PROGRAMME SPECIFICATION KEY FACTS

Programme name	Space Mission Analysis and Design
Award	**MSc**
Exit Awards	*PG Cert*
Exit Awards	*PG Dip*
School	School of Science and Technology
Department or equivalent	**Engineering**
Programme code	**PSSMAD**
Type of study	**Full-time**
Total UK credits	180
Total ECTS	90
Partner	N/A

PROGRAMME SUMMARY

The MSc in Space Mission Analysis and Design provides skills, knowledge and understanding of current technologies used in the growing and evolving space industry. This is a rapidly expanding part of an economy, both in the UK and internationally, with applications in (among others) space communications, space related navigation, earth observation, space science and space exploration.

The Programme aims to produce engineering/science graduates with a good knowledge in the theory and practice of space missions, space vehicle design and related technologies, being able to contribute to future developments in the design and deployment of space vehicles.

The Programme aims to provide a knowledge of the fundamental principles related to space technology, with emphasis on autonomous vehicle missions and operations and the launch of space vehicles. Space missions require advanced knowledge of space vehicle systems engineering, mission planning and design, and advanced orbital dynamics. These fundamental principles encapsulate techniques employed in spacecraft design, sensing technologies, signal processing, power distribution, orbit theory, overall systems engineering, dynamics, optimization, communications, and control.

Effective application of these techniques and technologies will be demonstrated in laboratory sessions via extensive simulation and modelling exercises using the General Mission Analysis Tool from NASA, and MATLAB. Industrial design projects and work on your individual Project/Dissertation will require a good knowledge of GMAT. In addition to the technical part of the programme, you will be introduced to the legal framework and ethical issues arising from space operation via a series of lectures and seminars. The programme is suited to new graduates and experienced professionals who want to advance their understanding of the field

and are interested in pursuing a career in one of the emerging application areas related to Space missions.

The Programme is offered as both full time (FT) and part time (PT) study. The FT Programme follows a normal 12-month pattern with two terms of taught modules, associated laboratory work and team projects, followed by an individual design project dissertation. The PT Programme is normally completed in 24 months with the dissertation work conducted in the summer term of year 2. The Programme comprises eight taught modules worth 15 credits each, followed by a dissertation (individual project) worth 60 credits.

Aims

This programme aims to equip you with the knowledge, skills and values needed for a career in the growing Industry in space systems and space mission design, support, and operations.

Content

The programme provides an opportunity to learn about space engineering, and in particular to develop a space mission from the initial concept of the mission to the launch of a spacecraft to fulfil the mission. You will learn how scientists and engineers work together to ensure how the mission payload can be supported by the spacecraft from launch to the completion of the mission. You will also be able to select the correct orbit for the mission and how the orbit is achieved from launch through space manoeuvres to the destination orbit. To support missions, you will learn the procedures, processes and safety of a spacecraft launch to the laws and regulations covering space mission.

Registration Period

The full-time mode of study usually takes 12 months, whereas the part-time 24 months (up to 28 months).
The maximum period of registration for full-time students is 3 years and 5 years for part-time students.

WHAT WILL I BE EXPECTED TO ACHIEVE?

On successful completion of this programme, you will be expected to be able to:

Knowledge

- Apply theory and practice from the course to solve specific space missions.
- Formulate performance and mission limitations of space vehicles.
- Propose, formulate, and apply advanced techniques and methods to Space Vehicle design to meet mission requirements.
- Evaluate advanced modelling techniques for the analysis and design of space vehicle to meet mission requirements.
- Discuss legal frameworks for space missions with legal representatives.
- Model the dynamic behaviour of space vehicles to assess orbit accuracy (orbit determination).
- Evaluate and apply safety regulations to space vehicle launch design, operations.

Skills

- Evaluate developments in the Aerospace field by critically evaluating theoretical research and emerging technologies required for designing orbiting and deep space spacecraft.
- Analyse and interpret complex data obtained from a variety of sensors and apply results to decision making.
- Apply analytic and design knowledge creatively and in innovative ways to meet mission requirements.
- Develop and synthesise new mission concepts and evaluate them through the use of advanced simulation/modelling tools.
- Demonstrate competent communication skills to relay the results of analysis and design in scientific reports and in presentations.
- Apply research skills and techniques to further develop knowledge in the field.

Values and attitudes

- Critically evaluate the impacts on society and the ethical issues arising from expanding the use of space vehicles.
- Recognise and take responsibility for developing safe and reliable products and solutions.
- Examine the importance of working with others in promoting an effective and innovative learning environment.
- Respect and listen to other views and promote participation, inclusivity, and equity.
- Critically analyse and demonstrate the need to take account of ethical issues if conducting research using human participants.

WHAT WILL I STUDY?

Taught component.

The programme consists of eight taught modules. All modules have a value of 15-credits.

Taught modules.

Module Title	SITS Code	Module Credits	Core/ Elective	Compensation Yes/No	Level
Space Flight	EPM913	15	Core	Y	7
Space Vehicle Systems Engineering	EPM914	15	Core	Y	7
Systems Dynamics, Modelling, Propulsion and Control	EPM103	15	Core	Y	7
Advanced Signal Processing and Communications	EPM109	15	Core	Y	7
Space Launch Operations & Management	EPM915	15	Core	Y	7
Space Vehicle Propulsion Systems	EPM916	15	Core	Y	7
Space law, Regulation and Ethics	EPM917	15	Core	Y	7
Space System Lifecycle Management	EPM918	15	Core	Y	7

Dissertation module

Module Title	SITS Code	Module Credits	Core	Compensation Yes/No	Level
Dissertation	EPM949	60	Core	N	7

You are normally required to complete all the taught modules successfully before progressing to the dissertation.

HOW WILL I LEARN?

The teaching and learning strategy is based on lectures, tutorials, laboratory coursework, design projects and seminars. Lectures provide a solid theoretical understanding of relevant technical fields. Seminars will be delivered by Academics and Industrialists with expert knowledge in the field to expand knowledge. They focus on specialised topics related to spacecraft design and operations, reinforce knowledge obtained from lectures and support project work. Tutorials and labs provide practical training and develop skills in modelling the efficacy and efficiency of integrated space vehicle technologies to meet mission objectives. Online resources will be available, including support material for lectures, pointers to relevant literature, technical specification manuals and software code.

The research project/dissertation aims to provide you with the opportunity to deal with problems in areas where new subject knowledge is required. This involves literature search, assessment of the relevance of previous work, the development of the research task, self-directed research, and the presentation of research results. Online learning will be provided with support documentation, experiments, and exercises. Considerable time should be dedicated to developing and modelling options as this is key to consolidating lectures with knowledge obtained from online searches.

WHAT TYPES OF ASSESSMENT AND FEEDBACK CAN I EXPECT?

Assessment and Assessment Criteria

Assessment of programme modules comprises written examinations and laboratory coursework. Each individual module coursework will require some design activities and will be combined with the written module examination to provide an overall module mark.

The dissertation is assessed primarily through a research project but with contributions from an interim report, work conducted during the project period and oral examination.

Assessment Criteria are descriptions, based on the intended learning outcomes, of the skills, knowledge, or attributes that you need to demonstrate, in order to complete an assessment successfully, providing a mechanism by which the quality of an assessment can be measured. Grade-Related Criteria are descriptions of the level of skills, knowledge, or attributes that you need to demonstrate in order to achieve a certain grade or mark in an assessment, providing a mechanism by which the quality of an assessment can be measured and placed within the overall set of marks. Assessment Criteria and Grade-Related Criteria will be made available to you to support you in completing assessments. These may be provided in programme handbooks, module specifications, on the virtual learning environment or attached to a specific assessment task.

Feedback on assessment

Feedback will be provided in line with our Assessment and Feedback Policy. Normally you will be provided with feedback within three weeks of the submission deadline or assessment date. This would normally include a provisional grade or mark. For end of module examinations or an equivalent significant task (e.g., an end of module project), feedback will normally be provided within four weeks. The timescale for feedback on final year projects or dissertations may be longer. The full policy can be found at:
https://www.city.ac.uk/__data/assets/pdf_file/0009/452565/Assessment-and-Feedback-Policy...pdf

Assessment Regulations

To pass your Programme you should complete successfully or be exempted from the relevant modules and assessments and will therefore acquire the required number of credits. The pass mark for each module is 50% for both Coursework and Examination combined. If you fail an assessment component or a module, the following will apply:

1. Compensation: where you fail up to a total of thirty credits at first sit or resit; you may be allowed compensation if:

   - Compensation is permitted for the module involved (see the module specification), and
   - It can be demonstrated that you have satisfied all the Learning Outcomes of the modules in the Programme, and
   - A minimum overall mark of no more than 10% below the module pass mark has been achieved in the module to be compensated, and
   - An aggregate mark of 50% has been achieved overall.

   Where you are eligible for compensation at the first attempt, this will be applied in the first instance rather than offering a resit opportunity.

   If you receive a compensated pass in a module, you will be awarded the credit for that module. The original component marks will be retained in the record of marks and your original module mark shall be used for the purpose of your Award calculation.

2. Resit: Where you are not eligible for compensation at the first attempt, you will be offered one resit attempt.

   If you are successful in the resit, you will be awarded the credit for that module. The mark for each assessment component that is subject to a resit will be capped at the pass for the module. This capped mark will be used in the calculation of the final module mark together with the original marks for the components that you passed at first attempt.

   If you do not meet the pass requirements for a module and do not complete your resit by the date specified you will not progress, and the Assessment Board will require that you be withdrawn from the Programme.

   If you fail to meet the requirements for the Programme, the Assessment Board will consider whether you are eligible for an Exit Award as per table below. If you would like to know more about the way in which assessment works at City, please see the full version of the Assessment Regulations at:
   https://www.city.ac.uk/__data/assets/pdf_file/0007/453652/Senate-Regulation-19-Assessment-Regulations-2022-23-v2.5.pdf

WHAT AWARD CAN I GET?

Master's Degree

For all of you completing the MSc in Space Mission Analysis and Design, you will have studied all eight taught modules (120 credits), and you will have demonstrated original application of knowledge in the area, either through the analysis, design, and evaluation of a concept related to space systems and related technologies, or the critical evaluation and extension of knowledge in the area through a research-led project. This will be achieved through your dissertation, a substantial module worth 60 credits that you can commence once you have successfully passed all your taught modules.

Programme credits and weighting

Programme Stage	HE Level	Credits	Weighting (%)
Taught	7	120	67
Dissertation	7	60	33

Class requirements

Class	% required
With Distinction	70
With Merit	60
Without classification	50

Postgraduate Diploma

Those awarded the Postgraduate Diploma will have acquired a theoretical knowledge related to the full taught part of the Programme. In addition, you will also have demonstrated practical skills through laboratory-based work during coursework of each taught module, which equates to passing all eight taught modules (120 credits).

Programme credits and weighting

Programme Stage	HE Level	Credits	Weighting (%)
Taught	7	120	100%

Class requirements

Class	% required
With Distinction	70
With Merit	60
Without classification	50

Postgraduate Certificate:

Those awarded the Postgraduate Certificate will have had the opportunity to study the theory and practice related to the analysis and design of space missions, equating to four taught 15-credit modules (60 credits). These can be any combination of modules among those offered.

Programme credits and weighting

Programme Stage	HE Level	Credits	Weighting (%)
Taught	7	60	100%

Class requirements

Class	% required
With Distinction	70
With Merit	60
Without classification	50

WHAT KIND OF CAREER MIGHT I GO ONTO?

Space mission analysis, space systems design and related technologies are expected to expand significantly in the near future and form an important part of the UK and the global economy. Strong employment opportunities in several branches of industry are expected, including, among others, Communications and Media, Earth Observation, Climate Change Control and Monitoring, Defence Operations, Manufacturing, Logistics and Energy/Smart Grids. Skills acquired in the MSc, such as spacecraft modelling, mission planning, launch control management, in-orbit maintenance, and sensor technologies, will be attractive for a wide range of start-up companies linked to the space sector.

Graduates starting a new business can benefit from City's London City Incubator and City's links to Tech City, providing support for start-up businesses. If you would like more information on the Careers support available at City, please go to:

http://www.city.ac.uk/careers/for-students-and-recent-graduates

For more information on the Careers support available at City, please visit:

https://www.city.ac.uk/careers/your-career

WHAT PLACEMENT OPPORTUNITIES ARE AVAILABLE?

Internships: you can participate in our professional placement programme, which is supported by the Corporate Relations and Employability Unit:
https://www.city.ac.uk/about/schools/science-technology/about-the-school/placements-and-internships

This will enable you to undertake your dissertation on a topic related to Autonomous Systems within an industrial or research placement over an extended period compared to regular projects. The School Corporate Relations and Employability Unit provides support to prepare CVs, interviews, and application for internships.

WILL I GET ANY PROFESSIONAL RECOGNITION?

Accreditation from IET, InstMC, RAeS, IEEE will be sought. Typically, accreditation is granted for programmes running at least three years.

HOW DO I ENTER THE PROGRAMME?

To register for the MSc a minimum admission requirement is a Second-Class Hons degree, or equivalent in Engineering, related Science, Computer Science or Mathematical discipline. Suitable industrial experience will also be considered, such as two years in related industry.

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