites which are engaged in leading edge research and development.

***Student Contact***

The following student contact and engagement takes place within the programme:

***Background Reading/Research***

Students are signposted towards background reading/research for each topic.

***Consolidation of Taught Materials***

Through a combination of staff-led sessions and individual study, material taught earlier in the module, or the programme, is consolidated to deepen understanding and allow application of the knowledge gained.

***Formal Lectures (including demonstrations)***

Formal lectures are staff-led sessions designed to introduce new topics and material or provide an overview of a topic for further student study.

***Visits to MOD Establishments and Defence Industry Sites***

Visits to MOD Establishments and Defence Industry Sites, within the UK, Germany/France, USA and Israel, provide students with the opportunity to gain information on technological advances and equipment under development. It also allows students to form an assessment of the acquisition processes, and a comparison between different approaches followed by different nations.

***Problem Analysis (tutorial)***

Students are provided with staff guidance to assist them with solving academic and real-world problems, analysing solutions and presenting and defending their findings.

***Practical Lab Sessions***

Students are given the opportunity to plan, conduct and analyse a flight trial, both in a synthetic and in a live flying environment.

***Group Work***

Good team-working skills are an essential skill for graduates; hence, teamwork plays an important role in the programme. Group work projects illustrate the value of team work, developing interpersonal skills and fostering cooperation and supportive peer relationships.

***Individual Coursework***

During the programme, student’s research and communication skills are developed through targeted lectures, sign-posted independent study and research, submission feedback and presentation practice. The individual coursework element of the programme culminates in the personal project, an independent study of a research topic, during which students are required to work independently, communicating their findings clearly and succinctly through graphical, oral and written presentations, under the guidance on an assigned supervisor.

***Assessment methods***

The development of skills is threaded through the programme and assessed both formatively and summatively. Formative assessments provide opportunities that allow students to carry out effective revision and practice to receive feed forward on their performance in preparation for the summative assessments. Students are supported by their allocated personal tutors to draw together the themes of the curriculum enabling them to design their own reflection model to demonstrate achievement of a range of learning outcomes from across a number of modules. The following summative assessment methods are adopted to enable students to demonstrate their acquisition of knowledge and skills as outlined in the module learning outcomes:

* Unseen formal examinations
* Individual assignments (including written submissions and oral presentations)
* Syndicate assignments (including written submissions and oral presentations)

Additionally, question and answer sessions are included within the oral presentations to confirm (individual) understanding and to enable expansion of points requiring further clarification from the written submissions. For syndicate assignments, normal practice is to award marks on the basis of overall syndicate performance. ASC staff has a number of techniques to ensure equal input from all members of the syndicate, including the rotation of syndicate leaders, the random selection of syndicate members and the use of question and answer sessions to test the knowledge of individual members of a syndicate.

***Reassessment methods***

A student who fails a module at the first attempt may be offered one opportunity to be reassessed in accordance with the Postgraduate Regulations, with the exception that ‘replace’ is not available due to the absence of elective modules. Due to course intensity, it is unlikely that MSc reassessment could be offered within year; however, this is considered on a case-by-case basis.

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

Students are supported by:

* **Module Leader** - the academic and administrative lead for each module
* **Course Manager (Deputy Course Manager)** - the administrative lead for the programme and the provider of additional pastoral and practical advice and support, especially to students encountering difficulties
* **Personal Project Mentors** – a primary and secondary mentor provided to each student to provide guidance and support in the research and development of the students’ personal projects
* **Academic Team** - maintaining an open door policy in the spirit of supporting students
* **Student Course Leader** – a student representative to facilitate good student-staff two-way communication

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

Kingston University has several methods for evaluating and improving the quality and standards of its provision, which 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**

All students on the programme are in full time employment and sponsored by their employers. The MSc Aerospace Systems course and its predecessor have a proven track record of career enhancement with many former graduates going on to achieve the rank of group captain equivalent or above. The existing Course is regarded as world-class providing state-of-the-art education for defence specialists and procurement

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

The overall MSc grade awarded would not normally exceed the grade awarded for the Personal Project; however, this is at the discretion of the Programme Assessment Board.

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

Aerosystems Course Information - <http://cui5-uk.diif.r.mil.uk/r/240/AST/default.aspx>

**Development of Programme Learning Outcomes in Modules**

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Level 7** | | | | | | | | | | | |
|  | **Module Code** |  | **AWS01** | **AWS02** | **AWS03** | **AWS04** | **AWS05** | **AWS06** | **AWS107** | **AE7101** | **AE7102** | **AE7103** | **AE7104** | **AE7100** |
| **Programme Learning Outcomes** | **Knowledge & Understanding** | A1 | S |  |  |  |  |  |  |  |  |  |  |  |
| A2 |  |  | F |  |  |  |  |  |  |  |  |  |
| A3 |  |  |  |  | F |  |  |  |  |  |  |  |
| A4 |  |  |  |  |  | F |  |  |  |  |  |  |
| A5 |  |  |  |  |  |  | F |  |  |  |  |  |
| A6 |  |  |  |  |  |  |  |  |  |  |  | S |
| **Intellectual Skills** | B1 |  |  |  | F |  |  |  |  |  |  |  |  |
| B2 |  |  |  | F |  |  |  |  |  |  |  |  |
| B3 |  |  |  |  | F |  |  |  |  |  |  |  |
| B4 |  |  |  |  |  |  |  |  | S |  |  |  |
| B5 |  |  |  |  |  |  |  |  | S |  |  |  |
| B6 |  |  |  |  |  |  |  | S |  |  |  |  |
| B7 |  |  |  |  |  |  |  | S |  |  |  |  |
| B8 |  |  |  |  |  |  |  | S |  |  |  |  |
| B9 |  |  |  |  |  |  |  | S |  |  |  |  |
| B10 |  |  |  |  |  |  |  |  |  | S |  |  |
| B11 |  |  |  |  |  |  |  |  |  | S |  |  |
| B12 |  |  |  |  |  |  |  |  |  | S |  |  |
| B13 |  |  |  |  |  |  |  |  |  |  |  | S |
| **Practical Skills** | C1 |  | F |  |  |  |  |  |  |  |  |  |  |
| C2 |  |  |  |  |  |  |  |  |  | S |  |  |
| C3 |  |  |  |  |  |  |  |  |  |  | S |  |
| C4 |  |  |  |  |  |  |  |  |  |  |  | S |

**F** where formative assessment/feedback occurs

**S**  indicates where a summative assessment occurs

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Level 7** | | | | | | | | | | | |
|  | **Module Code** |  | **AWS01** | **AWS02** | **AWS03** | **AWS04** | **AWS05** | **AWS06** | **AWS107** | **AE7101** | **AE7102** | **AE7103** | **AE7104** | **AE7100** |
| **Programme Learning Outcomes (Key Skills)** | **Self-Awareness** | AK1 | ✓ | ✓ |  |  | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| AK2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| AK3 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| AK4 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Communication** | BK1 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| BK2 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| BK3 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| BK4 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Interpersonal** | CK1 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ |  |
| CK2 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| CK3 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| CK4 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Research and Information Literacy** | DK1 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| DK2 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| DK3 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| DK4 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| DK5 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Numeracy** | EK1 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| EK2 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| EK3 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| EK4 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Management and Leadership** | FK1 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| FK2 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| FK3 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| FK4 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ |  |
| **Creativity and Problem Solving** | GK1 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| GK2 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |

**Technical Annex**

|  |  |
| --- | --- |
| **Final Award(s):** | MSc Aerospace Systems |
| **Intermediate Award(s):** | PGCert in Aerospace Systems  PGDip in Aerospace Systems |
| **Minimum period of registration:** | FT – 1 years |
| **Maximum period of registration:** | FT – 2 years |
| **FHEQ Level for the Final Award:** | Level 7 |
| **QAA Subject Benchmark:** | Engineering |
| **Modes of Delivery:** | Full-time |
| **Language of Delivery:** | English |
| **Faculty:** | SEC |
| **School:** | Aerospace and Aircraft Engineering |
| **JACS code:** | H400 |
| **UCAS Code:** | N/A |
| **Course Code:** |  |
| **Route Code:** |  |