Programme Specification[1]

Please note: there may be some adjustments to the teaching arrangements for courses associated with this programme. Given current circumstances related to the Covid-19 pandemic it is anticipated that some usual arrangements for teaching on campus will be modified to ensure the safety and wellbeing of students and staff on campus; further adjustments may also be necessary, or beneficial, during the course of the academic year as national requirements relating to management of the pandemic are revised.

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

Programme Title	*UCAS Code*	*GU Code*
Robotics and Artificial Intelligence, MSc		H671B-5200

2. Academic Session:

2022-23

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

11

4. Credits:

180

5. Entrance Requirements:

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

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

ATAS Certificate not required

7. Attendance Type:

Full Time

8. Programme Aims:

This programme introduces to the main technologies underlying the development of robotic systems capable to sense, think and act. The accent is on Artificial Intelligence methodologies that help a robot to 1) make sense of

[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.

its environment through the data it captures with its sensors, 2) to make optimal decisions in view of accomplishing a task and 3) to interact with the physical world through its mechanical components. The programme includes both methodological courses, mainly aimed at the acquisition of the necessary mathematical and theoretic skills, and experimental modules, mainly aimed at the acquisition of practical and applied knowledge.

The main goals of the program are as follows:

- To provide the methodological and experimental knowledge necessary to automatically analyse and process the signals that robotic systems gather through their sensors;
- To introduce the main Artificial Intelligence methodologies aimed at mapping data into decisions and plans;
- To introduce the basic notions of the robot's mechanics;
- To develop familiarity with the main hardware and software components of a robotic system;
- To introduce the main paradigms underlying the development of state-of-the-art robotic systems.

9. Intended Learning Outcomes of Programme:

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

Knowledge and Understanding:

By the end of this programme students will be able to:

- describe the underlying mechanical, control, electronic, computing science and technology, relevant to the development and analysis of robotic systems and artificial intelligence;
- explain the generic design and project management issues required to enable and support the synthesis of robotic and artificial intelligence systems;
- summarize the time-management and work planning issues related to the organization, implementation and successful completion, including reporting, of an individual research project.

Skills and Other Attributes:

By the end of this programme students will be able to:

Subject-specific/practical skills

- use software for selected areas of analysis and design in the context of robotics and artificial intelligence;
- demonstrate writing, planning, and research skills and methods in support of an individual project.

Intellectual skills

- interpret and critically assess existing theories, models, methods and results, both qualitative and quantitative, within a robotics and artificial intelligence context;
- recognise and assess the technical challenges inherent in robotics and artificial intelligence systems, and the ability to synthesis, and propose evaluation methods for, alternative solutions;
- construct a rational argument and present their analysis and solution persuasively.

Transferable/key skills

- apply design synthesis and analysis, within a coherent range of subjects in robotics and artificial intelligence, in order to propose and create new solutions to existing and future problems;
- communicate ideas clearly, by means of both written documentation and oral presentation;
- use modern information resources and technologies effectively;
- assign priorities, organize and schedule work activities effectively;
- work independently and in a team environment;
- demonstrate generic problem-solving skills;
- utilise specific software tools to support synthesis and analysis activity;
- professionally plan, report and present the results of multi-disciplinary project activity.

10. Typical Learning and Teaching Approaches:

Most courses achieve more than one intended learning outcome. The methods of delivery will vary depending on which intended learning outcome is being addressed. Details of this are provided in the individual course documentation but general principles of learning approaches used are outlined below.

Knowledge and understanding of the subject matter covered in the core and advanced courses are developed through lectures and seminars. These are supported by directed study of textbooks and journal articles (hard copy or electronic) and laboratory assignments. These will be supported by small and/or large group tutorials within each course. In addition, knowledge and understanding of robotics are developed through practical project work.

Subject-specific/practical skills are developed through practical tutorial exercises and laboratory sessions where hardware and software techniques are developed. Guided laboratory sessions are used to develop the skills and problem-based assignments are used to reinforce the skills developed. Also, skills are strengthened through project work involved in this programme.

Intellectual skills are practised and demonstrated through assignments and projects, tutorial, laboratory based activity.

Transferable/key skills are practised and demonstrated through assignments, projects, group-tutorial, laboratory, team and individual project work.

11. Typical Assessment Methods:

The student's theoretical knowledge of the principles of Robotics and Artificial Intelligence will be assessed in the examinations and laboratory based assignments set within the core courses. They will be further assessed in the coursework, report writing and oral presentations associated with the team and individual technical projects. The student's laboratory skills and scientific report writing will be assessed throughout the programme as part of the individual courses and project work.

12. Programme Structure and Features:

Structure

Course Title	Course Code	Credits	Core	Optional	Semester(s) taught
Robotics M *or* Robotics Foundations	ENG5326 *or* COMPSCI4076	20 *or* 10	C		2
Machine Learning and Artificial Intelligence for Data Scientists (M)	COMPSCI5100	15	C		1
Control M	ENG5022	20	C		1
Robotics Team Design Project M	ENG5325	20	C		2
Digital Signal Processing	ENG5027	20		O	1
Navigation Systems	ENG5062	10		O	1
Power Electronics & Drives M	ENG5292	20		O	1
Computational Social Intelligence (M)	COMPSCI5095	10		O	1
Human Computer Interaction Design and Evaluation (M)**	COMPSCI5057	10		O	2
Deep Learning for MSc (M)	COMPSCI5103	10		O	2
Advanced Control 5	ENG5009	10		O	2
Autonomous Vehicle Guidance Systems	ENG5017	10		O	2
Dynamics 5	ENG5299	10		O	2
Fault Detection, Isolation & Recovery	ENG5031	10		O	2
Real Time Embedded Programming	ENG5220	20		O	2
Conversational Interfaces (M)	COMPSCI5094	10		O	2
Cyber Security Fundamentals (M)	COMPSCI5063	10		O	2
MSc Project *or* MSc Project for Computing Science	ENG5059P *or* COMPSCI5086P	60	C		Summer

Features

A total of 180 credits is required (i.e. 120 credits of taught courses and a 60 credit individual project).

This programme enables candidates to specialise in Engineering or Computing Science courses, or take a mixture of courses from both theme areas. The choice of specialisation involves choosing the appropriate Robotics course and MSc project that matches the selected theme. This will allow candidates to continue in the theme area associated with their undergraduate degree.

** this course is only available to student with previous HCI learning. This should be discussed with course leader.

Regulations

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

(a) Award of the degree
(b) Progress
(c) Early exit awards

www.gla.ac.uk/services/senateoffice/policies/calendar/

Candidates who fail to meet the requirements of the MSc may be considered for the award of Postgraduate Diploma or Certificate under the School of Engineering MSc Regulations. Such candidates would not normally do a project.

13. Programme Accredited By:

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:

The Programme Specification is informed by the QAA Benchmark Statement for Masters in Engineering which can be found at https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-engineering-15-masters.pdf

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:	25/09/2022