UNIVERSITY OF EXETER

# ENGINEERING

## INCLUDING MINING ENGINEERING AND CLEAN ENERGY
## UNDERGRADUATE SUBJECT BROCHURE 2016

# KEY INFORMATION AND ENTRY REQUIREMENTS

| ENGINEERING (see page 1) | UCAS CODE | TYPICAL OFFER | |
|---|---|---|---|
| **MEng Single Honours*** | | | |
| MEng Civil Engineering | H202 | AAA-ABB; IB: 36-32 | E |
| MEng Civil Engineering with Industrial Experience | H201 | AAA-ABB; IB: 36-32 | E |
| MEng Civil Engineering with International Study | H207 | AAA-ABB; IB: 36-32 | E |
| MEng Civil and Environmental Engineering | H290 | AAA-ABB; IB: 36-32 | E |
| MEng Civil and Environmental Engineering with Industrial Experience | H291 | AAA-ABB; IB: 36-32 | E |
| MEng Civil and Environmental Engineering with International Study | H292 | AAA-ABB; IB: 36-32 | E |
| MEng Electronic Engineering | H601 | AAA-ABB; IB: 36-32 | E |
| MEng Electronic Engineering with Industrial Experience | HPD0 | AAA-ABB; IB: 36-32 | E |
| MEng Electronic Engineering with International Study | H1C0 | AAA-ABB; IB: 36-32 | E |
| MEng Electronic Engineering and Computer Science | HG64 | AAA-ABB; IB: 36-32 | E |
| MEng Electronic Engineering and Computer Science with Industrial Experience | IH61 | AAA-ABB; IB: 36-32 | E |
| MEng Electronic Engineering and Computer Science with International Study | IH16 | AAA-ABB; IB: 36-32 | E |
| MEng Engineering and Management | H704 | AAA-ABB; IB: 36-32 | E |
| MEng Engineering and Management with Industrial Experience | NH12 | AAA-ABB; IB: 36-32 | E |
| MEng Engineering and Management with International Study | HN1F | AAA-ABB; IB: 36-32 | E |
| MEng Materials Engineering | H191 | AAA-ABB; IB: 36-32 | E |
| MEng Materials Engineering with Industrial Experience | H196 | AAA-ABB; IB: 36-32 | E |
| MEng Materials Engineering with International Study | H198 | AAA-ABB; IB: 36-32 | E |
| MEng Mechanical Engineering | H302 | AAA-ABB; IB: 36-32 | E |
| MEng Mechanical Engineering with Industrial Experience | H303 | AAA-ABB; IB: 36-32 | E |
| MEng Mechanical Engineering with International Study | H309 | AAA-ABB; IB: 36-32 | E |
| MEng Engineering | H104 | AAA-ABB; IB: 36-32 | E |
| **BEng Single Honours** | | | |
| BEng Civil Engineering | H200 | AAA-ABB; IB: 36-32 | E |
| BEng Electronic Engineering | H610 | AAA-ABB; IB: 36-32 | E |
| BEng Electronic Engineering and Computer Science | HG6K | AAA-ABB; IB: 36-32 | E |
| BEng Engineering and Management | HN12 | AAA-ABB; IB: 36-32 | E |

** Interviews will be held for selected MEng programmes*

| ENGINEERING (see page 1) | UCAS CODE | TYPICAL OFFER | |
|---|---|---|---|
| BEng Materials Engineering | H190 | AAA-ABB; IB: 36-32 | E |
| BEng Mechanical Engineering | H300 | AAA-ABB; IB: 36-32 | E |
| BEng Engineering | H101 | AAA-ABB; IB: 36-32 | E |

For further details on all our entry requirements, please see **www.exeter.ac.uk/ug/engineering**

| MINING ENGINEERING (see page 17) | UCAS CODE | TYPICAL OFFER | |
|---|---|---|---|
| **MEng Single Honours** Mining Engineering | J113 | AAB-ABB; IB: 34-32 | C |
| **BEng Single Honours** Mining Engineering | J110 | AAB-BBB; IB: 34-30 | C |

For further details on all our entry requirements, please see **www.exeter.ac.uk/ug/mining**

| CLEAN ENERGY (see page 25) | UCAS CODE | TYPICAL OFFER | |
|---|---|---|---|
| **MEng Single Honours** Energy Engineering | H804 | AAA-ABB; IB: 36-32 | C |
| **BEng Single Honours** Energy Engineering | H803 | AAA-ABB; IB: 36-32 | C |
| **BSc Single Honours** Renewable Energy | F802 | AAB-BBB; IB: 34-30 | C |

For further details on all our entry requirements, please see **www.exeter.ac.uk/ug/clean-energy**

We strongly advise that you check this before attending an Open Day or making your application. Some programmes at the University require prior study of specific subjects and may also have minimum grade requirements at GCSE or equivalent, particularly in English Language and Mathematics.

## International students

If you are an international student you should consult our general and subject-specific entry requirements information for A levels and the International Baccalaureate, but the University also recognises a wide range of international qualifications. You can find further information about academic and English Language entry requirements at **www.exeter.ac.uk/ug/international**

For information on the application, decision, offer and confirmation process, please visit **www.exeter.ac.uk/ug/applications**

# ENGINEERING

90% of Engineering students in graduate level employment or further study within six months of graduating[1]

1st for overall satisfaction in General Engineering in the National Student Survey 2014[2]

5th for Engineering: General in *The Guardian University Guide 2015*

8th for Materials Technology in *The Complete University Guide 2015*

92% of research classified as world-leading or internationally excellent[3]

All specialist MEng/BEng programmes professionally accredited[4]

Opportunity for an Engineering Sports Scholarship


**STREATHAM CAMPUS, EXETER**
Website: **www.exeter.ac.uk/ug/engineering**
Email: **engineering@exeter.ac.uk**
Phone: **+44 (0)1392 724061**

**PENRYN CAMPUS, CORNWALL**
Website: **www.exeter.ac.uk/ug/mining**
Website: **www.exeter.ac.uk/ug/clean-energy**
Email: **cornwall@exeter.ac.uk**
Phone: **+44 (0)1326 371801**


Engineering challenges lie at the heart of many of the most significant problems facing society in the 21st century, ranging from responding to climate change through developing sustainable energy sources and making efficient use of scarce natural resources.

To be a successful engineer in the present fast-moving technological world you will require an education with the broadest possible interdisciplinary base. As tomorrow's engineer, you will find that your career will involve not only bringing your own specialist knowledge to a project, but also collaborating with engineers from other disciplines and the management of interdisciplinary teams.

At Exeter we offer a range of exciting, rewarding and professionally accredited specialist degrees covering the major engineering disciplines. We recognise that professional engineers often work together within multi-disciplinary teams, solving problems collectively, and this underpins how we teach. Our degrees offer professional and academic rigour within specialist engineering disciplines combined with a strong multi-disciplinary thread throughout.

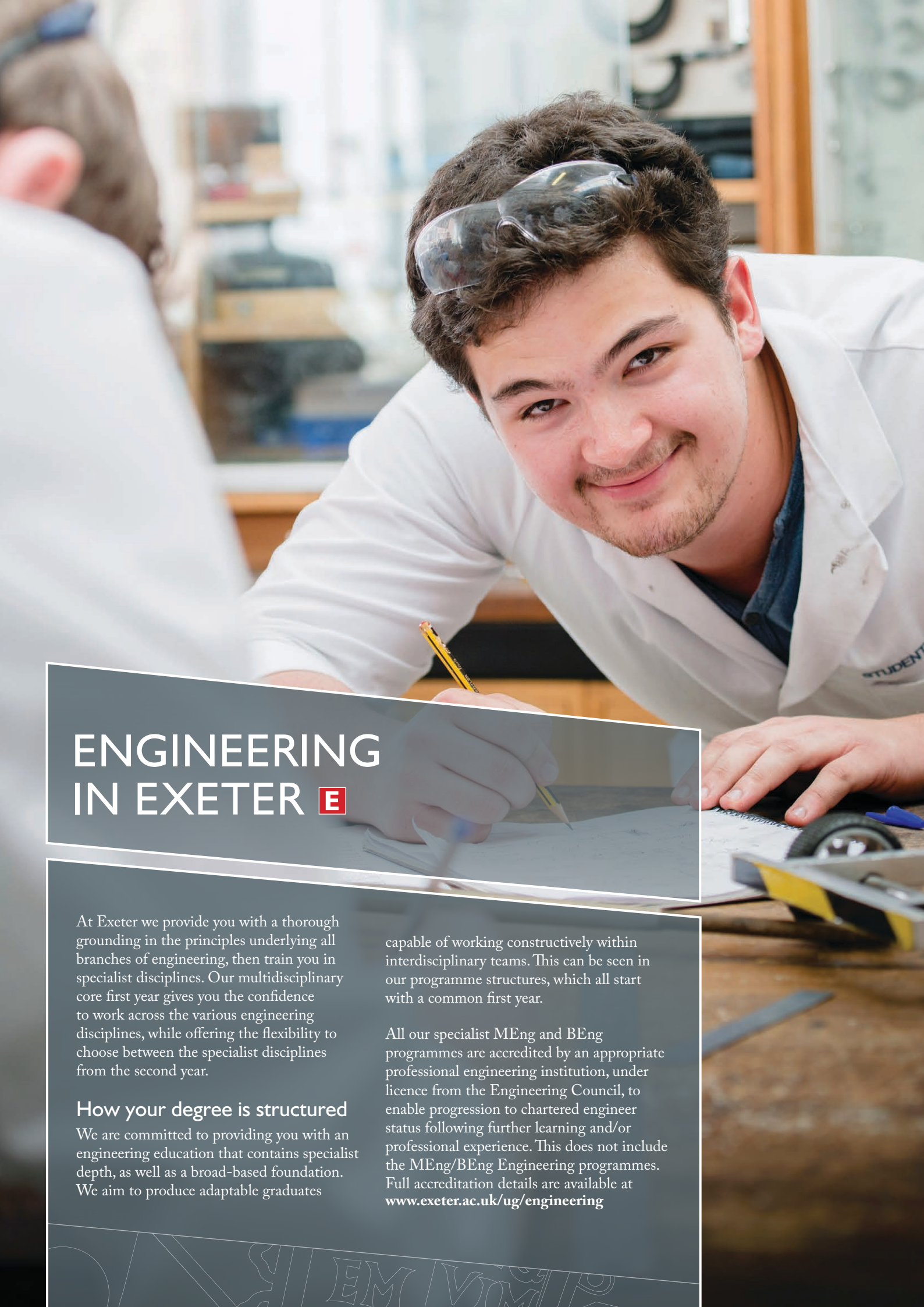
When you join us you may have had little experience of the different disciplines within engineering, so you may be uncertain which area will most inspire you. Our core first year lets you try them all, giving you the flexibility to change direction as you explore this fascinating subject. During the first year you will engage with our enthusiastic and supportive faculty across all disciplines and see for yourself how essential a multidisciplinary approach is to both a successful engineering career and ground-breaking research. In the second and subsequent years you will specialise in your chosen area of engineering, leading to a specialist degree at MEng or BEng level. Added flexibility is provided through being able to transfer between the BEng and MEng at the end of your second year, along with the opportunities to experience an industrial placement or a period of overseas study in any of our MEng programmes.

We collaborate with numerous major UK and international industrial organisations, as well as smaller companies, ensuring our programmes are relevant to the industrial and commercial imperatives of today and to the needs of the future. Our faculty undertakes research projects crossing engineering borders, collaborating with scientists from across our integrated College including physicists, mathematicians and computer scientists. This unique environment provides an inspirational learning platform, which combines with our state-of-the-art facilities and the personal support and academic guidance integral to our excellent student experience, to provide the perfect launch pad for the engineers of the future.

Athena SWAN

The Athena SWAN Charter recognises and celebrates good employment practice for women working in Science, Technology, Engineering, Mathematics and Medicine (STEMM) in higher education and research. We believe it is vitally important that women are adequately represented in what has traditionally been, and is still, a male-dominated area, and we strive for equality. Find out more at **www.exeter.ac.uk/engineering/about/swan**

[1] *Destination of Leavers from Higher Education Survey (DLHE) 2012/13 undergraduates*
[2] *based on the average percentage of positive responses across all survey categories for full service universities*
[3] *Research Excellence Framework 2014 based on the percentage of research categorised as 4* and 3*. Engineering is returned to the General Engineering Unit of Assessment*
[4] *the Meng/BEng Engineering programmes are not accredited*



# ENGINEERING IN EXETER

At Exeter we provide you with a thorough grounding in the principles underlying all branches of engineering, then train you in specialist disciplines. Our multidisciplinary core first year gives you the confidence to work across the various engineering disciplines, while offering the flexibility to choose between the specialist disciplines from the second year.

## How your degree is structured

We are committed to providing you with an engineering education that contains specialist depth, as well as a broad-based foundation. We aim to produce adaptable graduates capable of working constructively within interdisciplinary teams. This can be seen in our programme structures, which all start with a common first year.

All our specialist MEng and BEng programmes are accredited by an appropriate professional engineering institution, under licence from the Engineering Council, to enable progression to chartered engineer status following further learning and/or professional experience. This does not include the MEng/BEng Engineering programmes. Full accreditation details are available at **www.exeter.ac.uk/ug/engineering**

## Industrial experience and international study

Engineering is an international profession and many graduates will work overseas for part of their careers. One exciting option is to spend half a year during your third year at one of our partner institutions in Europe under the Erasmus exchange scheme, or spend a year further afield via international exchange agreements as a part of one of our MEng programmes.

Another option is to take an industrial placement in the vacation prior to the start of your third year (six to 10 weeks, subject to suitable arrangements). This is followed by an extended individual project during your third year, specifically designed around your industrial placement. The combined placement and project allows you to undertake paid vacation work while gaining highly relevant industrial experience. We can help support students to seek suitable employment. You can take either the international study version or the industrial experience version on our MEng programmes.

## Core first year

During your first year you will study a range of subjects fundamental to all branches of engineering, providing a broad-based introduction to the programmes on offer. We aim to give you experience of the multidisciplinary nature of engineering practice.

The core first year provides the skills and adaptability to work and communicate effectively across the spectrum of disciplines, as well as a foundation for training in a specialist branch. Half a day a week is devoted to engineering design activities where you will work in small groups in the labs and workshops. You will also take part in a Team Development Project to build a renewable electricity generator. The project is run as a competition and introduces team-working, an essential skill for engineers.

You then have the flexibility to study any of our specialist engineering disciplines at the end of your first year, while at the end of your second year you can also transfer between the BEng and MEng versions of the programmes, subject to appropriate performance.

## Civil and Environmental Engineering

Developments in the construction industry and more broadly in how we deal with various issues in urban areas and in the natural environment, are driven by the ever increasing demand for energy-efficient and sustainable use of limited resources, technological progress in other engineering disciplines, socio-economic activities and climate change. We will provide you with a broad and sufficiently specialised knowledge in a range of civil and environmental engineering subjects including geotechnics, structures, and water engineering.

The Joint Board of Moderators from four professional bodies (ICE, IStructE, IHE, and CIHT) accredit our Civil Engineering programmes.

### MEng/BEng Civil Engineering

Civil engineering is essentially about creating and managing the infrastructure and environment in which we live. As a civil engineer you will play a key role in the future prospects and health of society. Civil engineering interfaces with electrical, mechanical, chemical and managerial processes. People skills are vitally important to civil engineers, who work alongside a broad section of society in order to bring plans to fruition. Our programmes combine the science (mathematics, dynamics and materials) with personal and management skills developed through application and direct study.

**Year 1** See 'Core first year'.

**Year 2** You will start to specialise in your subject discipline but will still maintain some common engineering modules. You will have the opportunity to investigate some project ideas of your own, and at the end of the year you'll take part in a civil engineering residential field course.

**Year 3** By the third year you will have selected two key areas in which to specialise, from structural engineering, CAD, geotechnical engineering or water engineering. You will carry out an individual project under the supervision of a member of academic staff with expertise in your chosen area.

**Year 4 (MEng only)** In your final year you will specialise even more, thereby strengthening your understanding of either civil, structural, geotechnical, water or environmental engineering. You will work on a major interdisciplinary group project which will further develop your engineering and project management skills.

### MEng Civil and Environmental Engineering

Water-related problems and various other environmental issues are increasingly becoming key challenges at local and national levels as well as globally. There is now the need for engineers with specialised knowledge in civil and environmental engineering who are able to work efficiently in multidisciplinary teams. This programme offers highly professional training in civil engineering with special relevance to environmental engineering. By linking our expertise in civil engineering, water systems and climate systems, we offer an exciting and highly relevant programme that will prepare you for work in civil and environmental engineering.

**Year 1** See 'Core first year'.

**Year 2** From the second year onwards the core and optional modules start to take a more specialised pathway with a focus on civil engineering and its applications to large scale water systems and the impact of climate change.

**Year 3** The latter part of the programme puts special emphasis on working in a world where a changing climate has great impacts on planning, design, construction and operation of civil engineering projects. For example, changing rainfall patterns will bring significant new challenges to the design and maintenance of urban water supplies around the globe. You will carry out a substantial individual project with an environmental theme, as well as study important aspects of civil engineering.

**Year 4** You'll undertake a substantial interdisciplinary group project, industrial case studies and study advanced aspects of civil and environmental engineering such as urban drainage design, water management and hydroinformatics.

## Electronic Engineering

Electronics shape our world – from mobile phones to hybrid cars, medical instrumentation, renewable energy devices, aerospace systems and a host of other technologies essential to our everyday life and future well-being. Our degrees equip you with the skills and knowledge not only to understand the fundamentals of modern-day electronic and computer technology, but more importantly to help design, install and operate future technologies in a rewarding and interesting professional career.

Our Electronic Engineering programmes are accredited by the IET.

### MEng/BEng Electronic Engineering

There have been remarkable advances in electronics over recent years and electronic engineers are at the forefront of this fast-moving world. They work at the cutting-edge of the electronics industry and so their expertise is in great demand. A professional electronic engineer can have an exciting and diverse career designing and manufacturing new technological developments in electronics, computer engineering, communications systems and control engineering in all branches of industry.

Our programmes emphasise the need for technical competence combined with flexibility of mind. They recognise the fact that modern professional engineers need to be multi-skilled and familiar with concepts and techniques from other related areas of study.

**Year 1** See 'Core first year'.

**Year 2** You will start to specialise in your programme area while still maintaining some common modules with the Mechanical Engineering and Engineering and Management programmes. You will have the opportunity to investigate some project ideas of your own and work on an analogue or digital design for your case study. You will learn about how modern communication networks function and understand the principles of electronic design in cars and aeroplanes.

**Year 3** By year three, you will have narrowed down your specialisms to two of the following areas: communications engineering, electromagnetics, CAD and consumer electronics engineering. You will carry out an individual project under the supervision of a member of academic staff with expertise in your chosen area.

**Year 4 (MEng only)** In your final year you will specialise further, strengthening your understanding in either computer electronics, consumer electronics, software systems or operational systems engineering. You will work on a major group project which will further develop your engineering and project management skills.

### MEng/BEng Electronic Engineering and Computer Science

Electronic engineering and computer science are both concerned with enhancing our experience of the world and shaping the convenience of our future in terms of solving problems and developing products and systems which will increase the accuracy, speed and quality of information sources and technology. These disciplines are closely linked and specifically interweave in the manufacture of equipment such as pocket computer products like mobile phones or e-books.

Electronic engineering and computer science provides an in-depth training in both the hardware and software aspects of modern electronic systems and computers, from the fundamentals of electronics and microprocessors and manufacturing for electronic systems, to object-oriented programming and artificial intelligence and engineering management.

**Year 1** See 'Core first year'.

**Year 2** From this point on you begin to specialise in electronics and computer science modules giving you the freedom to choose your own degree path. This allows you to research and further your knowledge in particular interest areas such as software engineering or machine learning.

**Year 3** Further specialisation allows you to choose modules that offer advanced courses in a wide range of topics. Industry-linked projects also take place and work placement opportunities such as the *Commercial and Industrial Experience* module are recommended. This variety of learning gives you advanced knowledge, practical work experience and the confidence to conduct individual research, applying your expertise to solve real engineering problems and find computing solutions.

**Year 4 (MEng only)** The final year of study for MEng students offers a wide range of advanced modules. Many of these offer advanced practical project work with modules such as *Industrial Case Studies* giving you the opportunity to visit companies as well as learning hands-on skills from top-class manufacturing experts, such as Alcoa Howmet, Hymid Ltd, Jaguar/Land Rover, and BD Diagnostics.

## Engineering and Management

The commercial exploitation of technology in fields from energy to mobile communications or from aerospace systems and biomedical instruments to Formula 1 racing cars depends on professional engineering managers. As leaders of the engineering profession, engineering managers direct the development of new and profitable technology businesses and shape the future of industry. Our Engineering and Management programme combines our leading edge Mechanical or Electronic Engineering degree with the enhanced theory and practice in engineering management that enables our graduates to take a fast track to a management career in the most successful and dynamic enterprises.

Our Engineering and Management (Electronic) programmes are accredited by the IET and the Engineering and Management (Mechanical) programmes by the IMechE.

### MEng/BEng Engineering and Management

These degree programmes combine technical engineering training with management and are designed for those who will become managers in a wide range of careers such as manufacturing or technical service industries, for example transport, communication, environment or leisure; general managers who need a background in engineering; or management consultants or accountants who require further specialised training.

You will benefit from a series of visits to manufacturing and service industry companies and industry case studies. These act as an integrating medium, challenging you to apply your academic knowledge in solving practical problems. In addition, the final-year group project takes the form of an industrial systems analysis and is usually run in close collaboration with a company.

**Year 1** See 'Core first year'.

**Year 2** After the common first year, you will begin to specialise in your programme area while still maintaining some common modules with mechanical engineering and electronic engineering. You will

have the opportunity to investigate some project ideas of your own and work on the management aspects of designing a product or a project. You will learn about how modern manufacturing systems work while maintaining a broad view of electronics design, civil engineering project methods and control engineering.

**Year 3** By year three, you will have narrowed down your specialisms to two of the following areas: mechanical engineering, manufacturing engineering or electronics engineering. You will have a broad choice of subjects within these disciplines and will carry out an individual project under the supervision of a member of academic staff with expertise in your chosen area.

**Year 4 (MEng only)** You will specialise further and work on a major group project which will further develop your engineering and project management skills.

## Mechanical and Materials Engineering

The Mechanical Engineering and Materials Engineering programmes offer a stimulating mixture of theoretical study and hands-on practical work, all informed by recent advances in the engineering industry. You'll study topics such as fluid dynamics, mechanics of solids and structures, and dynamics, all of which are relevant to a wide range of industries including aerospace, renewable energy, automotive, marine and many others.

The Mechanical programmes are accredited by the Institution of Mechanical Engineers and the Materials programmes by the Institute of Materials, Minerals and Mining.

### MEng/BEng Mechanical Engineering

Mechanical engineering is a challenging and exciting subject that affects nearly all aspects of our lives. Topics covered include materials, manufacturing, aerodynamics and thermodynamics. However, a great deal of emphasis is also placed on essential transferable skills such as communication, teamwork, information technology and computer skills.

These programmes are suitable for those who wish to pursue careers as professional engineers employed by industry or research laboratories requiring electro/mechanical engineering or manufacturing engineering expertise. The programmes are also well suited for those who aim to become managers in industry and commerce and wish to start with a sound background in modern engineering.

**Year 1** See 'Core first year'.

**Year 2** You will start to specialise in mechanical engineering while still maintaining some common modules with civil engineering and materials engineering. You will have the opportunity to investigate some project ideas of your own and work on the appropriate structural forms and stress analysis methods in your chosen case study. You will learn about what it takes to design, manufacture and test a device and product in a competitive environment.

**Year 3** You will focus your study on the complementary areas of thermofluids, manufacturing and computational engineering. You will learn about ways to model fluid flows and compute the energy efficiencies of designs and processes, theoretical and numerical approaches in analysing mechanical systems and also the use of software such as finite element packages.

**Year 4 (MEng only)** In your final year you will specialise further, thereby strengthening your understanding of state-of-the-art designs in computer aided engineering, stress analysis and simulation models. You will work on a major group project which will further develop your engineering and project management skills.

### MEng/BEng Materials Engineering

Materials engineering is a discipline at the interface between materials science and engineering. It involves not only the understanding of materials and their properties, their internal microstructure or the particular manufacturing processes used in their production, but also how to use these in the design of real world applications. All branches of engineering rely on solid materials to carry mechanical or electrical loads, but materials engineering explores in much greater depth the link between what we can make materials do and how to use them in the design of new technologies.

Many of the most exciting current developments in the technological world are in materials engineering, such as nanotechnology, artificial replacement organs and tissues, and smart composites for aerospace applications. These and other topics are covered in these programmes including manufacturing, CAD/CAM, elasticity and solid mechanics. These programmes would suit those who aim to work in any technology field or in a management role in related industries.

**Year 1** See 'Core first year'.

**Year 2** You will start to specialise in materials engineering while still maintaining some common modules with mechanical engineering. You will have the opportunity to investigate some project ideas of your own and will learn about what it takes to design, manufacture and test a device and product in a competitive environment.

**Year 3** In year three you will focus on materials engineering and computational engineering which are complementary to each other. You will learn ways to calculate the failure mode of materials, theoretical and numerical approaches in analysing mechanical systems and also the use of software packages to design products.

**Year 4 (MEng only)** In your final year you will specialise further, thereby strengthening your understanding of state-of-the-art designs in materials engineering and stress analysis. You will work on a major group project which will further develop your engineering and project management skills.

## General Engineering

### MEng/BEng Engineering

These programmes are general in that you may choose to study modules across any of the disciplines, allowing for timetable constraints. These programmes are not accredited by any of the engineering institutions and are primarily intended for those students who are undecided as to which discipline to study and wish to keep their options open for the first year. Normally students on the MEng/BEng Engineering degrees change to one of the accredited, specialist discipline programmes at the end of the first year, though it is possible to continue on these general programmes beyond the first year.

# LEARNING AND TEACHING

Engineering at Exeter combines a breadth of academic expertise with a caring and supportive learning environment. Our programmes make use of a variety of teaching styles with contact hours ranging from 25-32 hours each week (depending on year of programme) including:

- ☐ **lectures** for the presentation of new topics and class exercises;
- ☐ **workshops** where you have hands-on use of equipment, discussion and solution of sample problems, with experts available to answer questions and provide support;
- ☐ **tutorials** involving small group work on problems relating to topics covered in lectures;
- ☐ **projects** of longer term practical work undertaken either individually or in teams, with sessions for consultation with staff;
- ☐ **Engineering Design Activities (EDAs)** which provide direct experience of putting engineering design into practice while learning the underpinning principles and mathematical skills in other modules.

The single most important aspect of teaching is face-to-face sessions with members of staff, which take place in all of these formats, usually to discuss material in more detail.

All members of staff deal with questions on an individual basis and it is easy to fix appointments with staff via email or during their advertised office hours.

We're actively engaged in introducing new methods of learning and teaching, including increasing use of interactive computer-based approaches to learning through our virtual learning environment, where the details of all modules are stored in an easily navigable website. Students can access detailed information about modules and learning outcomes and interact through activities such as the discussion forums.

## Research-inspired teaching

We believe every student benefits from being part of a culture that is inspired by research and being taught by experts – you will discuss the very latest ideas in seminars and tutorials and become actively involved in research yourself.

All our academic staff are active in internationally-recognised scientific research across a wide range of topics. As a research-led department, there are always numerous research projects in progress, funded by industry, charities, government departments and research councils.

Within Engineering, research is organised into institutes which include the Advanced Technology Research Institute and the Informatics Research Institute. This research provides the background for the evolution of the material taught on our degree programmes as well as providing opportunities for exciting project work. The department is also home to X-AT (Exeter Advanced Technologies), XMEC (Exeter Manufacturing Enterprise Centre) and research groups such as the Centre for Water Systems. Undergraduate students benefit from these centres through access to up-to-date equipment, industrially linked projects, and staff expertise.

Student projects undertaken in the third and fourth years are often linked to our research activities and may involve working with industrial partners. Recent projects have involved the design and construction of an autonomous hovering platform, modelling of airflow around a car and 3D CAD representation of the Met Office headquarters in Exeter, which has close research links with the College of Engineering, Mathematics and Physical Sciences.

You can find out much more about our research on our website at **www.exeter.ac.uk/ug/engineering**

My study abroad took me to the University of Stuttgart, the heart of automotive engineering in Germany. There, I completed two projects: a thesis on flame simulation and a report on nuclear power – which allowed me to tour around a nuclear facility! I thoroughly enjoyed my time; gaining a plethora of skills highly relevant to not only my engineering degree but in language and in the challenge of living abroad. I would highly recommend it to anyone seeking adventure.

John Pardy, MEng Mechanical Engineering

## Facilities

We have benefited from a £3 million investment in academic and social facilities. This includes completely refitted lecture theatres and teaching spaces, and a major expansion and upgrade of our undergraduate computer facilities and social space.

As a student you'll benefit from teaching laboratories covering most areas of mechanical, materials, electronic and civil engineering. You will also be supported in your studies by a team of highly trained technical staff. We use two main workshops, electrical and mechanical, which provide extensive facilities to cover all areas of teaching and manufacture in the engineering disciplines.

Within Engineering we make use of a range of computer rooms and modern, purpose-built, lecture facilities fitted with state-of-the-art audio-visual equipment. All of our computing facilities are updated regularly and operate under Windows or Linux and run current versions of all applicable engineering software including Solid Works and Auto CAD, Matlab and Abaqus.

The department and IT Services provide a helpdesk facility and a laptop surgery to help you with any difficulties and provide access to manuals and technical publications. Remote access to computing laboratories is available 24 hours a day, seven days a week, and most University accommodation has broadband access from your room. We also have wireless access throughout the building.

Our learning resource area is a flexible learning space which holds a selection of materials and includes group meeting rooms. This area is specifically for student use and offers space and facilities for individual and group working.

# CAREERS

An Engineering degree from Exeter is highly valued by employers. Our Employability Officer is active in developing aspects of our programmes and services that improve your employability. We also have a dedicated Careers Consultant who provides specific services such as careers workshops and support in matters such as applications and job interview skills. The Career Zone runs several careers fairs throughout the year and these have been particularly successful in putting major UK employers in touch with Exeter students.

We have many links to regional and national industry and student projects are usually industrially driven, often directly involving these companies. This provides an opportunity for you to undertake commercially important projects at the forefront of technology and enhance your employability. Relevant employers also visit the department to help students develop their career ideas at an early enough stage to help with module choices and placement decisions.

We provide skills development sessions in your first two years that include an induction week in the first year and a number of career related training sessions in your second year.

Many of our students take part in the Exeter Award and the Exeter Leaders Award. These schemes encourage you to participate in employability-related workshops, skills events, volunteering and employment which will contribute to your career decision-making skills and success in the employment market.

All of this means that Exeter has an excellent reputation with graduate recruiters and a strong employment record. Career opportunities for engineers are almost limitless, as engineers can be found working in the public sector, in health, communications, education, construction, defence, finance, and manufacturing. Engineers have a reputation as being articulate, numerate, problem solvers, who typically claim great job satisfaction, a good salary and a huge range of career possibilities.

Further details on the destinations of our graduates can be found at **www.exeter.ac.uk/ug/careers**

## Prerequisite for chartered status

Our specialist engineering degrees are accredited by Professional Engineering Institutions under licence from the UK regulator, the Engineering Council.

Accreditation is a mark of assurance that the degrees meet the standards set by the Engineering Council in the UK Standard for Professional Engineering Competence (UK-SPEC). An accredited degree will provide you with some or all of the underpinning knowledge, understanding and skills for eventual registration as an Incorporated (IEng) or Chartered Engineer (CEng). Some employers recruit preferentially from accredited degrees, and an accredited degree is likely to be recognised by other countries that are signatories to international accords.

## Examples of the destinations of our recent graduates:

### Occupations

Production Engineer // Graduate Civil Engineer // Systems Engineer // Design Engineer // Business Systems Improvement Manager // Railway Signalling Design Engineer // Science Teacher // Research Assistant // Structures Examiner

### Employers

National Instruments // Thales // Mott Macdonald // Jaguar/Land Rover // Cobham // AECOM // Dyson // Balfour Beatty

A number of our Engineering graduates choose to stay on at Exeter to continue their studies with us whilst others go further afield. A variety of subjects are studied from Masters level and PhDs in various specialist Engineering and associated fields through to professional qualifications such as teaching.

# MODULES IN EXETER E

KEY C = Core
● = Optional

For up-to-date details of all our programmes and modules, please check **www.exeter.ac.uk/ug/engineering**
Years 2-4 are indicative and the actual modules offered may vary from year to year. A selection is detailed below.

## Year 1 Modules

| Module Name | Civil Engineering | Civil and Environmental Engineering | Electronic Engineering | Electronic Engineering and Computer Science | Engineering and Management | Materials Engineering | Mechanical Engineering |
|---|---|---|---|---|---|---|---|
| Core Engineering 1 | C | C | C | C | C | C | C |
| Electronics for Engineers: Core Engineering 2 | C | C | C | C | C | C | C |
| Engineering Mathematics B | C | C | C | C | C | C | C |
| Engineering Mechanics: Core Engineering 2 | C | C | C | | C | C | C |
| Materials and Manufacturing: Core Engineering 2 | C | C | C | | C | C | C |
| Object-Oriented Programming | | | | C | | | |
| Professional Studies and Skills Development 1 | C | C | C | C | C | C | C |
| Programming for Science | | | | C | | | |

## Year 2 Modules

| Module Name | Civil Engineering | Civil and Environmental Engineering | Electronic Engineering | Electronic Engineering and Computer Science | Engineering and Management | Materials Engineering | Mechanical Engineering |
|---|---|---|---|---|---|---|---|
| Analogue and Digital Electronics Design | | | C | C | ● | | |
| Communication and Networking Technologies | | | C | C | | | |
| Construction Methods and Materials | C | C | | | | | |
| Control Engineering | | | C | ● | C | | C |
| Database Theory and Design | | | | C | | | |
| Geotechnics 1 | C | C | | | | | |
| Introduction to Mechanical Engineering Design | | | | | ● | C | C |
| Management and Management Science | C | C | C | ● | C | C | C |
| Manufacturing Systems | | | | | C | | |
| Materials Engineering | | | | | | C | |
| Mathematical Modelling of Engineering Systems | C | C | C | C | C | | C |
| Modelling and Control Engineering | | | | | | C | |
| PICS, Microcontrollers and Microprocessors | | | C | C | ● | | |
| Professional Studies and Skills Development 2 | C | C | C | | C | C | C |
| Programming for the Web | | | | ● | | | |
| Scientific Programming in C | | | C | | ● | | |
| Social and Professional Issues of the Information Age | | | | ● | | | |
| Software Development | | | | C | | | |
| Software Engineering | | | | C | | | |
| Solid Mechanics | C | C | | | ● | C | C |
| Structures | C | C | | | | C | C |
| The C Family, The History and Applications of C, Objective C, C++ and C# | | | | ● | | | |
| Thermofluid Engineering | C | C | | | ● | C | C |

# MODULES IN EXETER CONTINUED

## Year 3 Modules

| Module Name | Civil Engineering | Civil and Environmental Engineering | Electronic Engineering | Electronic Engineering and Computer Science | Engineering and Management | Materials Engineering | Mechanical Engineering |
|---|---|---|---|---|---|---|---|
| Civil Engineering Design Studies | C | ● | | | | | |
| Civil Engineering Hydraulics | C | C | | | | | |
| Commercial and Industrial Experience | ● | ● | ● | ● | ● | ● | ● |
| Communications Engineering | | | C | ● | | | |
| Computational Engineering | | | | | ● | ● | C |
| Computer Aided Engineering Drawing | ● | ● | ● | ● | ● | ● | ● |
| Cryptography | | | | | ● | | |
| Digital Signal Processing | | | C | ● | ● | | |
| Electromagnetics and Wave Propagation | | | C | ● | ● | | |
| Electronic Engineering Design Studies | | | C | ● | ● | | |
| Engineering in Society and Company Finance | C | C | C | ● | C | C | C |
| Enterprise Computing | | | | ● | | | |
| Fluid Dynamics | ● | ● | | | ● | ● | ● |
| Foreign Language Module | ● | ● | ● | ● | ● | ● | ● |
| Geotechnics 2 | C | C | | | | | |
| Graphs, Networks and Algorithms | ● | ● | | | ● | ● | ● |
| Individual Project | C | C | C | C | C | C | C |

| Module Name | Civil Engineering | Civil and Environmental Engineering | Electronic Engineering | Electronic Engineering and Computer Science | Engineering and Management | Materials Engineering | Mechanical Engineering |
|---|---|---|---|---|---|---|---|
| Learning from Data | | | | ● | | | |
| Management of Processes and People | | | | | C | | |
| Management of Product Development | | | | | C | | ● |
| Manufacturing | | | | | ● | C | ● |
| Materials | | | | | ● | C | ● |
| Mathematical Biology and Ecology | | | | | | | |
| Mechanical Engineering Design Studies | | | | | ● | C | C |
| Nature-Inspired Computation | | | | ● | | | |
| Nonlinear Systems and Control | | | | | ● | ● | ● |
| Numerics and Optimisation | ● | ● | ● | ● | ● | ● | ● |
| Operations Management | | | | | ● | | ● |
| Programming for the Web | | | | ● | | | |
| Statistics | ● | ● | | | ● | ● | ● |
| Structural Engineering | C | C | | | | | |
| Systems, Series and Transforms | ● | ● | ● | ● | ● | ● | ● |
| Thermofluids and Energy Conversion | | | | | | C | C |
| Water Resources and Pollution Control | ● | C | | | | | |

## Year 4 Modules (MEng only)

| Module Name | Civil Engineering | Civil and Environmental Engineering | Electronic Engineering | Electronic Engineering and Computer Science | Engineering and Management | Materials Engineering | Mechanical Engineering |
|---|---|---|---|---|---|---|---|
| Advanced Computational Fluid Dynamics | | | | | | ● | ● |
| Advanced Geotechnical Engineering | ● | ● | | | | | |
| Advanced Materials Engineering | | | | | | ● | ● |
| Advanced Structural Engineering | ● | ● | | | | | |
| Agile, Lean and Competitive Enterprise | | | | | ● | | |
| Computation and Numerical Analysis | | | | ● | | | |
| Data Storage and Memory Technologies | | | ● | ● | | | |
| Group Project | C | C | C | C | C | C | C |
| Hydroinformatics Tools | | ● | | | | | |
| Industrial Case Studies | C | C | C | C | C | C | C |
| ITMB Case Studies | | | | ● | | | |
| Innovative Antiseismic Technologies | ● | ● | | | | | |
| Intelligent Image Understanding | | | ● | ● | | | |
| Machine Learning and Optimisation | | | | ● | | | |
| Managing IT Projects | | | | ● | | | |

| Module Name | Civil Engineering | Civil and Environmental Engineering | Electronic Engineering | Electronic Engineering and Computer Science | Engineering and Management | Materials Engineering | Mechanical Engineering |
|---|---|---|---|---|---|---|---|
| Manufacturing Supply Chain Management | | | | | ● | | |
| Mechanics of Materials | ● | ● | | | | ● | ● |
| Mechatronics: Sensors and Machine Automation | | | ● | ● | | | ● |
| Multivariable State-Space Control | | | ● | ● | ● | | ● |
| Nature-Inspired Computation | | | ● | ● | | | |
| Networks, Data and Information | | | ● | | | | |
| New Developments in Materials Engineering | | | | | ● | ● | ● |
| Nonlinear Systems and Control | | | ● | | | | |
| Operational Research and Industrial Systems Modelling | | | ● | ● | ● | | |
| Pattern Recognition | | | ● | ● | | | |
| Signal Analysis and Image Processing | | | ● | ● | | | |
| Software Development for Business | | | ● | | | | |
| Urban Drainage and Waste Water Management | | ● | | | | | |
| Water and Environmental Systems | ● | ● | | | | | |
| Water Supply and Distribution Management | | ● | | | | | |

# MODULES IN EXETER CONTINUED

## Year 1

| | |
|---|---|
| **Core Engineering 1** | Introduces the fundamental concepts of materials, structures, mechanics and electronics, providing a foundation for further study in these areas. |
| **Electronics for Engineers: Core Engineering 2** | Introduces fundamental concepts of electronics, electronics terminology and devices and elementary circuits. You will explore the concept of logic systems and their implementation using electronic devices. |
| **Engineering Mathematics B** | Covers topics which are fundamental to engineers in their professional careers, placing an emphasis on the direct application of mathematics to engineering problems. |
| **Engineering Mechanics: Core Engineering 2** | Introduces the fundamental concepts of solid mechanics and fluid mechanics. |
| **Materials and Manufacturing: Core Engineering 2** | Through this module you will develop an awareness of principal engineering materials, their fabrication and technical and economic considerations. |
| **Object-Oriented Programming** | This module will introduce you to object-oriented problem-solving methods and provide you with object-oriented techniques for the analysis, design and implementation of solutions. |
| **Professional Studies and Skills Development 1** | Develops a range of transferable professional and personal skills that are essential to successful undergraduate study at university and in future employment. |
| **Programming for Science** | Provides an introductory course in computer programming and introduces the fundamental concepts of computer algorithms and programming with a strong emphasis on practical implementation. |

## Year 2

| | |
|---|---|
| **Analogue and Digital Electronics Design** | Encourages you to build on your basic knowledge of electronic devices and components to specify and construct practical digital and analogue electronic designs. |
| **Communication and Networking Technologies** | Provides an in-depth introduction to the fundamental principles underlying modern communication and network technologies and their applications. |
| **Construction Methods and Materials** | Explores the design process in civil engineering and introduces procedures for systematic design. |
| **Control Engineering** | Control Engineering is about making complex systems, such as cars and aeroplanes, behave in a desirable manner without complete manual control. This module considers the basic concepts of dynamics, feedback and stability and introduces the supporting computational techniques. |
| **Geotechnics 1** | Introduces the basic concepts of engineering geology, site investigation procedures and the principles of geotechnical engineering. |
| **Introduction to Mechanical Engineering Design** | Establishes a foundation for advanced mechanical design orientated projects and modules. The module culminates in the design, manufacture and testing of a device in a competitive environment. |
| **Management and Management Science** | Explores the economic environment, the tasks carried out and elementary tools used by engineering managers. The knowledge gained on this module will be useful for modules in subsequent years, especially in quantitative business analysis. |
| **Manufacturing Systems** | Provides an understanding of modern manufacturing systems and their design and management. |

| | |
|---|---|
| **Materials Engineering** | Develops your understanding of material properties, how they arise from internal microstructure and how they can be manipulated for specific applications. It will also introduce rapidly advancing topics in materials. |
| **Mathematical Modelling of Engineering Systems** | Explores standard methods of systems analysis using transform methods in both continuous and discrete variable form. Mathematical modelling of systems lies at the heart of engineering and allows us to predict how systems behave and thus design them properly and safely. |
| **Modelling and Control Engineering** | Introduces mathematical models of engineering systems, standard methods of systems analysis using transform methods in both continuous and discrete variable form. |
| **PICS, Microcontrollers and Microprocessors** | Introduces the fundamental principles of the design, operation and application of PICS, microcontrollers and microprocessors. You will also be introduced to assembly language programming for the Microchip PIC16MCU series devices. |
| **Professional Studies and Skills Development 2** | Enables you to develop a wide range of transferable skills as well as the practical design skills essential to all engineers. Engineering Design Activities provide useful experience of project team working, real engineering design, practical construction skills, self-organisation and report writing. |
| **Social and Professional Issues of the Information Age** | Introduces you to the law regulating the use of computers; encourages your awareness and critical thinking regarding the social impact of information technology and AI; and helps you relate professional IT/Computing Societies' Codes of conduct to ethical theory. |
| **Software Development** | The module will introduce you to software design and development concepts and methods, alongside intermediate and advanced constructs and concepts in the Java programming language, and the programming paradigms these relate to. |
| **Software Engineering** | This module will introduce you to those aspects of software engineering that relate to the requirements analysis and production of large systems by the application of object-orientated programming techniques to a large and complex project in a team-working environment. |
| **Solid Mechanics** | Shows you how to calculate the stresses and strains within a static or dynamic object, as well as giving you a thorough understanding of how these tensions arise. In addition to this you'll gain a sound knowledge of Finite Element software which is used by engineers to find these results. |
| **Structures** | Develops a deeper understanding of the mechanical behaviour of structures and their application to engineering design. |
| **Thermofluid Engineering** | Introduces the theory, principles and practice of engineering fluid mechanics, thermodynamics and heat transfer. Many things mankind does involve moving fluids or heat around; eg, engines and heat exchangers, turbines and pumps; or is influenced by fluid dynamics, such as cars, aircraft, dams and weirs. |

## Year 3

| | |
|---|---|
| **Civil Engineering Design Studies** | In this module you will explore the civil engineering profession and construction industry processes while enhancing your design experience. |
| **Civil Engineering Hydraulics** | Familiarises you with the essential topics in hydraulics for any civil engineering graduate. You will develop the ability to analyse and modify existing hydraulic systems and to design new systems. |
| **Commercial and Industrial Experience** | Provides practical work experience in a business or commercial setting that is of direct relevance to your degree programme. Individual placements are subject to availability and to approval by the relevant Programme Coordinator. |
| **Communications Engineering** | Develops the subject-specific knowledge, understanding and skills required to design and analyse modern-day communication systems. |
| **Computational Engineering** | This module introduces you to numerical design approaches currently used in industry to analyse systems. Computational engineering covers the numerical methods and algorithyms used to analyse and solve problems in everything from aircraft, cars and racing cars to blood flow. |
| **Computer Aided Engineering Drawing** | You will investigate the use of three-dimensional Computer Aided Engineering (CAE) Design tools for a variety of engineering applications; and gain an understanding of the mathematical principles underlying the CAE Design software and its limitations. |
| **Digital Signal Processing** | Considers the fundamental principles of digital signal processing, from both theoretical and practical viewpoints. You will design digital signal processing systems for a range of important application areas. |
| **Electromagnetics and Wave Propagation** | Introduces the fundamental principles of electromagnetics and applies theory to areas of technological importance including field computation and communication systems. |
| **Electronic Engineering Design Studies** | Within this module you will relate technical subjects studied in your degree to examples of their application in electronic products or services, in particular, the design criteria of a CD/DVD system. |
| **Water Supply and Distribution Management** | Provides a basic knowledge of classical and contemporary problems in management of water supply and distribution systems for the practising engineer. |
| **Engineering in Society and Company Finance** | As a professional engineer you will have responsibilities to society and this module aims to raise your awareness of these. It will equip you with a working understanding of non-technical issues such as social responsibility, health and safety, sustainability, product liability and intellectual property. |

# MODULES IN EXETER CONTINUED

| | |
|---|---|
| **Fluid Dynamics** | This module deals with the flow of incompressible fluids with both viscosity and inertia. Topics include some exact solutions of the Navier-Stokes equation, Stokes flow, and the derivation of the Reynolds equation for turbulent flows. |
| **Geotechnics 2** | Introduces the basic concepts of engineering geology, ground investigation procedures and the basic principles of foundation design. |
| **Graphs, Networks and Algorithms** | An introduction is given to the theory of graphs and the applications of graphs and networks to applied problems. The aim is to present the central results of modern graph theory together with the algorithms that are used to solve network optimisation problems. |
| **Individual Project** | You'll apply the knowledge and skills obtained from taught modules to a real engineering problem at a professional level and integrate knowledge gained in several areas of the degree programme. The project encourages the use of initiative, imagination and creativity and allows study in greater depth. Depending on your degree you will undertake this in Exeter, or linked with an industrial summer project (with Industrial Placement degree) or at one of our European or International Partner universities (with International Study degree). |
| **Management of Processes and People** | Introduces the organisation structure, management hierarchy and business motivation of an engineering company and its workforce from a perspective of total quality management. |
| **Management of Product Development** | Introduces the new product development process and a range of concepts and techniques for managing the process. |
| **Manufacturing** | Provides examples of current practices in advanced manufacturing, concentrating on the technical issues and applications of the technologies, and considers the interrelationship between materials, applications and manufacturing technologies. |
| **Materials** | Builds on the materials science content of the core first year and equips you with a deeper understanding of the deformation, strengthening and failure of materials. |
| **Mathematical Biology and Ecology** | This module will give you the opportunity to learn how mathematics may be applied to the biosciences in order to quantify population. |
| **Mechanical Engineering Design Studies** | You will gain experience of the practical aspects of basic mechanical engineering design, drawing on the theory taught in previous modules, plus invaluable experience of working in a design team. |
| **Nonlinear Systems and Control** | On this module, you will find out how the need to choose suitable Lyapunov functions or stabilising feedbacks lends itself for developing creative mathematical processes and intuition. |
| **Operations Management** | Introduces a core operations management task and highlights the key issues involved. You will discuss the central tasks of managing functions in operations, including the tools and techniques for improving the operations function. |
| **Statistics** | Lays the foundations for a thorough understanding of modern statistical theory and practice as well as how statistics are used today in important fields such as climate, sport, health and law. |
| **Structural Engineering** | A good knowledge of structural design and analysis are essential elements of the training of civil engineers. You will cover methods of analysis for both linear elastic and plastic modes of behaviour and gain an understanding of how these methods are applied to real structures. |
| **Systems, Series and Transforms** | This module will uncover the amazing and beautiful mathematics that underpins the miniaturised digital revolution of the last couple of decades. |
| **Thermofluids and Energy Conversion** | Examines the details of external flow, in particular boundary layers and flow around bluff bodies, together with the principles and engineering of all types of engines and power generation systems, eg, wind turbines and solar panels. |
| **Water Resources and Pollution Control** | Introduces the water cycle, flow and quality on natural systems, showing how the hydrologic system can be protected by proper design and how sustainable drainage designs can be achieved. |

## Year 4 (MEng only)

| | |
|---|---|
| **Advanced Computational Fluid Dynamics** | This module builds on previous CFD study, to offer an introduction to the use of the open source CFD code OpenFOAM, and also the commercial package ANSYS Workbench and the commercial mesher Pointwise. |
| **Advanced Geotechnical Engineering** | Introduces advanced concepts of geotechnical engineering including models in soil mechanics, elastoplastic constitutive models for soils, critical state theory, stress paths and soil tests and applications of elastoplastic models in geotechnical engineering. |
| **Advanced Materials Engineering** | Extends the understanding of materials gained in previous modules in the context of modern technology via exposure to current developments in biomaterials, materials for energy, and nano-composites. |
| **Advanced Computational Fluid Dynamics** | Extends the practical understanding of CFD packages developed in earlier modules and complements this with an understanding of numerical and modelling issues. |
| **Advanced Structural Engineering** | Extends your understanding of structural behaviour by studying new advanced concepts in the context of design and assessment of structures. |
| **Agile, Lean and Competitive Enterprise** | Lean production concerns the creation of quality products, expending less human energy and using less equipment, time and space. Agile manufacturing, meanwhile, relates to bringing new products into changing markets and the ability to be innovative and to thrive in a changing environment. |

| | |
|---|---|
| **Data Storage and Memory Technologies** | This module prepares you for work in this area by providing appropriate grounding in magnetic, optical and electronic memory systems and devices. It will introduce you to novel and emerging memory technologies, and develop your appreciation of the future demands, physical limits and challenges facing the data storage industry. |
| **Group Project** | The group project requires you to work together in a group of between six and eight students and undertake a significant technical challenge. All projects are supervised by academic members of staff and are normally run in conjunction with a collaborating industrial company. Recent examples have included our Formula Student team, our project work on 3-D printing, analysing the impact of climate change on building design, and investigating biologically inspired materials (seashells project). |
| **Hydroinformatics Tools** | Provides a basic understanding of tools in the emerging field of hydroinformatics for the practising engineer. You will gain practical experience in using these tools within the urban water management context. |
| **Industrial Case Studies** | Broadens your understanding of the operations and management of a variety of industrial organisations and provides you with a greater degree of industrial awareness than would be gained from a purely theoretical lecture programme. |
| **Innovative Antiseismic Technologies** | Develops your understanding of the principles and practices of earthquake engineering within structural engineering. You will appreciate the advantages of using antiseismic protections and have an insight into the new technology for monitoring and control. |
| **Intelligent Image Understanding** | This module presents some of the techniques used for analysing objects presented on images and how they are matched, recognised, identified and classified. |
| **Manufacturing Supply Chain Management** | This module looks at the different aspects of the tools and techniques employed within supply chain management, including forecasting, planning, inventory and distribution, together with the strategic and management aspects of supply chain management, principally related to the manufacturing industry. |
| **Mechanics of Materials** | Introduces the more advanced aspects of the theory of elasticity as applied to solid mechanics, providing a basis for study in solid mechanics, computational engineering and materials. |
| **Mechatronics: Sensors and Machine Automation** | This module combines major components of electronic and mechanical engineering to explore how mechanical systems are instrumented and controlled. |
| **Multivariable State-Space Control** | This module explores control theory, which is concerned with forcing measured outputs of a system to follow a desired reference command, through the manipulation of certain input variables to the system. |
| **Nature-Inspired Computation** | This module will provide you with the knowledge to create and apply techniques based on evolution, the intelligence of swarms of insects and flocks of animals, and the way the human brain is thought to process information. |
| **Networks, Data and Information** | This module will provide you with the skills required to create and manage efficient networks and databases and to write intelligent queries to deliver useful business information from the collected data. |
| **New Developments in Materials Engineering** | Provides an insight into the very latest developments in materials engineering; those that are likely to have an impact on your future career. |
| **Operational Research and Industrial Systems Modelling** | Considers how manufacturing and service industries can be helped by mathematical modelling and computer simulation. |
| **Pattern Recognition** | This module will provide you with a thorough grounding in the theory and application of pattern recognition, classification, categorisation, and concept acquisition. |
| **Signal Analysis and Image Processing** | This module builds upon signal processing and system theory modules to deliver a professional-level course in modern signal processing aimed at causal time series and non-causal image data. |
| **Software Development for Business** | This module aims to equip you with the knowledge of how IT system software is developed. As well as learning basic programming skills, you will find out about the necessary theory and software development methods that are commonly adopted, including the software development lifecycle and testing regimes. |
| **Urban Drainage and Waste Water Management** | Provides a basic knowledge of classical and contemporary problems in the management of urban drainage systems for the practising engineer. You will gain practical experience in using urban drainage modelling tools. |
| **Water and Environmental Systems** | Enables you to develop a systems approach in designing, controlling, modelling and managing water resources and environmental engineering projects. |
| **Water Supply and Distribution Management** | Provides a basic knowledge of classical and contemporary problems in management of water supply and distribution systems for the practising engineer. |

# ENGINEERING IN CORNWALL

At our Penryn Campus in Cornwall, we offer degree programmes that cover two specialist areas of Engineering that allows you to study, in detail, subjects that take advantage of the Cornish landscape.

Our Mining Engineering programmes are taught by the University's Camborne School of Mines (CSM), which has 125 years' experience in training mining engineers and an excellent international reputation, while our Clean Energy Programmes are designed for individuals seeking a professional role in the rapidly expanding and strategically important energy sector.

The Penryn Campus' stunning main buildings have been equipped with the latest technologies to deliver the very best learning and teaching facilities. We share the campus facilities with the University of Falmouth, creating a vibrant mixture of students from science, engineering, humanities and arts backgrounds, which spreads beyond campus to the local area.

# MINING ENGINEERING

2nd for Materials and Mineral Engineering in *The Guardian University Guide 2015*

94% of Mining Engineering students in graduate level employment or further study within six months of graduating[1]

88% for overall satisfaction in the National Student Survey 2013[2]

Only UK institution to offer an undergraduate Mining Engineering degree

Outstanding global industry reputation and with paid placement opportunities around the world

Accredited by the Institute of Materials, Minerals and Mining (IOM[3])

Superb facilities include an underground test mine and world class analytical mineralogy labs

Taught by Camborne School of Mines which has an excellent international reputation

Emphasis on field-based training

Exeter Mining Engineering graduates are the 2nd highest earners in the UK; £41,000 average salary six months after graduation[3]

92% of research classified as world-leading or internationally excellent[4]

Our degree programmes are truly multidisciplinary, including elements of civil and mechanical engineering, geology, metallurgy, economics, environmental management and health and safety. They are also highly vocational, so in addition to lecture-based study, the programmes include field trips, tours, a summer industrial placement and practical classes in surveying and in our test mine. You will generally spend your second year summer vacation gaining work experience anywhere from Australia to the UK and will often be paid for doing so.

The BEng Mining Engineering degree is professionally accredited by the Institute of Materials, Minerals and Mining (IOM[3]), providing the opportunity for you to work towards Chartered Engineer status after you graduate. An application is in progress for accreditation of the MEng programme.

Mining Engineering is taught by the University's Camborne School of Mines (CSM), which has 125 years' experience in training mining engineers and an excellent international reputation. Many extractive industry operations around the world will have a CSM mining engineer somewhere within their staff.

CSM is one of the best equipped departments of its kind in Europe. Our staff are actively involved in research and you will benefit from their cutting-edge knowledge and our research facilities. We are also the only university in the UK to have its own test mine for teaching and research.

[1] *Destination of Leavers from Higher Education Survey (DLHE) of 2012/13 undergraduates*
[2] *based on the average percentage of positive responses across all survey categories for full service universities*
[3] *Sunday Times league table of graduate salaries, based on 2012/13 figures*
[4] *Research Excellence Framework 2014 based on the percentage of research categorised as 4* and 3*. Mining and Minerals Engineering is returned to the General Engineering Unit of Assessment*

# DEGREE PROGRAMMES

## What is Mining Engineering?

The demand for minerals will continue to grow as the world's population doubles over the next 40 years. Mineral development and production must be managed in a responsible manner if we are to obtain these minerals without great damage to our environment. Highly trained engineers and scientists are needed by the minerals industry now and in the future. Mining applies many different branches of science and engineering to understand how minerals can be extracted from the earth.

Mining engineers are primarily responsible for the safe and economic production of the Earth's minerals. They work with metal ores, diamonds, coal, oil and industrial minerals such as clays, granites and limestone. Many mines involve deep underground excavations with high temperatures and very large stresses in the rock. Others involve surface working in quarries, open pits and strip mines.

Mining engineers often manage teams of engineers and others from many different disciplines. Because of this, mining engineering degrees are very wide ranging and ideal for careers in engineering management.

Mining engineers must be able to understand the nature of the rocks with which they work. They apply sound engineering principles to design safe and economic methods of extraction.

Knowledge of geology, engineering, rock mechanics, economics, surveying and management is necessary for anyone involved in the design and management of mines.

Recycling and reclamation are of growing international importance within the mining industry. Improvements in extraction technology now allow the treatment of secondary sources, such as the waste from previously mined deposits, industrial and domestic waste and contaminated land. In many cases it is possible to develop processes which allow a range of materials, including metals, plastics and glass, to be recovered from waste streams offering the potential for increased recycling.

## Single Honours

### MEng/BEng Mining Engineering

**Year 1** The first year of the programmes are mainly devoted to general engineering principles together with geology and surveying, and an introduction to mining and minerals engineering. You will attend a one-week induction course at our test mine during the Easter vacation and learn to use mining equipment and explosives safely. At the end of the first year a three-week surface surveying field course is held on campus.

**Year 2** In year two more emphasis is placed on mining subjects and management whilst the engineering and geology topics from the first year are further developed. In the summer vacation between the second and third years you will work in the extractive industry for at least eight weeks. Most students work overseas during this period. Although the onus is on you to find a placement, the department can help by providing contact details and suggesting companies which suit your interests. Companies with close ties to the department also provide placements for a number of students. Most students receive a wage during their placement and some companies provide other support such as accommodation and travel allowances.

Following the work placement and prior to the beginning of your final year, you will undertake a week long industrial tour.

**Year 3** In the third year all subjects are very closely connected with mining. Mine design, geotechnical engineering, mining geology and minerals management are developed further.

You will also carry out a mining feasibility study where you will work in small groups to design and cost a mining project. Throughout the third year you will work on an individual research project in your area of interest, under the supervision of a member of academic staff.

**Year 4 (MEng only)** If you take the four-year MEng programme you'll undertake a group design project along with additional independent study. You'll also take modules covering advanced mine design and prepare an industrial-focused thesis following a project undertaken with a mining company as part of your summer vacation.

# LEARNING AND TEACHING

Our teaching is carried out through a number of methods including lectures, tutorials, laboratory work, field courses, feasibility studies and projects. On average you will spend 20 hours per week in taught activities at the University and will be expected to carry out a further 20 hours per week in independent study.

During your degree you will undertake blasting trials, ventilation surveys, surface and underground surveying exercises, and operate mining equipment. The CSM underground test mine works as a purpose-built testing facility where both teaching and research can be conducted in an authentic setting.

Other facilities include a sensor-based materials sorting and characterisation facility, mineral processing laboratory and a geomechanics rock and soil testing facility. We are also fortunate to have some of the most up-to-date surveying equipment which is available for both surface and underground surveying techniques. You will have access to the research facilities in the department throughout your degree.

We're actively engaged in introducing new methods of learning and teaching, including increasing use of interactive computer-based approaches to learning through our virtual learning environment, where the details of all modules are stored in an easily navigable website. Students can access detailed information about modules and learning outcomes and interact through activities such as the discussion forums.

## Research-inspired teaching

We believe that every student benefits from being part of a culture that is inspired by research and being taught by experts – you will discuss the very latest ideas in seminars and tutorials and become actively involved in research yourself.

Across all our undergraduate programmes, teaching is strongly informed by the research expertise of academic staff who are internationally-recognised experts in their field.

Camborne School of Mines is recognised as a centre for research related to the formation, discovery, extraction and utilisation of the Earth's natural resources, and subsequent remediation. The applied nature of much of the research is indicated by significant international industrial collaboration. Research within CSM is coordinated by two multidisciplinary groups. These draw upon the department's research expertise in mining and minerals engineering and geology.

In mining and minerals engineering we have very active research interests in blast vibration analysis, surveying, ore sorting, health and safety management, geotechnical analysis of slopes and excavations, and resource modelling.

## Facilities

We offer state-of-the-art equipment for teaching and research on campus and at our test mine nearby. Laboratory classes, using our extensive teaching equipment, enable you to fully appreciate the theoretical elements of the programme via practical examples.

Our research facilities include world class analytical geochemical and mineral analysis laboratories complete with QEMSCAN®, a sophisticated scanning electron microscope-based mineralogical assessment system which is a unique facility amongst UK universities.

Our analytical suite comprises of an electron microprobe, low vacuum scanning electron microscope, X-ray diffraction, X-ray fluorescence, atomic absorption spectroscopy, and high quality microscope and imaging facilities.

## Field work and tours

An industrial tour takes place during mid-September preceding the final year. Visits are also made to mine sites both on the surface and underground, along with mill visits and visits to waste treatment/recycling plants. These visits develop additional learning skills and awareness of the minerals/extraction industry.

## Academic support

The Penryn Campus offers a friendly, supportive community, where staff and students get to know each other well. As a student you will have a personal tutor who is a member of academic staff with whom you can discuss personal and academic issues. There are also a number of services on campus where you can get additional advice and information. You can find further information about all these services in the University's undergraduate prospectus or online at **www.exeter.ac.uk/undergraduate**

## The environment and sustainability

At the University of Exeter, we are committed to producing graduates who have an understanding of both the scientific and the human/social issues which are involved in the vital field of environment and sustainability.

At our Penryn Campus, the Environment and Sustainability Institute (ESI) is at the forefront of scientific and technological research in this field. We aim to develop further opportunities for Mining Engineering students to develop their knowledge, understanding and interest in sustainability.

## Assessment

Assessment methods vary between modules, and may include essays, practical write-ups, surveying exercises, presentations and project work. You will have to pass the assessment in the first year, but the mark does not contribute to your degree classification. The overall mark for your degree is calculated from your final and penultimate-year assessments. These draw on coursework, guided project work and exams.

## Scholarships

Through the generous support of The Camborne School of Mines Trust, industrial sponsors and past students and staff we are usually able to offer scholarships each year to new students who register on degree programmes run by Camborne School of Mines.

The scholarships are awarded primarily on the basis of academic merit and are payable for the duration of your degree programme, subject to continued satisfactory academic performance. Further information can be found on our website at **www.exeter.ac.uk/ug/mining**

# CAREERS

A very high proportion of graduates of Mining Engineering enter employment directly related to their studies in the minerals industry, either in the UK or overseas. Other graduates move into areas such as tunnelling, civil engineering design or the oil and gas industry. However, recent graduates are working in fields as diverse as sales and marketing and operations management for major UK minerals providers. Alternatively, some graduates opt to continue their training by undertaking taught postgraduate (MSc) courses in geotechnical engineering or computing, or undertake research degrees (MPhil/PhD).

## Examples of the destinations of our recent graduates:

### Occupations

Tunnel Engineer // Mining Engineer // Chemical Engineer // Graduate Mining Engineer // Trainee Mining Engineer // Management Trainee in Mining Engineering // Mine Ventilation Engineer // Engineer

### Employers

Leighton Asia // Newport Goldmining // MMD Sizers // Rimex Metals Ltd // Rio Tinto // Grinaker Ltd // Xstrata // Sibelco // Anglo American // The Lisheen Mine // First Quantum Minerals

## Examples of further study followed by our graduates:

- MSc Mining Engineering, University of Exeter

Information about the careers entered by graduates can be found at **www.exeter.ac.uk/ug/careers**

# MINING ENGINEERING MODULES

Please be aware that modules are subject to change, please check **www.exeter.ac.uk/ug/mining** for latest details.

## Year 1

| | |
|---|---|
| **Mathematics** | You will take two mathematics modules in the first year. The first consolidates key mathematical principles and methods in the areas of algebra, trigonometry, calculus and basic statistics. The second extends these areas, covers a range of engineering maths topics and includes an introduction to the software package MathCad. |
| **Surveying and CAD** | Takes you through fundamental surveying techniques and associated computation. Examines other methods of survey control and detailed data capture along with the computational skills required for these methods. |
| **Mining and Minerals Engineering** | An overview of the minerals industry starting with a historical perspective and leading up to the current day implications of financial, political and energy constraints. A basic introduction to mining and minerals engineering then follows, as well as sustainability and the effects of mining on the environment. Blasting practicals are also undertaken during the term. |
| **Geology** | Provides an elementary training in the principal geological disciplines and their applied significance, plus an overview of the structure of the Earth and the processes by which it has evolved. |
| **Engineering Mechanics** | Ensures a full understanding of engineering mechanics for students with differing backgrounds in applied mathematics and mechanics. This module will enable you to understand later aspects of study and to make a first assessment of a mechanical or structural project. |
| **Thermodynamics and Fluid Mechanics** | Designed to develop your knowledge of fluid mechanics and of energy transfer and storage in thermal systems. |
| **Electrical and Electronic Principles** | An introductory module covering the fundamental electrical principles including a complete range of semiconductor devices and electronic systems. |

## Year 2

| | |
|---|---|
| **Fluid Mechanics** | Extends the basic principles covered in the *Thermodynamics and Fluid Mechanics* module and their practical application to real engineering situations. |
| **Mathematics 2** | You will take two mathematics modules in the second year, one covering advanced algebra and calculus; and the other covering advanced mathematics for engineering. |
| **Project Management and Accounting** | A detailed introduction to quantitative project management techniques. This module also provides you with experience of computer simulations used in project management along with accounting techniques. |
| **Mechanics of Materials** | Provides an appreciation of the strength and safety of the structural components you'll find in industry. It also serves as an introduction to later work on the analysis of stress and non-elastic behaviour of materials. |
| **Surface Mining and Mine Transport** | Provides an overview of surface mining methods and the equipment used. Extends your understanding of engineering principles in relation to the handling and transport of bulk materials and people. |
| **Electrical Energy Conversion and Transport** | Covers the supply and utilisation of electrical energy on a large scale and the use of a wide range of electrical machines. Also covers the fundamentals of data transmission, the practical interfacing of microprocessors to working plant, and control engineering. |
| **Geotechnics** | A general introduction to rotary drilling, basic applied hydrology and rock engineering. Provides an insight into specific design applications of geotechnical engineering in civil and mining practice. |
| **Mining and Surveying** | Provides a general introduction to the safe use of explosives, the selection of suitable drilling methods and underground excavation support, and an overview of mine development techniques and mine drainage. In the first semester, an underground survey is conducted at our test mine. During the last three weeks of term, you will take part in a major practical surface surveying exercise on campus. |

# MINING ENGINEERING MODULES CONTINUED

## Year 3

| | |
|---|---|
| **Minerals Engineering** | Provides an overview of minerals engineering which includes both mineral processing and extractive metallurgy. |
| **Surface Excavation Design** | Provides design-based consideration of some major aspects of geotechnical engineering found in civil and mining engineering practice. |
| **Safety and Sustainable Development** | Acquaints you with health and safety legislation relating to mining and quarrying, including the sustainable development methods that are being adopted by mining companies across the world to address the issues of mining legacies. |
| **Tunnelling and Excavation Design** | Provides design-based consideration of some major aspects of geotechnical engineering found in civil and mining engineering practice. Includes an introduction to tunnelling methods and machine selection. |
| **Working Environment and Ventilation** | Extends your understanding of engineering principles in relation to the environmental conditions encountered in the workplace in relation to the ventilation of underground mines and surface buildings and plant. |
| **Mineral Economics and Feasibility Studies** | Helps you to understand that the global minerals industry presents a unique investment environment, which needs to be mastered to ensure the successful development of a minerals venture. It prepares you for the month long *Feasibility Study* exercise. |
| **Feasibility Study** | In the second term you'll carry out a feasibility study of a mining project. You'll work in a group and take a potential mining project from the initial geological information, through the mine and environmental planning stage, to an economic evaluation and request for capital. |
| **Industrial Placement and Project** | You will gain relevant work experience during the summer vacation period between years 2 and 3; undertaking an industrial placement at a surface or underground mine or within a mining-related discipline. Research, data analysis and technical report writing skills are then tested in this module. |

## Year 4

| | |
|---|---|
| **Individual Research Thesis** | This module involves independent study at M-level where students conduct independent research into a topic of their choice which is directly related to the programme. |
| **Group Design Project** | You'll be placed into groups and will produce a critical design project directly related to an aspect of the course. Emphasis is given to an integrated approach where unique solutions can be generated. |
| **Mine Automation** | This module will explore the various ways in which mine automation is being used to make the industry both more profitable, safer and easier to manage. |
| **Advanced Mine Design** | This module takes mine design to an advanced level of study, using some of the latest mine design software packages. |
| **Advance Mine Ventilation and Modelling** | This module continues on from the third year module on ventilation and requires you to undertake ventilation airway modelling using the latest software packages. |
| **Advanced Minerals Engineering** | This module extends your knowledge beyond that of the third year module, *Minerals Engineering*, and focuses on the advanced facets of mineral processing. |


BIOFUEL
KEROSENE

# CLEAN ENERGY

93% of Renewable Energy students in graduate-level employment or further study within six months of graduating[1]

92% of research classified as world-leading or internationally excellent[2]

Practical vocational training involving industrial placements and field work

Expertise in energy policy, marine renewables, bio-fuels, electrical power and networks, wind, photo-voltaic and thermal technologies

Industrial support from many of the key companies in the industry

energy INSTITUTE LEARNING AFFILIATE

Specialising in energy engineering with a focus on clean and renewable energy technologies for over a decade, our programmes are well established in providing graduate engineers to the sector. They offer excellent vocational training in the areas of renewable and clean energy, with each programme tailored to your strengths and with a clear progression towards employability outcomes.

The BEng/MEng programmes are tailored to students who want to focus on an engineering career meeting the needs of the clean energy sector, whilst providing essential business and managerial skills. The BSc programme remains centred in engineering but has a broader remit tailored towards consultancy or policy opportunities.

Renewable energy is produced from sources that are replenished as they are used, such as the wind, water flowing in streams, rivers and seas, the sun and sustainably grown crops.

In order to harness these sources and reduce our dependency on finite reserves of oil, coal and gas, renewable energy professionals need to understand the scientific principles of renewable energy technology and have the management skills to ensure that UK and international carbon emission reduction targets are met. They must also understand the effect of human activities on the environment and the socio-economic and business issues influencing delivery of the technology.

Cornwall has significant and diverse renewable energy resources and has led the UK in the development and exploitation of wind power. At the Penryn Campus, we have an internationally leading marine energy department, a new solar energy group and an internationally active energy policy group.

Our Clean Energy degree programmes have been tailored to meet the needs of the renewable energy sector and system requirements. Links with a wide variety of companies together with our research strengths allow us to offer these programmes with substantial backing from the renewable energy industry.

Our facilities and student resources include an engineering teaching laboratory, and industry standard IT and software. Local commercial renewable energy developments are plentiful – recent developments include new wind farms, repowered and scaled-up older wind farms, the UK's first solar PV farms and a world-leading marine energy development. Our new Environment and Sustainability Institute building is amongst the most sustainable in the country meeting the highest of BREEAM standards. This environment, together with day-field trips, a week-long residential field trip in second year and a two to three month work placement, provide a practical context that complements the taught material.

We have well established links with industry leaders including Scottish and Southern Energy, Bill Dunster Architects, and Wardell Armstrong International. Exemplifying this, our relationship with REG Windpower Ltd means our students have access to the data acquisition system for the two 850kW wind turbines the company operates just 500 metres from the campus.

[1] *Destination of Leavers from Higher Education Survey (DLHE) of 2012/13 undergraduates*
[2] *Research Excellence Framework 2014 based on the percentage of research categorised as 4* and 3*. Renewable Energy is returned to the General Engineering Unit of Assessment*

# DEGREE PROGRAMMES

## Single Honours

### BEng/MEng Energy Engineering

This is a practical, vocational programme, focusing on clean and renewable energy technologies, for individuals seeking a professional technical and engineering role in the rapidly expanding and strategically important energy sector. You'll gain a high level of technical and ethical competence, extend your understanding of commercial, economic and business issues and develop a professional outlook.

**Year 1** Initial focus is on engineering fundamentals including mathematics, mechanical, and electrical engineering modules as well as physics and thermodynamics. Specific computer skills are covered as well as a broad introduction to renewable energy systems and environmental management in preparation for more advanced modules later in the programme.

**Year 2** Core engineering modules continue the development of the key disciplines with further development of essential computational skills and additional modules on clean energy systems. Local field trips and practical experience give students an applied knowledge in clean and renewable energy techniques as well as developing report writing and teamworking skills.

**Year 3** An undergraduate dissertation forms an important element of the work in this year, allowing students to explore areas of particular interest and develop research, analytical and writing skills. The *Third Year Field Trip* and a design module will allow students to obtain practical engineering skills. Meeting the core modules, students have the opportunity to choose a minimum of four engineering modules relevant to their career development.

Modules include specific clean or renewable energy technologies such as solar and wind power, marine renewables, renewable heat technologies and energy storage. A further two optional modules can be chosen from our wider selection to allow students to improve their grounding in a range of topics, including environmental impact, energy policy, ethics and life cycle analysis subjects, or engineering subjects.

**Year 4 (MEng only)** The fourth year of study is focussed on deepening acquired skills through a series of advanced modules and project work. We will provide support for you to find an industrial placement or academic project. The placement will enable you to work closely within a company or a structured research environment, which is active in renewable or clean energy. The group design project will provide an opportunity to help you further develop teamworking and R&D skills. Alongside these activities, optional modules will dig into the advanced engineering aspects of *Advanced Wind Turbine Design*; *Offshore Energy Engineering*; *Solar Energy Research and Development; Future Energy Storage and Distribution*; and *Advanced Electronics and Electrical Engineering*. The fourth year is the exciting culmination and application of the full range of the engineering principles and energy technology specialities studied in the previous years.

### BSc Renewable Energy

This is a vocational programme for individuals seeking a professional consultancy or management role in the rapidly expanding and strategically important energy sector, focusing on clean and renewable energy systems.

Linked to the BEng Energy Engineering programme, the BSc Renewable Energy is tailored to students who wish to have more of a focus on energy policy or the environmental and socio-economic impacts of clean and renewable technologies. You'll gain a high level of technical and ethical competence in the sector, extend your understanding of commercial, economic and business issues, and develop a professional outlook. This will provide you with the skills to work as a project manager or consultant for government and industry.

**Year 1** First term modules concentrate on developing your core engineering and mathematical skills while introducing the diverse range of renewable energy sources, their extents and exploitation methods. In the second term you'll study the engineering sciences governing both natural processes and power conversion technology, as well as project management and accounting.

**Year 2** Second year modules provide greater depth of training in the socio-economic subjects and wider climate issues. Study of essential engineering disciplines that underlie the application of renewable energy technology continues along with energy policy and management. In the summer vacation you may carry out a minimum six week industrial placement.

**Year 3** Third year modules are designed to build on the previous two years to enable study of specialist areas in order to gain deep knowledge, understanding and ability. Students have the opportunity to choose three or four modules from a range of options designed to develop the skills for broader socio-economic renewable energy career development. Topics include environmental impact, ethics and life cycle analysis subjects. A further three or four modules are selected from a wider range of technically orientated modules which include resource assessment, power conversion design and performance monitoring. In addition, a design module will be offered to students to allow them to obtain practical engineering skills.

Throughout the third year you will work on an individual research project in your area of interest, under the supervision of a member of academic staff. Through your selection of options, choice of dissertation topic and choice of vacation placement, you are in control of the content of over half of your third year programme.

### Programme Accreditation

The current programmes have been accredited by the Energy Institute for progression to Incorporated Engineer (BSc) or Chartered Engineer (MEng). With significant developments to the Renewable Energy BSc and the new Energy Engineering BEng/MEng programmes, accreditation is currently pending.

Exeter has a long history of successfully accredited programmes and we strongly anticipate that graduates of the Energy Engineering programmes will leave with the academic qualifications for Incorporated (BEng) or Chartered Engineer (MEng) status, depending on their choice of the three or four year programme.

It is also anticipated that module choices made during the third year of the Renewable Energy BSc will determine whether the criteria for progression towards Incorporated Engineer or Chartered Energy Manager has been met.

# LEARNING AND TEACHING

Formal teaching and learning methods vary between modules but typically include lectures, laboratory classes, practical work, seminars, tutorials, computer-based learning packages, and residential or one-day field-based activities. You will typically have 18-20 hours of formal contact time per week. You'll be expected to spend roughly the same amount of time in independent learning and some work will be expected during the vacations.

There is an increasing use of interactive computer-based approaches to learning through our virtual learning environment where the details of all modules are stored in an easily navigable website. Students can access detailed information about modules and learning outcomes and interact through activities such as the discussion forums.

## Facilities

The campus is equipped with the latest facilities for teaching and research. Our teaching laboratory contains technology for the study of biomass heating; water flows; hydroelectric turbines; photovoltaics; solar thermal; fuel cells; hydraulic systems; wind power; and electronics and electrical power systems.

The lab is also equipped with industry standard software for the analysis of flows of liquids, gases (Solidworks) and electricity; computer aided design (AutoCAD); wind energy resource assessment (Windfarmer, Wind Farm); and wind turbine design (Bladed). As an undergraduate student, you'll be able to use all of these programmes and facilities in the lab which can be viewed on our website at **www.exeter.ac.uk/virtualtours**

A variety of devices producing renewable energy exist around the campus including two solar powered buildings: Daphne du Maurier and the Performance Centre, plus a 3 x 1MW fully condensing gas boiler and a ground source heat pump system. As part of the continuing expansion of the campus, the University has developed the Environment and Sustainability Institute (ESI). The ESI opened in late 2012 and employs both solar and wind energy technology as well as benefitting from state-of-the-art energy efficiency. The campus is 500m from the Roskrow Barton commercial wind development that comprises 2 x 850kW, V52-850 Vestas wind turbines.

## Research-inspired teaching

We believe that every student benefits from being part of a culture that is inspired by research and taught by experts. We are a lead institution in PRIMaRE (Peninsula Research in Marine Renewable Energy), a multi-centre research organisation specialising in all elements of research concerning marine renewable energy sources including their operation, development of the technology, their environmental and ecological impacts and their socio-economic impacts. Policy research aims to develop methods through which the growth of renewable energy can be enhanced further, as well as methods to ensure that it is properly regulated. We are collaborating with other universities within the UK and overseas, notably to examine the potential and cost of increased use of renewable heat sources. We are committed to a focus on examining the development of industrial capacity related to new clean energy technologies.

## Field work, tours and placements

Throughout the programmes you will experience a range of renewable energy technologies. This will include trips to renewable energy facilities such as Goonhilly wind farm, local solar PV farms, micro hydro and other relevant installations, and may include events like public planning meetings or energy use assessments of public or private buildings as opportunities become available. Our aim is to get out to see real world technology or events whenever we can.

In the summer vacation between your second and third year, you may carry out a minimum six-week industrial placement. The onus is on you to select the area in which you wish to work and to find a placement, although we can help by providing contact details and suggesting companies which suit your interests. Companies with close ties to the department also provide placements for a number of students.

In the third year, the residential field trip will entail a field-based renewable energy technical resource assessment exercise. Working as a project team you will focus on the use of appropriate renewable energy technologies.

## Assessment

Assessment methods vary between modules, but usually combine exams and coursework (which might include practical laboratory work, professional posters, group exercises, essays or verbal presentations). Your first year doesn't count towards your final degree classification, but you do have to pass it in order to progress. If you study a three-year programme, assessments in the final two years both count towards your classification, and if you study a four-year programme then the final three years all contribute.

## Academic support

The Penryn Campus offers a friendly, supportive community, where staff and students get to know each other well. All students have a personal tutor who is a member of academic staff with whom you can discuss personal and academic issues. There are also a number of services on campus where you can get additional advice and information. You can find further information about all these services in the University's undergraduate prospectus or online at **www.exeter.ac.uk/undergraduate**

## Scholarships

The Lawrence Scholarship is available to top performing students undertaking a four-year undergraduate degree programme in the College of Engineering, Mathematics and Physical Sciences. For the latest information about our scholarships, please visit **www.exeter.ac.uk/emps/undergraduate/funding**

# CAREERS

These degrees have been designed to include the knowledge and skills that potential employers in the energy sector have told us they require. A very high proportion of our graduates find employment in the energy sector or are studying for a higher degree.

All students receive free membership to the Energy Institute for their period of study and graduates are encouraged to upgrade their membership to the Energy Institute from Student to Graduate, which is the first step in working towards formal recognition of their professional status as a Chartered Engineer (CEng) or Incorporated Engineer (IEng).

Many students from the department take part in the Exeter Award and the Exeter Leaders Award. These schemes encourage you to participate in employability-related workshops, skills events, volunteering and employment which will contribute to your career decision-making skills and success in the employment market.

Information about the careers entered by graduates can be found at **www.exeter.ac.uk/ug/careers**

"I decided to study Renewable Energy at the Penryn Campus because the course here is very diverse and industry-based. There are a lot of fascinating modules and very good post-graduation employability rates. The small size of the community here means that lecturers know all of the students' faces, and they always have time to clarify any aspects of a module that may be confusing us. There are also a lot of research-based teaching staff and we often have the chance to attend seminars where they give presentations on how their work is progressing."

Jason Rive,
MEng Renewable Energy, Penryn Campus

# CLEAN ENERGY MODULES

For up-to-date details of all our modules, please see **www.exeter.ac.uk/ug/clean-energy**
Please note that modules are subject to change and timetabling constraints and that not all modules are available every year.

## BEng/MEng Energy Engineering

### Year 1

| | |
|---|---|
| **Electrical and Electronic Principles** | An introduction to the key elements of understanding electrical and electronic systems. |
| **Introduction to Computational Engineering** | An introduction to programming, computational analysis and design is provided using a number of industry standard software packages. |
| **Mathematics** | A mathematics module tailored to support engineering topics including advanced calculus, matrix methods, vector algebra and differential equations. |
| **Mechanical Engineering** | An introduction to the fundamentals of mechanical engineering. |
| **Energy Policy, Markets and Law** | Understanding the rules which govern all elements of renewable energy development, including planning, construction and generation, is essential to operating within the industry. This module provides an overview of UK, European and global energy legislation and regulation and its implications for renewable energy. |
| **Renewable Energy Systems 1** | Your first introduction to core renewable energy technologies including solar power, biomass, hydroelectricity, tidal, wind, wave and geothermal. |
| **Science for Energy Engineering** | This module develops a practical understanding of key principles from physics and chemistry that are fundamental to a number of clean energy generation technologies. |
| **Thermodynamics and Fluid Mechanics** | An introduction to the fundamentals of thermodynamics and fluid mechanics. |

### Year 2

| | |
|---|---|
| **Advanced Mathematics: Signals, Data and Systems** | Specific application of mathematics to a range of renewable energy and energy distribution technologies. |
| **Applied Thermodynamics** | A more advanced look into thermodynamics which considers how the subject is applied in a wide range of clean energy technologies. |
| **Electrical Energy Conversion and Transport** | Further development of the key concepts relating to electrical and electronic power systems. |
| **Energy Management** | This module will enable you to understand the need to manage energy as a resource and to learn the basis of energy management techniques as well as introducing the legal, social and administrative framework within which the industry operates. You'll learn of the opportunities that exist for improving energy conversion efficiency and waste avoidance and be able to conduct energy use audits in commercial and domestic premises. |
| **Fluid Dynamics** | The science of fluid motion relevant to energy harvesting, structural loading and its response behaviour. |
| **Materials and Engineering Design** | A more advanced mechanical engineering module, building on year one work to provide a deeper understanding of further key concepts. |
| **Project Management and Accounting** | A detailed introduction to quantitative project management techniques. This module also provides you with experience of computer simulations used in project management. |
| **Renewable Energy Systems 2** | Further discussion of core renewable energy technologies including solar power, biomass, hydroelectricity, tidal, wind, wave and geothermal. |

### Year 3

*Core modules:*

| | |
|---|---|
| **Engineering Design and Innovation** | Develops your understanding of engineering design and the key stages of a successful design process. It builds competence in each of these stages and provides a gateway towards complex engineering design within your subsequent career. |
| **Dissertation** | An opportunity to pick your own area of interest in the energy field and carry out a supervised individual research project. Project titles may involve any aspect of the course and possibly include the support of an industrial partner. This project begins in the first term and continues throughout second term with eight full weeks of the timetable allocated to it. |
| **Professional Ethics, Competence and Commercial Awareness** | Today's energy professionals demonstrate a personal and professional commitment to society, to their profession, and to the environment. These principles are embedded in professional codes of conduct and mechanisms for self-regulation. This module encourages understanding of these ideas and develops understanding of business practice and business governance. |
| **Third Year Field Trip** | A field trip which encourages you to work in groups to produce a renewable energy resource assessment at an overseas location. It brings together key elements of subjects studied in a practical exercise to assess a real world location to a professional standard. |

# CLEAN ENERGY MODULES CONTINUED

*Core engineering modules: (A minimum of four modules need to be chosen from the 'core engineering modules')*

| | |
|---|---|
| **Energy Generation from Biomass and Waste** | An in-depth, practitioner-driven module which considers the technical issues underlying the use of biomass and waste for electrical generation and heat. |
| **Geothermal Energy** | Introduces enhanced geothermal power generation and ground source heat pumps. |
| **Marine Renewable Energy** | An in-depth module covering aspects of resource estimation, turbine and wave device design, deployment, economics and environmental impact with a focus on wave and tidal energy technologies. |
| **Modelling, Simulation and Control** | A practical module in computer software used in the design of conversion plant and machines including 2D-Phases, Fluent/SFX, SWAN and MATLAB. |
| **Network Engineering, Modelling and Management** | This specialist third year option extends the knowledge gained in previous electrical modules to address more deeply integration of the electrical output from renewable energy generation into the network. (*Optional for BEng students.*) |
| **Smart Energy and Energy Storage Technologies** | Storage technologies are a key enabling technology for renewables. This module considers the problems of intermittent supply and peak loading on grid systems as well as solutions. |
| **Solar Power** | An in-depth module considering all elements of solar power exploitation, from assessment of resource to the potential effects of climate change on available resource. You will study the different kinds of PV technology available, including fabrication methods, installation and performance as well as issues such as connection and integration, environmental impact, financial appraisal and PV in developing countries. |
| **Sustainable Architecture** | An introduction to key elements of architectural practice with sustainability in mind. With input from leading UK practitioners the module covers a broad area. |
| **Wind Power** | Builds on introductory material to deliver a detailed view of turbine design, site assessment and resource modelling. |

*Other optional modules:*

| | |
|---|---|
| **GIS and CAD for Renewable Energy** | The application of GIS tools is a key discipline within the sector, particularly in the development of new capacity. This module employs expert industrial practitioners to familiarise you with key concepts and their application. |
| **Life Cycle Analysis** | Introduces the concept of LCA as applied to generation technologies. |
| **Work Placement Report** | An industrial placement allows you to gain practical experience, a relevant reference and build your confidence. Students work on an approved industrial or commercial placement for not less than six weeks during the long vacation between the second and third years. |

## Year 4 (MEng only)

*Core modules:*

| | |
|---|---|
| **Group Design Project** | The group design project provides experience of working as part of a project team of four to six in a situation close to that which might be found in an industrial or commercial setting. You will apply knowledge and skills, at the forefront of the renewable energy discipline, obtained from taught modules and independent learning to a real engineering situation at a professional level and as part of a team effort. |
| **Industry Placement Project** | For this module, you'll obtain work experience during the summer vacation within a business or other concern operating within the energy sector, UK or worldwide. You'll work on a real industrial project, aiming to meet all requirements associated with working to a defined project brief. This will be established during the summer placement stage, but its execution will extend through the academic year. |

*Core optional modules: (A minimum of four modules need to be chosen from the 'core optional modules')*

| | |
|---|---|
| **Advanced Electronics and Electrical Engineering** | You will further your understanding of electrical and electronics engineering through developing competence with computational design tools that are routinely adopted in industry, for analysis and design tasks. |
| **Advanced Wind Turbine Design** | You'll develop your understanding of the principles of design of horizontal axis wind turbines to a state of detailed knowledge, to the extent that you could develop and establish new designs for wind turbines or individual components that meet recognised design codes. |
| **Future Energy Storage and Distribution** | By studying the latest developments in large scale energy storage, the impacts on the wider energy network are explored. |
| **Offshore Energy Engineering** | You'll develop an advanced understanding of design and installation requirements within the sector of marine renewable energy within the fields of hydrodynamics, offshore structure design, risk and project management, and resource characterisation and consenting. |
| **Solar Energy Research and Development** | Extends the understanding of the principles of solar power exploring some of the latest product developments as well as details regarding the deployment of the current generation of photovoltaic systems. |

# BSc Renewable Energy

## Year 1

| | |
|---|---|
| **Electrical and Electronic Principles** | An introduction to the key elements of understanding electrical and electronic systems. |
| **Introduction to Computational Engineering** | An introduction to programming, computational analysis and design is provided using a number of industry standard software packages. |
| **Mathematics 1A** | Gets you up to speed on some basic principles, methods and techniques in algebra, trigonometry, calculus and statistics. |
| **Mathematics IB** | Further extends the topics introduced in *Mathematics 1A* and adds vector and matrix algebra and basic statistics to support your development and allow progress across your other modules. |
| **Mechanical Engineering** | An introduction to the fundamentals of mechanical engineering. |
| **Renewable Energy Systems 1** | Your first introduction to core renewable energy technologies including solar power, biomass, hydroelectricity, tidal, wind, wave and geothermal. |
| **Science for Energy Engineering** | This module develops a practical understanding of key principles from physics and chemistry that are fundamental to a number of clean energy generation technologies. |
| **Energy Policy, Markets and Law** | Understanding the rules which govern all elements of renewable energy development, including planning, construction and generation, is essential to operating within the industry. This module provides an overview of UK, European and global energy legislation and regulation and its implications for renewable energy. |

## Year 2

| | |
|---|---|
| **Business and Entrepreneurship** | In addition to providing you with an understanding of business activity, the aim of this module is also to give a rigorous and honest insight into the realities of new business ventures by focusing on the requirements necessary for turning an idea into a feasible and attractive new enterprise. |
| **Electrical Energy Conversion and Transport** | Further development of the key concepts relating to electrical and electronic power systems. |
| **Energy Management** | This module will enable you to understand the need to manage energy as a resource and to learn the basis of energy management techniques as well as introducing the legal, social and administrative framework within which the industry operates. You'll learn of the opportunities that exist for improving energy conversion efficiency and waste avoidance and be able to conduct energy use audits in commercial and domestic premises. |
| **Project Management and Accounting** | A detailed introduction to quantitative project management techniques. This module also provides you with experience of computer simulations used in project management. |
| **Engineering for Energy Professionals** | Essential elements of a number of engineering, mathematics and material science subjects are covered in this module. |

# CLEAN ENERGY MODULES CONTINUED

| | |
|---|---|
| **The Politics of Climate Change and Energy** | During this module you will learn about the key concepts in climate science and policy, climate change science, and the debate over its reliability and climate policy and action at the international and national levels. We will also cover the role of different energy options in mitigating climate change, the strengths and weaknesses of UK energy policy and the possible ways forward for UK energy systems. |
| **Renewable Energy Systems 2** | Further discussion of core renewable energy technologies including solar power, biomass, hydroelectricity, tidal, wind, wave and geothermal. |

## Year 3

*Core modules:*

| | |
|---|---|
| **Dissertation** | An opportunity to pick your own area of interest in the energy field and carry out a supervised individual research project. Project titles may involve any aspect of the course and possibly include the support of an industrial partner. This project begins in the first term and continues throughout second term with eight full weeks of the timetable allocated to it. |
| **Professional Ethics, Competence and Commercial Awareness** | Today's energy professionals demonstrate a personal and professional commitment to society, to their profession, and to the environment. These principles are embedded in professional codes of conduct and mechanisms for self-regulation. This module encourages understanding of these ideas and develops understanding of business practice and business governance. |
| **Third Year Field Trip** | A field trip which encourages you to work in groups to produce a renewable energy resource assessment at an overseas location. It brings together key elements of subjects studied in a practical exercise to assess a real world location to a professional standard. |

*Core optional modules: (A minimum of three modules need to be chosen from the 'core optional modules')*

| | |
|---|---|
| **GIS and CAD for Renewable Energy** | The application of GIS tools is a key discipline within the sector, particularly in the development of new capacity. This module employs expert industrial practitioners to familiarise you with key concepts and their application. |
| **Smart Energy and Energy Storage Technologies** | Storage technologies are a key enabling technology for renewables. This module considers the problems of intermittent supply and peak loading on grid systems as well as solutions. |
| **Sustainable Architecture** | An introduction to key elements of architectural practice with sustainability in mind. With input from leading UK practitioners the module covers a broad area. |
| **Work Placement Report** | An industrial placement allows you to gain practical experience, a relevant reference and build your confidence. Students work on an approved industrial or commercial placement for not less than six weeks during the long vacation between the second and third years. |

*Optional modules:*

| | |
|---|---|
| **Energy Generation from Biomass and Waste** | An in-depth, practitioner-driven module which considers the technical issues underlying the use of biomass and waste for electrical generation and heat. |
| **Geothermal Energy** | Introduces enhanced geothermal power generation and ground source heat pumps. |
| **Life Cycle Analysis** | Introduces the concept of LCA as applied to generation technologies. |
| **Marine Renewable Energy** | An in-depth module covering aspects of resource estimation, turbine or wave device design, deployment, economics and environmental impact with a focus on wave and tidal energy technologies. |
| **Solar Power** | An in-depth module considering all elements of solar power exploitation, from assessment of resource to the potential effects of climate change on available resource. You will study the different kinds of PV technology available, including fabrication methods, installation and performance as well as issues such as connection and integration, environmental impact, financial appraisal and PV in developing countries. |
| **Wind Power** | Builds on introductory material to deliver a detailed view of turbine design, site assessment and resource modelling. |

# ABOUT THE UNIVERSITY OF EXETER

1st in the Russell Group for student satisfaction according to the National Student Survey 2014

7th in *The Times and The Sunday Times Good University Guide 2015*

Our teaching is inspired by our research, 82% of which was ranked as world-leading or internationally excellent in the 2014 Research Excellence Framework

Six months after graduation, 93% of our first degree graduates were in employment or further study (HESA 2012/13)

# VISIT US TO FIND OUT MORE

## Open Days

You can register your interest now for our Open Days and receive priority access to book your place*; visit **www.exeter.ac.uk/opendays**

** Pre-registration guarantees priority access to the booking system and is not an absolute guarantee of a place at any of our Open Days. Booking is essential and is on a first-come, first-served basis.*

Exeter campuses:

**Friday 5 June 2015**
**Saturday 6 June 2015**
**Saturday 5 September 2015**

Penryn Campus, Cornwall:

**Saturday 13 June 2015**
**Saturday 26 September 2015**

## Campus Tours

We run campus tours at the Streatham Campus each weekday during term time and at the Penryn Campus on Wednesday and Friday afternoons. You'll be shown around by a current student, who'll give you a first-hand account of what it's like to live and study at the University.

**Exeter** phone: +44 (0)1392 724043
email: visitus@exeter.ac.uk

**Cornwall** phone: +44 (0)1326 371801
email: cornwall@exeter.ac.uk

## www.exeter.ac.uk/ug/engineering
## www.exeter.ac.uk/ug/mining
## www.exeter.ac.uk/ug/clean-energy

Find us on Facebook and Twitter:
www.facebook.com/exeteruni
www.twitter.com/uniofexeter



FSC www.fsc.org MIX Paper from responsible sources FSC® C015185

2015CAMS152