School of Mathematical and Computer Sciences

ARTIFICIAL INTELLIGENCE with SPEECH and MULTIMODAL INTERACTION
MSc / PG Diploma

Full-Time / Part-Time

Distinctly Ambitious
www.hw.ac.uk
Heriot-Watt University offers a first-rate environment for postgraduate study and research. We are one of the UK’s leading universities, recognized internationally for excellent teaching and innovative technology in our specialist areas of science, engineering, business management, languages and textile design.

Heriot-Watt became a university in 1966 and our origins go back to the foundation of the School of Arts in Edinburgh in 1821. We are Scotland’s most international university. Over 30% of our students come from outside the UK.

We introduced the first Computer Science degree in Scotland in 1966, have taught MSc degrees in this subject from 1970 and are part of the world class SICSA research cluster that aims to sustain and expand Scotland’s research excellence in Informatics and Computer Science.

Programme Structure

The first two semesters (September-May) are spent studying taught courses in AI, multimodal interaction and spoken interfaces. At the same time research skills are developed as a preliminary for work on an MSc project. Exams take place at the end of each semester.

In the third semester (May-August) students undertake a specialist project and write it up as a dissertation. It enables development and consolidation of skills introduced in the taught courses, applying them to a challenging practical problem in the subject area.

The project is carried out under the supervision of an academic who is an expert in the field. In some cases the project can be carried out in collaboration with an outside industrial or academic organisation.

The table shows the essential and optional courses in the first 2 semesters. Full time students must study 4 courses each semester.

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SEMESTER 1 COURSES

F21GA 3D Graphics and Animation
- To investigate 3D graphics concepts including lighting, materials, modelling, occlusions, projections, reflections, rendering, scene graphs, shading, texture mapping, transformations, viewpoints.
- To explore animation including blending, clipping, poses, skeletons and skinning.
- To develop programming skills in 2D and 3D graphics and animation.

F29AI Artificial Intelligence and Intelligent Agents
- To introduce the concepts and techniques of AI, including planning, search and knowledge representation.
- To introduce the scope, subfields and applications of AI topics to be taken from a list including natural language processing, expert systems, robots and autonomous agents, machine learning and neural networks, and vision.
- To develop skills in AI programming.

F21BC Biologically Inspired Computation
- To impart why traditional computation finds it hard to do pattern recognition, problem solving and autonomous agency.
- To show how some natural and biological systems approach these tasks.
- To introduce the main biologically-inspired algorithms and techniques which are researched and applied.
- To establish a practical understanding of the real-world problems to which these techniques may be fruitfully applied.

F21DL Data Mining and Machine Learning
- To introduce the fundamental concepts and techniques used in machine learning.
- To develop a critical awareness of the appropriateness of different methods.
- To provide familiarity with common applications such as data mining.

F21HR Human Robot Interaction
- To impart the issues involved in building intelligent robots for HRI.
- To impart knowledge and skills in managing and planning software development in HRI group projects.
- To enhance knowledge and skills in middleware tools and data management for robotic systems and interaction design.
- To develop critical capabilities in project planning, systems analysis, requirements capture, and system specification.

SEMESTER 2 COURSES

F21SC Industrial Programming
- To develop proficiency in modern industrial programming languages such as C#, C++11, Python, PHP.
- To enable the elaboration and combination of system components in different languages.
- To enable an agile and flexible response to changes in industrial practices.
- To enable participation by industrial practitioners to provide context and applicability.

F21SA Statistical Modelling and Analysis
- To impart a range of statistical modelling and analysis techniques for data analysis and demonstrate their practical application.
- To develop the ability to deal with complex issues and make informed professional judgements about them using statistical models and analysis.

F21AD Advanced Interaction Design
- To develop extensive, detailed and critical knowledge of requirements gathering, design and evaluation techniques in interaction design.
- To develop awareness of current research and emerging issues in the field of interaction design.
- To impart a range of specialised skills, and research methods involved in working with users.

F21BD Big Data Management
- To review principal abstractions, methods and techniques for the management of large and complex data sets (“Big Data”).
- To develop an understanding of the foundations and tools of the Semantic Web.
- To impart the ability to appreciate critically a range of data integration solutions.

F21GP Computer Games Programming
- To develop appreciation of the history and types of computer games and the elements of game design and theory.
- To give an understanding of games physics, obstacle avoidance, path planning, group movement and learning and adaptation in games.
- To impart knowledge of current computer games tools and environments.
- To develop programming skills and techniques specific to the area of 2D and 3D computer games.

F21CA Conversational Agents and Spoken Language Processing
- To impart extensive, detailed and critical knowledge of the design, implementation and evaluation techniques for conversational agents and spoken language processing.
- To develop an awareness of current research and emerging issues in the field of conversational agents and spoken language processing.
- To introduce a range of interdisciplinary research methods and specialised practical skills involved in building working conversational interfaces.

F21DV Data Visualization and Analytics
- To show how to develop graphical applications to search, explore, and retrieve information in various data sets.
- To impart principles of data visualization and analysis for big, complex, dynamic, heterogeneous, linked, or dirty data.
- To impart the ability to implement interactive web-based visualisation systems and assess their effectiveness.

F21RP Research Methods and Project Planning
- To develop skills in critical thinking, research planning, academic writing and experimental design appropriate for a post-graduate programme.
- To enable students to gain skills in project planning and an awareness of legal, social, ethical and professional issues relevant for IT professionals.
- To enhance students’ employability by development of job seeking and career planning skills.

We may alter the courses offered at any time. Some courses may not run every year. Not every course combination may be possible to take. Students must satisfy each course’s prerequisites and their course choice must be agreed with the programme’s director.

www.macs.hw.ac.uk/cs/pgcourses
**Entry Requirements**

Applicants require a 1st or 2nd class honours degree or its equivalent with a substantial academic component of Computing or IT. Graduates with a little less than this may sometimes be admitted to the Postgraduate Diploma programme. If their exam and coursework performance is MSc level by May, they may then be recommended for transfer to the MSc.

Honours graduates without relevant computing knowledge, who wish to retrain and become AI professionals, may like to consider doing our 2 year MSc in AI instead.

Non-native English speakers must also satisfy the university’s requirements for competency in English. This can be done with an IELTS score of 6.5 and in other ways. English language training can also be undertaken at Heriot-Watt University before starting the MSc.

**How to apply**

Apply online at [www.hw.ac.uk/study/apply/uk/postgraduate.htm](http://www.hw.ac.uk/study/apply/uk/postgraduate.htm)

Supporting documents including 2 academic references, degree certificates, transcripts of marks and English test results can be uploaded digitally to the online application facility.

**Contact information**

Postgraduate Admissions
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MACSpgenquiries@hw.ac.uk
[www.macs.hw.ac.uk/cs/pgcourses](http://www.macs.hw.ac.uk/cs/pgcourses)

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**Post-Study Work Opportunities in Scotland**

Opportunities exist for students who graduate in a specialism in demand in the Scottish economy to get employment here. The Scottish government is keen to help talented individuals from around the world come to study, work and live here. More information can be found at [www.talentscotland.com](http://www.talentscotland.com)

**Career Prospects**

Graduates from this programme can expect to get employment with AI businesses, software houses, IT companies, R and D divisions of companies, financial services organisations, defence contractors or government IT agencies and as researchers or research students within universities.

**Scholarships and Awards**

International students can apply for a variety of scholarships from the Scottish executive, other bodies and our school. Please visit [www.macs.hw.ac.uk/cs/pgcourses/finance.htm#international](http://www.macs.hw.ac.uk/cs/pgcourses/finance.htm#international)

Scottish and EU citizens can apply for SAAS loans covering most of the fees. Please visit [www.saas.gov.uk](http://www.saas.gov.uk)

Other scholarships may be available from the university. Please visit [www.hw.ac.uk/study/scholarships/postgraduate-taught.htm](http://www.hw.ac.uk/study/scholarships/postgraduate-taught.htm)

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**Employment**

First destinations of some of our recent MSc graduates:

- Software Engineer, Ion Concept Systems
- Software Engineer, Logica
- PhD Computer Science, Heriot-Watt University
- IT Manager, NCS
- Database Administrator, Pension Fund Commission
- System Specialist, UBS AG (Bank)
- Test Engineer, IBM
- Systems Engineer, GEC Marconi Avionics
- Graduate Software Engineering, Thomson Marconi Sonar Ltd
- Computer Programmer, Bull Europe
- Software Consultant, Absoft
- Software Engineer, Thales (UK)

**Cost**

The Scots/UK/EU fee for this one year full time MSc programme at Heriot-Watt university in Edinburgh starting in September 2019 is £7168. The overseas fee is £18680. The cost of living during one year of study in Edinburgh is estimated at £10800.