Structural and Foundation Engineering MSc/Diploma

Delivery: Full Time, Part Time, Distance Learning  
Programme type: Taught Programme  
Study location: Edinburgh  
Entry date: September, January (DL only)

Introduction

This programme is designed for graduates and practising engineers who wish to improve their knowledge of structural and foundation engineering. The structure and content of the programme has been carefully designed following liaison with a wide range of employers in the sector.

This programme builds directly on staff research activities which comprise experimental, numerical and theoretical work. Students also have access to excellent practical facilities for static, dynamic and impact testing. Advanced computer and networking facilities, including state-of-the-art parallel processing capability, are also available.

Part-time and Distance Learning study options

This programme can be studied full-time, part-time or via Independent Distance Learning (IDL), ideal for those in employment or with other commitments, providing flexible study options that fit around work or family. As an IDL student you will not be required to attend any lectures, tutorials or other events at any of Heriot-Watt University's campuses.

The Institute for Infrastructure and Environment (IIE)

This programme is delivered by Heriot Watt University’s Institute for Infrastructure and Environment. As a Structural and Foundation Engineering postgraduate student you will be part of the Institute's Graduate School, connecting you with staff, research associates and fellow students engaging in cutting-edge research in areas such as water management, ultra-speed railways, construction materials, geomechanics and more.

Programme duration

<table>
<thead>
<tr>
<th>Mode of study</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time</td>
<td>1 year</td>
</tr>
<tr>
<td>Part-time</td>
<td>2 years</td>
</tr>
<tr>
<td>Independent Distance Learning (IDL)</td>
<td>2-7 years*</td>
</tr>
</tbody>
</table>

*An IDL programme - whether at PgDip or MSc level - can be completed in a minimum of 2 years. On average, our PgDip programmes studied via IDL are completed in 2-3 years, while MSc programmes are completed in 2.5-7 years. Most students intend to complete their studies via IDL within 2-3 years.

Professional recognition

This degree is accredited as meeting the requirements for Further Learning for a Chartered Engineer (CEng) for candidates who have already acquired an Accredited CEng (Partial) BEng (Hons) or an accredited IEng (Full) BEng/BSc (Hons) undergraduate first degree. See the Joint Board of Moderators (JBM) for further information.

Industry links

The direct relationship between the programme and industry needs is reinforced in two ways: through projects with an
industrial context; and through specific aspects of the taught courses, for example, presentation of case studies and seminars. There are also opportunities for visiting lecturers from relevant sectors to get involved in teaching part of the courses.

This programme is also supported by the Civil Engineering Industry Advisory Committee, which includes representatives from major multi-national employers AECOM, ARUP, Balfour Beatty, Halcrow, Jacobs and WSP Group. This committee convenes regularly and advises on the programme content and structure, ensuring quality, up-to-date content and relevance to industry needs.

Teaching and research excellence

Our teaching staff is engaged in a wide range of research, with 50% of that research recognised as being internationally excellent by the most recent Research Assessment Exercise (RAE 2008).

With a history dating back to 1821, Heriot-Watt is one of the UK’s leading universities, and Scotland’s most international. Find out more about Heriot-Watt University's reputation, rankings and international profile.

Programme content

The curriculum of Structural and Foundation Engineering, led by Professor Laghrouche, covers the specialist technical and computational skills necessary for today’s construction industry and therefore offers excellent preparation for employment across an industry that includes consulting and contracting engineers, public authorities and local government. In addition, the programme also provides a suitable springboard for graduates seeking a career in a research lead environment.

Both MSc and Diploma students undertake the eight taught courses listed below. MSc students also complete a Masters dissertation.

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Indeterminate Structures</td>
<td>• Safety, Risk and Reliability</td>
</tr>
<tr>
<td>• Stability and Dynamics</td>
<td>• Earthquake Engineering</td>
</tr>
<tr>
<td>• Ground Engineering</td>
<td>• Foundation Engineering</td>
</tr>
<tr>
<td>• FEA &amp; Stress Analysis A</td>
<td>• FEA &amp; Stress Analysis B</td>
</tr>
</tbody>
</table>

Course descriptions

Please find below the course descriptions. For more information on courses, please contact the Programme Leader.

Indeterminate Structures

**Semester 1 (mandatory)**

This course aims to provide students with a variety of techniques to analyse forces and displacements in linear, statically determinate and statically indeterminate skeletal structures. In this context, the course enables learners to strengthen their ability to model such structures and to understand the relationship between the mathematical models used in analysis and the behaviour of the real-world structures. It also introduces the safe and efficient use of commercial software packages for the static analysis of linear elastic beam and the plastic analysis of frames structures, as well as the modelling of structural behaviour in a laboratory environment, providing an awareness of health and safety issues in the latter. Subjects covered in the syllabus include:

*Statically indeterminate structures; moment distribution; plastic analysis of frames.*
Ground Engineering

**Semester 1 (mandatory)**

The overall aim of this course is to provide the students with detailed knowledge and understanding in ground engineering for geotechnical engineers, extending the knowledge gained in undergraduate geotechnical courses to allow the learners to apply theoretical design and analysis to practical problems. Subject that are covered in this course include:

- Site investigation and soil sampling techniques; analysis of slope stability problems and failure modes; earth pressure analysis and retaining walls; application of geotextiles in geotechnical, highway & railway engineering; methods of ground improvement through compaction, grouting, consolidation and drainage.

Safety, Risk and Reliability

**Semester 2 (mandatory)**

This course aims to provide the students with an appreciation and understanding of the basic principles of structural reliability theory. It provides an introduction to concepts of structural safety and risk, as well as probability theory and probability distributions. Specific topics covered in the course syllabus include:

- Probabilistic modelling of strength and loads; first order second moment and first order reliability methods; reliability-based code calibration; Monte-Carlo simulation and variance reduction techniques; Introduction to causes of structural deterioration (corrosion, fatigue and fracture); risk based inspection strategies using Bayesian methods.

Earthquake Engineering

**Semester 2 (mandatory)**

This course aims to provide students with an understanding of the nature of seismic forces and the response of structures subjected to such loading, as well as to provide learners with an introduction to earthquake-resistant design and the seismic assessment of structures. The main subjects covered in the course syllabus include:

- Introduction to engineering seismology; waves in elastic media; introduction to Eurocode 8; simplified and multi-modal response spectrum analyses; elastic & inelastic systems; time history and frequency domain analyses; soil-structure interaction – transmitting boundaries; methods of seismic structural assessment; structural repair and strengthening techniques.

Foundation Engineering

**Semester 2 (mandatory)**

The overall aim of this course is to provide the student with knowledge and understanding of the geotechnical design process, equipping learners with appropriate methods of analysis for settlement and bearing capacity calculations, as well as in examining appropriate national codes and Eurocodes and their implications in geotechnical design. The course syllabus includes the following topics:

- Introduction to foundation types (e.g. shallow footings; piled foundation types); deformation due to surface loading (e.g. stress distributions; elastic displacement; settlement theory; bearing capacity; consolidation); bearing capacity of foundations (e.g. shallow footings; active/passive pressures; general bearing capacity methods); Piles (e.g. forces and load transfer; capacity; soil types; pile group behaviour)
Research projects

The research activities of the programme involve combinations of experimental, numerical and theoretical work. The School has excellent practical facilities for static, dynamic, and impact testing and it has access to advanced computer and networking facilities that include a state-of-the-art parallel processing computer.

Dissertation

MSc students are also required to submit a research dissertation, the research topic normally aligns with the research interests of the staff in the School but can be tailored to suit the interests of the student or student’s employer. Distance learning and part time students are encouraged to suggest project topics based on their own work experience.

Project

At the discretion of the Programme Leader, MSc students may choose to nominate a research project which enables them to investigate a problem they have encountered in their workplace or elsewhere. The research project can be undertaken in conjunction with a suitable industrial partner on campus or in industry if the industrial partner has the facilities to provide adequate supervision.

Programme leader

Professor Laghrouche is a Lecturer in Earthquake Engineering and Structural Dynamics. His research interests lie in the general area of Applied Scientific Computing with a particular emphasis on elastic and acoustic waves, soil-structure interaction, non-reflecting boundary conditions, finite and infinite elements, meshless methods, non-linear modelling and parallel computing.

The additional staff members who deliver the programme have wide ranging expertise in specialist subjects which include reinforced concrete technology, dynamic and impact testing of materials, offshore engineering, structural safety, soil-structure interaction and numerical modelling.

Graduate opportunities

Recent graduates have gained employment in a multitude of engineering consultancies, civil engineering contractors, local and national government organisations and research establishments.

Entry requirements

For MSc level entry applicants must have:

- Minimum of 2:2 honours degree or equivalent academic qualification in cognate and semi-cognate subject area. For PG conversion programmes, non-cognate degrees will be considered. Corporate (or chartered) membership of relevant professional institutions will also be considered.

For PG Diploma level entry applicants must have:

- Third class honours degree in a cognate or semi-cognate subject area PLUS 2 years of relevant experience at an appropriate level completed post qualification.
- Cognate or semi-cognate ordinary degree PLUS 3-4 years of relevant experience at an appropriate level following graduation.
- Candidates who do not meet the above entry requirements or have no formal academic qualifications will be considered individually based on their CV and interview. Admission via this route will be at the discretion of the Director of Admissions and the number of successful applicants will be restricted.
There is no entry at PG Certificate level except through exceptional agreement with approved learning partners.

**Non-graduating study at masters level:**

- Entry is based on CV or on formal academic qualifications or graduate (or incorporated) membership of a relevant professional institution.

**Distance Learning January entry**

Distance learning students can choose to start their studies in January or September. The January intake is not available to students studying on-campus.

**English language requirements**

If English is not the applicant's first language a minimum of IELTS 6.5 or equivalent is required with all elements passed at 6.0 or above.

Applicants who have previously successfully completed programmes delivered in the medium of English language may be considered and will be required to provide documentary evidence of this. Examples would be secondary school education or undergraduate degree programme. A minimum of at least one year of full time study (or equivalent) in the medium of English language will be required.

**Distance learning students**

Please note that independent distance learning students who access their studies online will be expected to have access to a PC/laptop and internet.

**Tuition fees**

<table>
<thead>
<tr>
<th>Status*</th>
<th>Full-time</th>
<th>Part-time</th>
<th>Distance Learning**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotland / Non-UK EU</td>
<td>£4980</td>
<td>£2690</td>
<td>£1130</td>
</tr>
<tr>
<td>England/Northern Ireland/Wales</td>
<td>£5880</td>
<td>£3180</td>
<td>£1130</td>
</tr>
<tr>
<td>Overseas</td>
<td>£16770</td>
<td>£8730</td>
<td>£1130</td>
</tr>
</tbody>
</table>

* If you are unsure which category you fall in to, you should complete a fee status enquiry form, which allows us to assess your fees.

** Fee per course

** Additional fee information**

** £1130 per course. This programme consists of 8 courses. MSc students are also required to submit a Masters dissertation.**

For Independent Distance Learning fees, please check the IDL Tuition and Exam Fees document.

**Scholarships & bursaries**
Alumni Scholarship Scheme  
Heriot-Watt Alumni

Carnegie-Cameron Taught Postgraduate Bursaries  
Applicants must be Scottish by birth, have at least one parent born in Scotland or have been continuously resident in Scotland for a period of three years for the purpose of secondary or tertiary education.

Commonwealth Scholarship and Fellowship Plan  
International (Commonwealth citizens)

Department for International Development (DFID) Commonwealth Shared Scholarship Scheme  
Commonwealth citizens

East Lothian Educational Trust  
Applicants must be a resident of the old county of East Lothian (ie excluding Musselburgh, Wallyford and Whitecraig.)

GoEuro Scholarship Programme  
Enrolled students in any academic year

Leverhulme Trade Charities Trust  
Restricted to residents of the UK who are a son, daughter, spouse, widow or widower of a commercial traveller, chemist or grocer.

Local Education Authority Awards  
Various

Mexican Scholarships  
Mexican applicants

Music Scholarships  
All students

Part-time Fee Grant (SAAS)  
See SAAS residence conditions.

Postgraduate Student Allowance Scheme (SAAS)  
EU and UK applicants who meet the SAAS criteria on eligible courses

Remission of Fees (families of staff)  
Spouses/civil partners and children of members of staff, also retired members of staff of the University

Royal Caledonian Schools Trust  
Applicants must be of Scots parentage (conditions apply - see below)

Scotland's Saltire Scholarships  
Citizens of Canada, the People's Republic of China, India or USA (2 awards for each country)

Sports Scholarships  
All students

Staff Scholarships  
Employees of Heriot-Watt University

The Consumer Affairs UK Scholarship Programme  
All currently enrolled students

The Muirhead Trust  
Scottish, female applicants for science and engineering courses

West Lothian Educational Trust  
Individuals must have originated in West Lothian or have lived there for the last 3 years.

Contacts

- Professor O Laghrouche
- Professor of Structures
- Tel: +44 (0) 131 451 3100
- Web: web.sbe.hw.ac.uk/survey/postgrad/