

Programme Specifications

KEY FACTS

Programme name	MSc in Robotics, AI and Autonomous Systems
Award	MSc
School	School of Science & Technology
Department or equivalent	Electrical and Electronic Engineering
Programme code	PSAUSY
Type of study	Full Time/ Part Time
Total UK credits	185
Total ECTS	92.5

PROGRAMME SUMMARY

The MSc in Robotics, AI and Autonomous Systems is designed to provide skills, knowledge and understanding of the current technologies used in the growing industry of Autonomous Systems. This is a rapidly expanding part of the Economy, both in the UK and internationally, with applications (among others) in Transport, Robotics, Healthcare, Defence, Manufacturing, Logistics and Energy. The Programme aims to produce engineering graduates who are well trained in the Theory and Practice of the field and related Technologies and who will be able to contribute to future developments related to the design and deployment of Autonomous Systems.

The Programme aims to provide knowledge of the fundamental principles related to the design and operation of Autonomous Systems, with emphasis on Autonomous Vehicles and Mobile Robots operating in air, ground and space. Autonomous operation requires advanced levels of Versatility, Adaptability and Machine Intelligence. These characteristics can be achieved by applying the latest advances in AI and Machine Learning, Sensing, Signal Processing, IT, Human-Machine-interaction, Systems Engineering, Dynamics, Optimization, Communication and Control. Implementation of the technologies related to all these disciplines relies on Software and Hardware skills which will be developed via extensive lab work in Programming and Embedded Systems design, Industrial design projects and work on your individual Project/Dissertation on a topic related to Autonomous Systems. In addition to the technical part of the Programme, you will be introduced to the legal framework and ethical issues arising from Autonomous Systems' operation via a series of lectures and seminars. The programme is suited for new graduates and 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 Systems Autonomy.

The Programme is offered full time (FT) and part time (PT). The FT Programme follows a normal 12- month pattern with two terms of taught modules, followed by a 4-month

individual design project/dissertation. The PT Programme is normally completed in 24 months with the dissertation work carried out in the summer term of year 2. There are 10 Core modules, including dissertation module, of which eight carry 15 credits each and one is 5-credit module. There are no elective modules offered in the Programme.

Aims:

This programme aims to prepare you with the knowledge, skills and values needed for a career in the growing Industry of Autonomous Systems. There are three types of awards that you can get.

Postgraduate Certificate in Robotics, AI and Autonomous Systems

Those awarded the Postgraduate Certificate will have had the opportunity to study the theory and practice related to the analysis, design, and evaluation of Autonomous Systems and the underlying Technologies. To be awarded the Postgraduate Certificate you should demonstrate sufficient ability in at least four taught 15-credit modules (60 credits). These can be any combination of modules among those offered.

Postgraduate Diploma in Robotics, AI and Autonomous Systems

Those awarded the Postgraduate Diploma, in addition to the above, 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 nine taught modules (eight 15-credit and one 5-credit module), worth 125 credits in total.

MSc in Robotics, AI and Autonomous Systems

For all of you completing the MSc in Robotics, AI and Autonomous Systems, in addition to the above, you will have demonstrated original application of knowledge in the area, either through the analysis, design, and evaluation of a concept related of Systems Autonomy and its related technologies, or the critical evaluation and extension of the knowledge in the area through a research-led project, which can involve the development of a relevant software and/or hardware application. This will be achieved through your individual project, a substantial module worth 60 credits that you can commence once you have successfully passed all your taught modules.

WHAT WILL I BE EXPECTED TO ACHIEVE?

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

Knowledge and understanding:

- Propose designs of Autonomous Systems based on theoretical and practical components.

- Analyse the performance and limitations of the underlying technologies related to Autonomous Systems.
- Propose and formulate advanced techniques and methods applicable to problems related to Autonomous Systems' design. ^[L]_[SEP]
- Apply and critically evaluate advanced software techniques to deal with analysis and design tasks in the general area of Autonomy.
- Apply the legal framework of Autonomous Systems operation practically.
- Model the dynamic behaviour of vehicles and mobile robots operating individually or cooperatively and apply feedback control for effective trajectory planning and tracking.
- Synthesis of human-machine interaction concepts in the context of Autonomous Systems operation.

Skills:

- Follow future developments in the field by critically evaluating theoretical research and emerging technologies required for designing Autonomous Systems.
- Analyse complex data obtained from a variety of sensors and take optimal decisions in real-time by applying intelligent techniques based on Statistics and Machine learning.
- Apply analytic and design knowledge creatively and in innovative ways. ^[L]_[SEP]
- Develop ^[L]_[SEP] concepts and evaluate them through suitable hardware and/or software platforms.
- Communicate competently the results of analysis and design in scientific reports and oral presentations.
- Develop and apply Research Skills and Techniques to further develop knowledge in the field.

^[L]_[SEP]

Values and attitudes:

- Appreciate the impacts to society and the ethical issues arising from expanding Autonomous systems applications.
- 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. ^[L]_[SEP]
- Respect and listen other views. ^[L]_[SEP]

This programme has been developed in accordance with the QAA Subject Benchmark for generic masters' level programmes

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. They focus on specialised topics related to Autonomous Systems, reinforce knowledge obtained from lectures and support project work. Tutorials and labs provide practical training and develop skills in Programming, Embedded Systems Design, Data acquisition and Sensor technologies, Signal Processing, Communication, Optimization and Machine Learning algorithms, Communication and Control. 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 develop software and hardware solutions that will lead to prototypes.

For all modules (including Dissertation) you will be expected to work out in detail the examples provided in the lectures, explore the theoretical concepts by reading textbooks and scientific papers and work on Coursework/Group Projects/Individual Dissertation project tasks.

WHAT TYPES OF ASSESSMENT AND FEEDBACK CAN I EXPECT?

Assessment and Assessment Criteria

Assessment of the 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 Individual Project is assessed primarily through a dissertation on a topic related to Autonomous Systems but with contributions from an interim report, work carried out during the project period and oral examination.

Assessment Criteria are descriptions, based on the intended learning outcomes, of the skills, knowledge or attitudes 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. The modules in this Programme cannot be compensated. If you fail an assessment component or a module, the following will apply:

Resit: For each failed module 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: http://www.city.ac.uk/__data/assets/word_doc/0003/69249/s19.doc

WHAT AWARD CAN I GET?

Master's Degree:

	HE Level	Credits	Weighting (%)	Class	% required
Taught	7	125	67	With Distinction	70
Dissertation	7	60	33	With Merit	60
				Without classification	50

Postgraduate Diploma:

	HE Level	Credits	Weighting (%)	Class	% required
Taught	7	125	100	With Distinction	70
				With Merit	60

				Without classification	50
<u>Postgraduate Certificate:</u>					
	HE Level	Credits	Weighting (%)	Class	% required
Taught	7	60	100		
				Without classification	50

WHAT WILL I STUDY?

Taught component

The programme consists of 9 taught modules, all core modules. These are listed in the Table below. Of these, eight are 15-credit modules and one is a 5-credit module. The first four modules listed in the Table are offered in term 1, and the last five in Term 2.

Module Title	SITS Code	Module Credits	Core/ Elective	Can be Compensated?	Level
Advanced Signal Processing and Communications.	EPM109	15	Core	N	7
Robotics, Imaging and Vision	EPM110	15	Core	N	7
Engineering Programming	EPM102	15	Core	N	7
System Dynamics, Modelling, Propulsion and Control	EPM103	15	Core	N	7
Embedded Systems	EPM104	15	Core	N	7
Man-Machine, Machine-Machine Teaming	EPM105	15	Core	N	7
Machine Learning	EPM106	15	Core	N	7
AI for Engineering Design Projects	EPM108	15	Core	N	7
Regulation and Ethics of Autonomous Systems	EPM107	5	Core	N	7

Dissertation component

Module Title	SITS Code	Module Credits	Core/ Elective	Can be Compensated?	Level
Dissertation	EPM949	60	Core	N	7

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

TO WHAT KIND OF CAREER MIGHT I GO ON?

Autonomous Systems and related technologies including AI and Robotics 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, Automotive and Transport, Robotics, Healthcare, Defence, Manufacturing, Logistics and Energy/Smart Grids. Skills acquired in the MSc, such as AI software/hardware development, Embedded Systems, Machine Learning and Sensor Technologies, will be attractive for a wide range of start-up companies linked to the Autonomous Systems market and beyond.

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>

WHAT STUDY ABROAD OPTIONS ARE AVAILABLE?

Study Abroad is not offered in this Programme.

WHAT PLACEMENT OPPORTUNITIES ARE AVAILABLE?

Internships: you can participate in our professional placement programme, which is supported by the Professional Liaison Unit. 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 Professional Liaison Unit provides support to prepare CVs, interviews and application for internships.

WILL I GET ANY PROFESSIONAL RECOGNITION?

We intend to seek IET and InstMC accreditations.

HOW DO I ENTER THE PROGRAMME?

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

For those students, whose first language is not English, the following qualification is also required: IELTS: 6.5 (minimum of 6.0 in all four test components is preferable). Please note that TOEFL is not accepted as evidence of English language ability for students that require a Confirmation of Acceptance for Studies.

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