HERIOT WATT UNIVERSITY

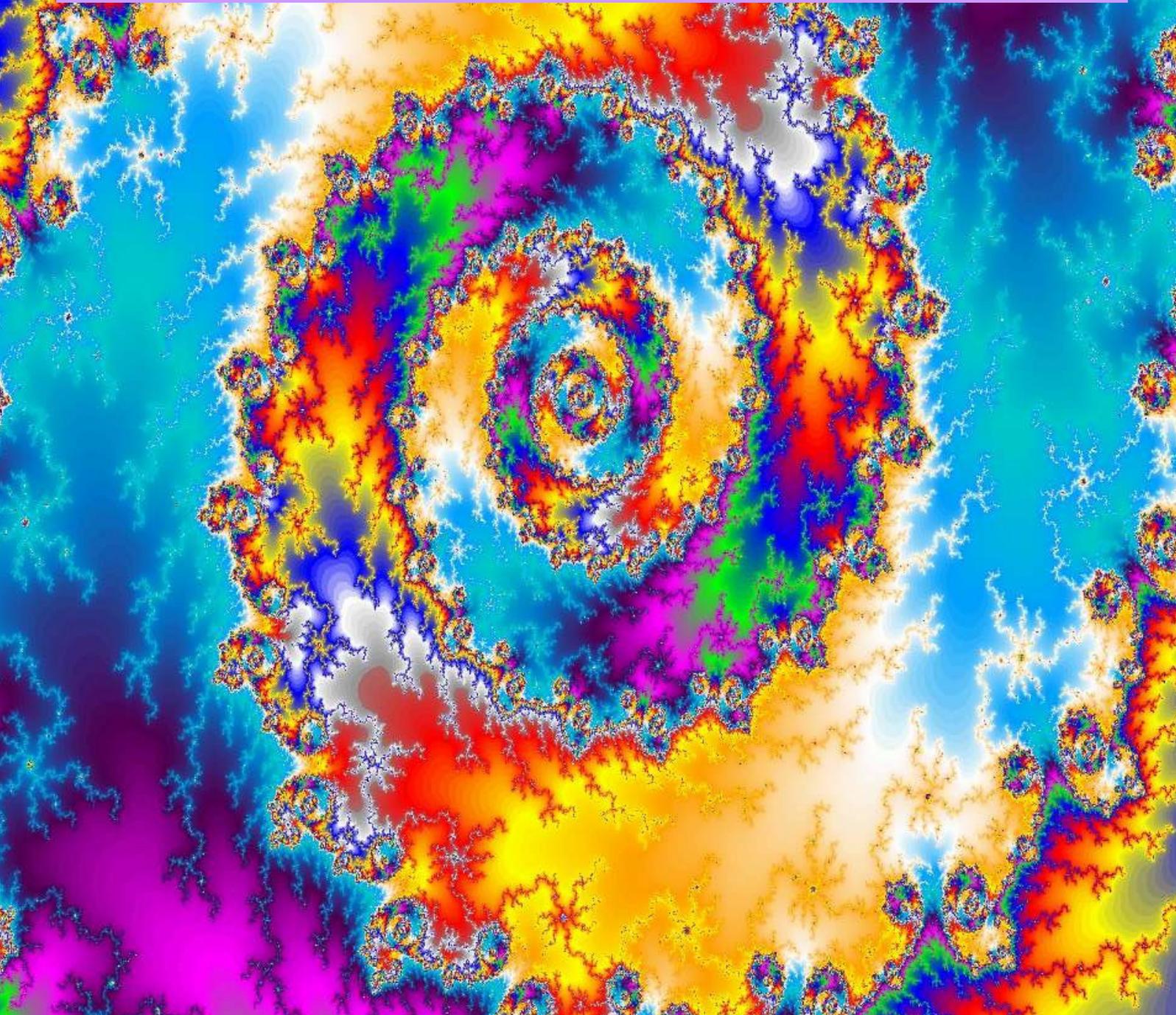## School of Mathematical and Computer Sciences

DATA SCIENCE
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.

Aim of Programme

The aim of this MSc programme is to impart the theory and skills for managing and analysing very large and complex data sets, sometimes referred to as Big Data. Students will learn how to model, store and process these data sets using the latest algorithms and techniques. They will also learn apt methods and tools for visually exploring data.

The programme is research led and students will benefit from the interaction with staff who are involved in internationally leading research projects in the field. The skills acquired by students will be applicable to industrial applications as well as scientific data exploration such as business intelligence or e-health.

Duration of Programme

The full-time MSc programme starts in mid September and lasts 1 year. The Postgraduate Diploma starts at the same time but only lasts 8 months. Students completing the PG Diploma at MSc level may transfer to the MSc.

Part-time study for the MSc over 2 years is also possible by special arrangement with the programme director.

Programme Structure

The first two semesters (September-May) are spent studying taught courses in Data Science 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.

Semester 1	Semester 2
F21DL Data Mining and Machine Learning F21SA Statistical Modelling and Analysis	F21BD Big Data Management F21RP Research Methods and Project Planning
2 options: F21BC Biologically Inspired Computation F21CN Computer Network Security F21SC Industrial Programming F21SF Software Engineering Foundations	**2 options:** F21AS Advanced Software Engineering F21DV Data Visualisation and Analytics F21DE Digital and Knowledge Economy F21DP Distributed and Parallel Technologies

SEMESTER 1 COURSES

F21BC Biologically Inspired Computation
- To impart an appreciation of why traditional computation finds it hard to perform certain key tasks in pattern recognition, problem solving and autonomous intelligence.
- To show how a range of natural biological systems handle these tasks.
- To introduce the main biologically-inspired algorithms and techniques which are now commonly researched and applied.
- To establish a practical understanding of the real-world problems to which these techniques may be applied.

F21CN Computer Network Security
- To impart critical understanding of key concepts, issues, theories and principles of computer network security.
- To develop detailed theoretical and practical knowledge of foundational issues in computer network security.
- To provide detailed understanding and practical experience with key services and tools used for computer network security purposes.
- To give practical experience of analysing requirements, designing, implementing and testing security solutions for computer network applications.

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

F21SC Industrial Programming
- To develop proficiency in the modern industrial programming languages C# and Python.
- To enable the elaboration and combination of system components in different languages.
- To enable an agile and flexible response to changes in industrial practices and let industrial practitioners participate to provide context and applicability.

F21SF Software Engineering Foundations
- To impart understanding of the object oriented paradigm and the process of object oriented design.
- To support the development of object oriented programs in Java.
- To carry out object oriented design from specification, document the design using appropriate techniques, implement the design in Java and evaluate the results.
- To develop an understanding of windows-based systems and their development.

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

SEMESTER 2 COURSES

F21AS Advanced Software Engineering
- To consolidate proficiency in imperative programming and software development.
- To develop further object oriented programming and design methods.
- To introduce concurrent programming techniques and the deployment of patterns and UML in software engineering.
- To instil understanding of the concepts and benefits of advanced software engineering methods.
- To give practical experience of a large software engineering project.

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 tools and foundations of the Semantic Web.
- To impart ability to appreciate critically a range of data integration solutions.

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

F21DE Digital and Knowledge Economy
- To consider the impact of deploying new technologies and emerging knowledge in developed economies.
- To discuss e-Business, as a modern business model that leverages technical advancements to create economic growth.
- To introduce relevant models, analytical techniques, technologies and methodologies including business, organisational, knowledge and technology based issues.
- To facilitate the dialogue between business and computing personnel, and translate business requirements to computing ones and vice versa.

F21DP Distributed and Parallel Technologies
- To explore technologies and techniques underlying advanced distributed and parallel software development including distribution technologies, parallel program design and performance analysis.

F21RP Research Methods and Project Planning
- To enable students 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.

Post-Study Work Opportunities

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

Career Prospects

MSc graduates can expect to get employment with software houses, IT companies, R+D divisions of companies, financial services organisations, defence contractors or government IT agencies and as researchers or research students within universities.

Professional Accreditation

This MSc programme is accredited by the Chartered Institute of IT or BCS and should fulfil its further education requirements for a Chartered IT Professional. It also partially fulfils membership requirements for the CEng and CSci professional bodies.

Scholarships and Awards

International students can apply for a scholarships from the Scottish executive, other bodies and our school.

🌐 www.macs.hw.ac.uk/cs/pgcourses/ finance.htm#international

Scots and EU citizens can get SAAS loans to cover most of the fees.

🌐 www.saas.gov.uk

Other scholarships may be available :

🌐 www.hw.ac.uk/study/scholarships/ postgraduate-taught.htm

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. The Dubai campus fee is AED 81900 for 2019/20.

Entry Requirements

Applicants require a good honours degree with a major academic component of Computing or IT that includes study of databases and programming or its equivalent. 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 Data Scientists, may like to consider doing our 2 year MSc in Data Science 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.

Applicants requiring sponsorship for a tier 4 visa to study in the UK via a CAS letter must also satisfy the UK Borders Agency's minimum English language requirements. They are IELTS 5.5 in reading, writing, speaking and listening

How to apply

Apply online at

🌐 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
Room 1.24
Earl Mountbatten Building
School of Mathematical & Computer Sciences
Heriot-Watt University, Riccarton, Edinburgh EH14 4AS SCOTLAND

📱 +44 (0) 131 451 8444

📠 +44 (0) 131 451 3327

✉ MACSpgenquiries@hw.ac.uk

🌐 www.macs.hw.ac.uk/cs/pgcourses