NETWORK SECURITY
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 its 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.

**Aim of Programme**

The aim of this MSc programme is to teach graduates with an IT background the theory, methods and tools of the art of computer network security. Students will acquire the principles and skills needed to elicit security requirements, analyse threats, formulate security policies, devise security regimes of mechanisms and services, deploy computer network security solutions and validate their effectiveness. They will also acquire detailed understanding and knowledge of contemporary issues in computer network security research areas.

**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.

**Programme Structure**

The first two semesters (September-May) are spent studying taught courses in computer network security and related subjects. 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. The project enables further development and consolidation of skills introduced in taught courses, applying them to a challenging practical problem in computer network security.

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

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

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F21CN</strong> Computer Network Security</td>
<td><strong>F21AN</strong> Advanced Network Security</td>
</tr>
<tr>
<td><strong>F21SC</strong> Industrial Programming</td>
<td><strong>F21RP</strong> Research Methods and Project Planning</td>
</tr>
<tr>
<td><strong>Options:</strong></td>
<td><strong>Options:</strong></td>
</tr>
<tr>
<td><strong>F29DC</strong> Data Communications and Networking</td>
<td><strong>F21AS</strong> Advanced Software Engineering</td>
</tr>
<tr>
<td><strong>F21DL</strong> Data Mining and Machine Learning</td>
<td><strong>F21BD</strong> Big Data Management</td>
</tr>
<tr>
<td><strong>F21RS</strong> Rigorous Methods for Software Engineering†</td>
<td><strong>F21DP</strong> Distributed and Parallel Technologies</td>
</tr>
<tr>
<td><strong>F21SF</strong> Software Engineering Foundations†</td>
<td><strong>F21NA</strong> Network Applications</td>
</tr>
<tr>
<td>† cannot be studied at same time</td>
<td></td>
</tr>
</tbody>
</table>
SEMESTER 1 COURSES

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 tools and services for computer network security purposes.
- To give practical experience of analysing requirements, design, implementation and testing of security solutions for computer network applications.

F29DC Data Communications and Networking
- To provide core knowledge in data communications and computer networking.
- To understand the principles of the structure of the Internet.
- To study communications, protocols and services at various layers for computer networks.

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 of machine learning.
- To provide familiarity with common applications such as data mining.

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 flexible responses to changes in industrial practices.
- To enable participation by industrial practitioners to provide context and applicability.

F21RS Rigorous Methods for Software Engineering
- To address the challenges of developing high quality software including specification, static analysis, formal verification and abstract interpretation.
- To impart understanding of processes, standards and quality metrics supporting rigorous software engineering.

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 window-based systems and their development.

SEMESTER 2 COURSES

F21AD Advanced Network Security
- To develop critical analysis skills in computer network security further and allow the identification of network security threats in a systematic way.
- To provide in-depth understanding of penetration testing concepts and methodologies.
- To give practical experience of exploiting vulnerabilities in common computer system architectures.
- To impart a deep understanding of common techniques for implementing countermeasures.

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

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.

F21NA Network Applications
- To impart knowledge and understanding of the theories, principles and protocols underlying network applications on the Internet.
- To develop skills in a range of network technologies, enable a grasp of the main design and practical issues faced in their application, and apply relevant techniques for a given network application problem.
- To give experience of creatively developing in teams a substantial network application involving web and application server technologies.

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 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 in Scotland

Opportunities exist for students who graduate in a specialist 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

Graduates from this programme can expect to be able to get employment with software houses, IT companies, research and development divisions of companies, financial services organisations, defence contractors or government IT agencies as well as within universities. These jobs will be as network security consultants, security analysts, security auditors, penetration testers, computer systems managers, network software engineers, IT systems analysts, information systems officers and research assistants.

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

Scottish and EU citizens can apply for SAAS loans covering most of the fees. Please visit www.saas.gov.uk

Other scholarships may be available from the university. Please visit www.hw.ac.uk/study/scholarships/postgraduate-taught.htm

Entry Requirements

Applicants require a first or second class honours degree or its overseas 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.

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, an ECCE certificate, Pearson Test of Academic English 58, Cambridge First Certificate in English A or B, level C in academic English from our own English language teachers or by proving they have studied wholly in English at university level. A full range of English language training courses can be taken at Heriot-Watt University before starting a programme.

Applicants needing sponsorship for a tier 4 visa to study in the UK via a CAS letter must satisfy the UK Borders Agency’s minimum English requirements. They are IELTS 5.5 in reading, writing, speaking and listening from an approved test centre.

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