THE UNIVERSITY of EDINBURGH
School of Engineering

THE SCHOOL *of* ENGINEERING at The University of Edinburgh

Course Guide

For UCAS Applicants

Mechanical Engineering


Manufacturers of
Moore Wright

The first part of the document lists the modules undertaken in each of the degree programmes. The second part of the document gives short descriptions of each of these modules.

At the end of the document is a list of host companies where students have had placements during their degree.

Prospective students should refer to the Undergraduate pages of the University website (http://www.ed.ac.uk/) to find out more about studying at the University of Edinburgh.

The modules and programmes described in this document are meant as a guide only and therefore you might find when you are undertaking the degree programme the modules are different from that stated in this document.

If you have any questions about the information contained in this document, please contact us:

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Mechanical Engineering (BEng)

Degree Type: **Single** UCAS Code: **H300**

Year of Programme	Course	Credit
1	Engineering 1	20
	Mechanical Engineering 1	20
	Engineering Mathematics 1B	20
	Engineering Mathematics 2B	20
	Further courses	40
2	Dynamics 2	10
	Fluid Mechanics 2	10
	Engineering Thermodynamics 2	10
	Structural Mechanics 2A	10
	Materials Science and Engineering 2	10
	Mechanical Engineering Design 2A	10
	Mechanical Engineering Design 2B	10
	Industrial Management 1	20
	Power Engineering 2	10
	Engineering Mathematics 2A	10
	Engineering Mathematics 2B	10
3	Computer Aided Engineering 3	10
	Dynamics 3	10
	Fluid Mechanics (Mechanical) 3	10
	Manufacturing Technology 3	10

Year of Programme	Course	Credit
3	Solid Mechanics 3	10
	Thermodynamics 3	10
	Control and Instrumentation Engineering 3	10
	Mechanical Design Principles 3	10
	Mechanical Design Project 3	10
	Sustainable Energy Group Design Project 3	10
	Professional Issues for Mechanical Engineers 3	10
	Computer Methods in Structural Engineering 3	10
4	Mechanical Engineering Group Project 4	20
	BEng Mechanical Engineering Project 4 ‡	40
	40 CREDITS FROM*:	
	Dynamics 4	10
	Energy Systems 4	10
	Engineering Project Management 4	10
	Fluid Mechanics (Mechanical) 4	10
	Finite Element Methods for Solids and Structures 4	10
	20 CREDITS FROM*:	
	Polymers and Composite Materials 4	10
	Supply Chain Management 4	10
	Engineering in Medicine 5	10

* A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

‡ For the award of Honours a minimum mark of 40% must be attained in the BEng Mechanical Engineering Project 4.

Mechanical Engineering (MEng)

Degree Type: **Integrated Masters Single Honours** UCAS Code: **H303**
Years 1, 2 & 3 are the same as Mechanical Engineering (BEng) H300

Year of Programme	Course	Credit
4†	Dynamics 4	10
	Energy Systems 4	10
	Fluid Mechanics (Mechanical) 4	10
	Industrial/European Placement 4	60
	20 CREDITS FROM*:	
	Group Design Project (Hydropower Scheme)	20
	Group Design Project (Potable Water Supply)	20
	Group Design Project (Design of Micro-systems)	20
	Group Design Project (The Passive House)	20
	Group Design Project (CO2 Capture Plant)	20
	10 CREDITS FROM*:	
	Engineering Project Management 4	10
	Finite Element Methods for Solids and Structures 4	10
5	Mechanical Engineering MEng Individual Project 5 ‡	40
	Semester 1: 40 CREDITS FROM *:	
	Computational Fluid Dynamics 5	20

Year of Programme	Course	Credit
5	Engineering Project Management 4	10
	Finite Element Methods for Solids and Structures 4	10
	Fire Science and Fire Dynamics 4	10
	Sustainable Energy Technologies 4	10
	Advanced Dynamics and Applications 5	10
	Fire Safety Engineering 4	10
	Semester 2: 40 CREDITS FROM*:	
	Polymers and Composite Materials 4	10
	Supply Chain Management 4	10
	Engineering in Medicine 5	10
	Nanotechnology 5	20
	Marine Energy 5	10
	Wind Energy 5	10
	Thin-Walled Members and Stability 4	10
	The Finite Element Method 5	10
	Oil and Gas Systems Engineering 5	10

* A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

† Entry to 4th year MEng normally requires average of at least 55% in third year, at the first attempt.

‡ For the award of Honours a minimum mark of 40% must be attained in the Mechanical Engineering MEng Individual Project 5.

Mechanical Engineering with Management (BEng)

Degree Type: **Single Honours with Subsidiary** Subject UCAS Code: **H3N2**

Year of Programme	Course	Credit
1	Engineering 1	20
	Mechanical Engineering 1	20
	Engineering Mathematics 1A	20
	Engineering Mathematics 1B	20
	Further courses	40
2	Dynamics 2	10
	Fluid Mechanics 2	10
	Engineering Thermodynamics 2	10
	Structural Mechanics 2A	10
	Mechanical Engineering Design 2A	10
	Mechanical Engineering Design 2B	10
	Industrial Management 1	20
	Techniques of Management	10
	Engineering Mathematics 2A	10
	Engineering Mathematics 2B	20
3	Computer Aided Engineering 3	10
	Dynamics 3	10
	Fluid Mechanics (Mechanical) 3	10
	Manufacturing Technology 3	10
	Solid Mechanics 3	10

Year of Programme	Course	Credit
3	Thermodynamics 3	10
	Mechanical Design Principles 3	10
	Marketing Technical Products 3	10
	Professional Issues for Mechanical Engineers 3	10
	Manufacturing Information Systems (MIS) 3	10
	Computer Methods in Structural Engineering 3	10
4	Operations Management 4	10
	Engineering Project Management 4	10
	Supply Chain Management 4	10
	Mechanical Engineering Group Project 4	20
	BEng Mechanical Engineering Project 4 ‡	40
	20 CREDITS FROM*:	
	Dynamics 4	10
	Energy Systems 4	10
	Fluid Mechanics (Mechanical) 4	10
	Finite Element Methods for Solids and Structures 4	10
	10 CREDITS FROM*:	
	Engineering in Medicine 5	10
	Polymers and Composite Materials 4	10

* A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

‡ For the award of Honours a minimum mark of 40% must be attained in the MEng Mechanical Engineering Project 4.

Mechanical Engineering with Management (MEng)

Degree Type: **Integrated Masters Single Honours with Subsidiary** Subject UCAS Code: **H3NF**
Years 1, 2 & 3 are the same as Mechanical Engineering with Management (BEng) H3N2

Year of Programme	Course	Credit
4†	Operations Management 4	10
	Engineering Project Management 4	10
	Industrial/European Placement 4	60
	20 CREDITS FROM*:	
	Dynamics 4	10
	Energy Systems 4	10
	Fluid Mechanics (Mechanical) 4	10
	Finite Element Methods for Solids and Structures 4	10
	20 CREDITS FROM*:	
	Group Design Project (Hydropower Scheme)	20
	Group Design Project (Potable Water Supply)	20
	Group Design Project (Design of Micro-systems)	20
	Group Design Project (The Passive House)	20
	Group Design Project (CO2 Capture Plant)	20
5	Mechanical Engineering MEng Individual Project 5 ‡	40
	Modern Economic Issues in Industry 5	10
	Supply Chain Management 4	10

Year of Programme	Course	Credit
5	Technology and Innovation Management 5	10
	Semester 1: 40 CREDITS FROM*:	
	Computational Fluid Dynamics 5	20
	Dynamics 4	10
	Energy Systems 4	10
	Fluid Mechanics (Mechanical) 4	10
	Fire Science and Fire Dynamics 4	10
	Finite Element Methods for Solids and Structures 4	10
	Advanced Dynamics and Applications 5	10
	Fire Safety Engineering 4	10
	Semester 2: 10 CREDITS FROM*:	
	Polymers and Composite Materials 4	10
	Engineering in Medicine 5	10
	Thin-Walled Members and Stability 4	10
	The Finite Element Method 5	10
	Oil and Gas Systems Engineering 5	10

* A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

† Entry to 4th year MEng normally requires average of at least 55% in third year, at the first attempt.

‡ For the award of Honours a minimum mark of 40% must be attained in the Mechanical Engineering MEng Individual Project 5.

Mechanical Engineering with Renewable Energy (BEng)

Degree Type: **Single Honours with Subsidiary Subject** UCAS Code: **H3F8**
Years 1 & 2 are the same as Mechanical Engineering (BEng) H300

Year of Programme	Course	Credit
3	Computer Aided Engineering 3	10
	Dynamics 3	10
	Fluid Mechanics (Mechanical) 3	10
	Manufacturing Technology 3	10
	Solid Mechanics 3	10
	Thermodynamics 3	10
	Control and Instrumentation Engineering 3	10
	Mechanical Design Principles 3	10
	Sustainable Energy Group Design Project 3	10
	Sustainable Energy: Principles and Processes 3	10
	Professional Issues for Mechanical Engineers 3	10
	Computer Methods in Structural Engineering 3	10
4	Sustainable Energy Technologies 4	10

Year of Programme	Course	Credit
4	Mechanical Engineering Group Project 4	20
	BEng Mechanical Engineering Project 4 ‡	40
	Energy Systems 4	10
	20 CREDITS FROM*:	
	Engineering Project Management 4	10
	Fluid Mechanics (Mechanical) 4	10
	Dynamics 4	10
	Finite Element Methods for Solids and Structures 4	10
	20 CREDITS FROM*:	
	Polymers and Composite Materials 4	10
	Supply Chain Management 4	10
	Engineering in Medicine 5	10

* A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

‡ For the award of Honours a minimum mark of 40% must be attained in the BEng Mechanical Engineering Project 4.

Mechanical Engineering with Renewable Energy (MEng)

Degree Type: **Integrated Masters Single Honours with Subsidiary** Subject UCAS Code: **H3NF**
Years 1 & 2 are the same as Mechanical Engineering (BEng) H300
Year 3 is the same as Mechanical Engineering with Renewable Energy (BEng)

Year of Programme	Course	Credit
4†	Energy Systems 4	10
	Fluid Mechanics (Mechanical) 4	10
	Sustainable Energy Technologies 4	10
	Industrial/European Placement 4	60
	20 CREDITS FROM*:	
	Group Design Project (Hydropower Scheme)	20
	Group Design Project (The Passive House)	20
	Group Design Project (CO2 Capture Plant)	20
	10 CREDITS FROM*:	
	Dynamics 4	10
	Engineering Project Management 4	10
	Finite Element Methods for Solids and Structures 4	10
5	Mechanical Engineering MEng Individual Project 5 ‡	40
	Marine Energy 5	10
	Wind Energy 5	10

Year of Programme	Course	Credit
5	Semester 1: 40 CREDITS FROM*:	
	Computational Fluid Dynamics 5	20
	Dynamics 4	10
	Engineering Project Management 4	10
	Fire Science and Fire Dynamics 4	10
	Finite Element Methods for Solids and Structures 4	10
	Advanced Dynamics and Applications 5	10
	Fire Safety Engineering 4	10
	20 CREDITS FROM*:	
	Nanotechnology 5	20
	Polymer and Composite Materials 4	10
	Supply Chain Management 4	10
	Engineering in Medicine 5	10
	Thin-Walled Members and Stability 4	10
	The Finite Element Method 5	10
	Oil and Gas Systems Engineering 5	10

* A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

† Entry to 4th year MEng normally requires average of 55% in third year, at the first attempt.

‡ For the award of Honours a minimum mark of 40% must be attained in the Mechanical Engineering MEng Individual Project 5.

Electrical and Mechanical Engineering (MEng)

Degree Type: **Combined** UCAS Code: **HHH6**

Year of Programme	Course	Credit
1	Engineering 1	20
	Mechanical Engineering 1	20
	Electrical Engineering 1	20
	Engineering Mathematics 1A	20
	Engineering Mathematics 1B	20
	Further Courses	20
2	Dynamics 2	10
	Fluid Mechanics 2	10
	Engineering Thermodynamics 2	10
	Structural Mechanics 2A	10
	Industrial Management 1	20
	Engineering Mathematics 2A	10
	Engineering Mathematics 2B	10
	Analogue Circuits 2	10
	Digital System Design 2	10
	Power Engineering 2	10
	10 CREDITS FROM*:	
	Engineering Mathematics 2A	10
	Electronics Project Laboratory 2C	10
3	Dynamics 3	10
	Fluid Mechanics (Mechanical) 3	10
	Thermodynamics 3	10
	Professional Issues for Mechanical Engineers 3	10
	Analogue Circuits 3	10
	Power Electronics and Machines 3	10
	Power Systems 3	10
	Control and Instrumentation Engineering 3	10
	Solid Mechanics 3	10
	Digital System Design 3	10
	Engineering Software 3	10
	Sustainable Energy Group Design Project 3	10
4†	Industrial/European Placement 4	60
	10 CREDITS FROM*:	
	Power Electronics 4	10
	Power Systems and Machines 4	10
4†	30 CREDITS FROM*:	
	Dynamics 4	10
	Engineering Project Management 4	10
	Energy Systems 4	10
	Fluid Mechanics (Mechanical) 4	10
	Finite Element Methods for Solids and Structures 4	10
	20 CREDITS FROM*:	
	Group Design Project (Hydropower Scheme)	20
	Group Design Project (Potable Water Supply)	20
	Group Design Project (Design of Micro-systems)	20
	Group Design Project (The Passive House)	20
	Group Design Project (CO2 Capture Plant)	20
5	Mechanical Engineering MEng Individual Project 5 ‡	40
	Power Systems Engineering 5	20
	Semester 1: 40 CREDITS FROM*:	
	Dynamics 4	10
	Energy Systems 4	10
	Engineering Project Management 4	10
	Fluid Mechanics (Mechanical) 4	10
	Fire Science and Fire Dynamics 4	10
	Sustainable Energy Technologies 4	10
	Power Electronics 4	10
	Power Systems and Machines 4	10
	Finite Element Methods for Solids and Structures 4	10
	Computational Fluid Dynamics	20
	Advanced Dynamics and Applications 5	10
	Fire Safety Engineering 4	10
	10 CREDITS FROM*:	
	Analogue Electronics (Circuits) 4	10
	Power Conversion 4	10
	Digital System Design 4	10
	Marine Energy 5	10
	Wind Energy 5	10
	Engineering in Medicine 5	10
	Thin-Walled Members and Stability 4	10
	The Finite Element Method 5	10
	Oil and Gas Systems Engineering 5	10

* A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

† Entry to 4th year MEng normally requires average of at least 55% in third year.

‡ For the award of Honours a minimum mark of 40% must be attained in the Mechanical Engineering MEng Individual Project 5.

Electrical and Mechanical Engineering (BEng)

Degree Type: Combined UCAS Code: HH36
Years 1, 2 & 3 are the same as Electrical and Mechanical Engineering (MEng) HHH6

Year of Programme	Course	Credit
4	Mechanical Engineering Group Project 4	20
	BEng Electrical and Mechanical Engineering Project 4 ‡	40
	10 CREDITS FROM*:	
	Power Electronics 4	10
	Power Systems and Machines 4	10
	30 CREDITS FROM*:	
	Dynamics 4	10
4	Engineering Project Management 4	10
4	Energy Systems 4	10
	Fluid Mechanics (Mechanical) 4	10
	Finite Element Methods for Solids and Structures 4	10
	20 CREDITS FROM*:	
	Digital System Design 4	10
	Analogue Electronics (Circuits) 4	10
	Power Conversion 4	10

*A handbook giving details, as well as restrictions on choice of courses, will be available for students entering the programme to facilitate forward planning.

‡ For the award of Honours a minimum mark of 40% must be attained in the BEng Electrical and Mechanical Engineering Project 4.

Mechanical Engineering

What is Mechanical Engineering?

Professional Mechanical Engineers are responsible for the design and manufacture of an enormous range of industrial products - almost anything with moving parts, from aircraft to washing machines. As a Mechanical Engineer, you may find yourself using fundamental physics, complex mathematics and state-of-the-art computers, as well as your creative and inventive skills in designing and improving products. You may rapidly find yourself responsible for managing a large team of people and large financial budgets in producing new processes and products.

The main applications of Mechanical Engineering are usually thought of as planes, trains and automobiles. These industries have Mechanical Engineering principles and Mechanical Engineers at the very core of their businesses, but the subject opens doors to a much wider range of topics than you might think. A glance at the subject matter of recent final year projects gives a hint of what can be in store:

- automotive
- aeronautical and aerospace
- renewable energy
- robotics
- biomechanics
- sports engineering
- medical engineering
- manufacturing
- management & business

Why study Mechanical Engineering at Edinburgh?

The School of Engineering at the University of Edinburgh is of a medium-size with a strong emphasis on both teaching and research. The most recent Research Assessment Exercise in 2014 recognised the excellence of our staff with 94% of our overall research activity being world leading or internationally excellent.

We provide a friendly environment for learning, with guidance and pastoral care being offered throughout our degrees.

The School is well provided with the equipment required to cover all aspects of the subject area. Up-to-date computing facilities are available to all students. Increasingly, teaching materials and support are provided electronically using these facilities. Students also use advanced design software packages that are commonly used in industry. There is an emphasis on experimental work throughout all the degree programmes, and we have a broad range of equipment available for undergraduate study. What does the degree involve?

As a Mechanical Engineer, you will use a toolbox comprising in-depth knowledge of the core subjects (Materials, Fluid Mechanics, Thermodynamics, Solid Mechanics, Dynamics, Maths) to design solutions to problems, and place these solutions firmly in a business context. These, therefore, are the subjects and the over-arching themes that will be developed as you progress through your studies - the basics at first, but culminating in a major, individual project and industrial placement in your honours years.

In your **first year**, you will spend roughly equal amounts of time studying Engineering, Maths and outside subjects of your choice. The first half of the year will reinforce your basic Mechanics, while in the second half of the year we'll give you your first taste of Dynamics (moving objects), Thermodynamics (energy systems), Materials and Solid Mechanics (stresses, strains).

Second year sees your first major courses in Fluids, Solids, Dynamics and Thermodynamics, building the foundations of each of these subjects. You'll also have your first 'Design' classes, in which you'll begin to learn ways of pulling together material from all your lecture topics into solving problems. You'll also learn the basics of Computer Aided Design with the aid of a state-of-the-art CAD package (SolidEdge). The management / business aspects of the subject becomes a focus too, with about one third of your year spent studying this.

The **third year** develops your study of second year topics to the point at which we consider you to have the 'core' Mechanical

"Looking back through the years of my Engineering course at the University of Edinburgh it is amazing how far I have come, what I have learned and accomplished. The sound theoretical knowledge, practical laboratories and industrious work placements have developed me as an engineer and given me the skills to transgress the current job market. Better still, Edinburgh is a lively city that allows you to keep the balance and have fun through numerous societies, sports teams, pubs and clubs. The University and city are so well tendered to university study that I have applied to stay in Edinburgh for another three years to do a PhD, despite several job offers"

Jeffrey Steynor, Electrical & Mechanical Engineering student

Engineering knowledge. Up until the end of third year, you need to know it all; after third year you start to have a choice! The third year curriculum includes a little variety too - we introduce a series of industrial visits and a series of industrial seminars.

For the **MEng degrees**, the **fourth year** splits into two very different halves. The first half of the year is spent in an intensive series of advanced lecture courses and a multidisciplinary Group Design Project supervised by visiting Professors from industry. The second is spent on Industrial Placement. Placements in recent years have included Rolls-Royce, NASA, Ford, Lotus, Jaguar, BAE Systems and JCB. A list of all recent placements is included at the end of this document. The **MEng fifth** year comprises a major individual project and advanced study modules.

The **BEng fourth year** stream spends the first half of the year doing intensive lecture courses (as the MEng stream) but, after these are over, the BEng class proceeds to a major individual project for the second half of the year.

What can I study Mechanical Engineering with?

The structure of the engineering courses at Edinburgh is flexible, allowing students to defer the choice of specialisation until at least the end of first year. This flexibility means that a Mechanical Engineering student can keep open the option of Civil or Electrical Engineering, and even a science option such as Physics, Chemistry or Computer Science. The choice of Honours degree can be delayed to the beginning of the second year for the Electrical and Mechanical Engineering degrees, the middle of the second year for the "with Management" degrees, and the beginning of the third year to decide between the "with Renewable Energy" and Mechanical Engineering degrees. For all students, entry to MEng Honours is based upon third year performance.

What sort of teaching and assessment methods are used?

Our strategy in teaching is to commence with the scientific principles underpinning the practice of engineering, and then to show how these are applied to solving engineering problems. There is a structured programme of laboratory work and industrial visits to support the lecture material and design teaching. Group design exercises are used throughout the degree programme to apply the taught theory. Students are assessed using a combination of examinations, coursework and projects.

Are there any opportunities to study abroad?

For many students, a period of studying abroad can be a valuable and rewarding experience. Studying Mechanical Engineering at Edinburgh offers a wide variety of overseas study opportunities. We have a well-established exchange programme with many international universities through the Erasmus programme (Europe) and the University's International Exchange Programme (rest of the world) - under which students spend their whole third year overseas. Students have recently undertaken their third year at The University of California, Caltech, The University of Melbourne and The University of British Columbia and many more.

An integral part of the MEng programmes is a placement of six months, carried out in the fourth year. Usually, this placement is undertaken at a company. Although normally UK-based, the geographical spread of placements has extended from Alaska (small-scale wind energy) to Thailand (windsurfer boards).

Alternatively, the placement can be taken at a university abroad. Currently we have partnerships with Leibniz Universität Hannover (Germany), Chalmers University of Technology (Gothenburg, Sweden), Haute Ecole Blaise Pascal (Virton, Belgium), Malaga University (Spain) and University of Genoa (Italy).

Are there any links with industry or commerce?

As would be expected with an Engineering School, our links with the industrial sector beyond university are strong. Students on the MEng programmes undertake a six-month placement, the majority of which are taken in industry. Recent placements have included BMW, Ford, Glenmorangie, npower, Pelamis Wave Power, Rolls Royce, Shell, TUV NEL and Volkswagen.

We also have an 'Industrial Liaison Board' comprising representatives of a spectrum of companies which meets annually. It reviews our degree content to ensure that we continue to meet the needs of industrial employers, and suggests innovations and enhancements as appropriate.

Are there any bursaries or scholarships available?

The School of Engineering offer several scholarships and bursaries alongside those offered by the University. For more information please visit: **www.eng.ed.ac.uk and search for scholarships.**

What can I do after my degree?

The skills you will gain whilst studying this degree are highly sought after in industry. Recent graduates have left for jobs with companies across a wide range of industries: automotive (Ford, Jaguar, Land Rover), aerospace (BAE Systems, Rolls Royce), oil and gas (ExxonMobil, Shell), energy (ScottishPower, npower) and renewable energy (Garrad Hassan, Pelamis Wave Power, Wavegen). Many others choose to further their studies by proceeding to postgraduate level (PhD or MSc).

Our graduates have not only found employment in industries associated with engineering. A number have moved into areas such as management consulting (working for consultants such as Accenture, Deloitte or PriceWaterhouseCoopers), where a background in management, along with numeracy and problem-solving skills is highly valued.

What are admissions staff looking for?

Applicants should be aware that when demand for places is high, attaining the minimum entry requirements may be insufficient for the offer of a place to be made. All applicants must have Mathematics and Physics (or equivalent) to Higher or A Level standard.

You will find our most up to date entry requirements at: www.ed.ac.uk/studying/undergraduate/degrees

All applicants who are made an offer to study this subject will be invited to visit us. A visit will enable you to see the environment in which you may be spending the next few years of your life, as well as providing you with the opportunity to discuss any particular questions in a one-to-one session with a lecturer.

Students with strong A Levels or Advanced Highers may be given the option of starting at second year, thus completing a BEng in only three years or an MEng in four years.

We encourage applications for the MEng rather than the BEng whenever possible. At present, an MEng degree is the simplest route to ensuring that you will be eligible for professional qualification as a Chartered Engineer after appropriate experience in industry. BEng graduates will need to undertake further study before they can attain such status. In practice the ability to change to, or continue on, the MEng programme depends on performance during the third year.

How do I find out more?

For further information or to arrange a visit, please contact:

Recruitment and Admissions Officer, School of Engineering, The University of Edinburgh, Faraday Building, King's Buildings, Edinburgh EH9 3JL

Tel: 0131 650 7352 Email: ugenquiries@eng.ed.ac.uk Web: **www.eng.ed.ac.uk**

1st Year

Engineering 1 (20 points)

Lectures = 3 hours per week, tutorials = 1 hour per week; laboratory sessions = 3 hours per week. Taught in Semester 1

An introduction to the engineering profession, including aspects of Chemical, Civil, Electrical and Mechanical Engineering. This course will demonstrate, through lectures and case studies, how Engineers with different specialist background can each contribute to the solution of complex engineering problems.

Prerequisites: SCE H-grade Mathematics or equivalent.

Mechanical Engineering 1 (20 points)

Lectures = 3 hours per week; tutorials and laboratory sessions = 4 hours per week. Taught in Semester 2

This is an introduction to the principles of Mechanical Engineering. The topics covered include: Analysis of Static Structures, Stress and Strain, Dynamic Analysis of Bodies in Simple Linear and Rotational Motion, Energy Conversion. Practical work includes measurement techniques and the construction of machines such as gearboxes, engines and pumps. A significant part of this half-course is jointly taught with Civil Engineering 1.

Prerequisites: It is RECOMMENDED that students have passed Engineering 1.

Engineering Mathematics 1A (10 Points)

Lectures = 3 hours per week; Tutorials = 1 hour per week

This course covers:

- Basic rules of algebra and algebraic manipulation, suffix and sigma notation, binomial expansion, parametric representation, numbers and errors.
- Functions, graphs, periodicity; polynomials, factorization, rational functions, partial fractions, curve sketching. The circular, hyperbolic and logarithmic functions and their inverses. Implicit functions, piecewise functions, algebraic functions.
- Sequences and series; permutations and combinations, Binomial theorem. Polynomials and their roots, partial fractions.
- Complex numbers: Cartesian, polar form and de Moivre's theorem; connection with trigonometric and hyperbolic functions; the complex logarithm; loci.
- Basic vector algebra; scalar product, vector product, triple product and geometry.
- Matrices, inverses and determinants, linear equations and elimination.
- Rank, eigenvalues, eigenvectors, symmetric matrices.

Prerequisites: A-Grade at Higher Mathematics OR B-Grade at A-level Mathematics OR equivalent

Engineering Mathematics 1A (10 Points)

Lectures = 4 hours per week; Tutorials = 1 hour per week

This course covers:

AP's, GP's, limits, power series, radius of convergence.

-Basic differentiation: rate of change, simple derivatives, rules of differentiation, maxima/minima. Derivatives of powers, polynomials, rational functions, circular functions. Chain rule. Differentiation of exponential and related functions, differentiation of inverse functions, parametric and implicit differentiation, higher derivatives. Partial differentiation, directional derivatives, chain rule, total derivative, exact differentials. L'Hopital's rule. Taylor &©s Theorem and related results. Maclaurin series.

- Basic integration: anti-derivatives, definite and indefinite integrals.
- Fundamental Theorem of Calculus. Substitution. Area, arc-length, volume, mean values, rms values and other summation applications of integration. Integration by parts. Limits and improper integrals.
- Differential equations. General and particular solutions, boundary values.
- Separable differential equations. First order linear differential equations with constant coefficients.

Prerequisites: A-Grade at Higher Mathematics OR B-Grade at A-level Mathematics OR equivalent

Electrical Engineering 1 (20 points)

Lectures 3 hours per week; tutorials and laboratory sessions = 4 hours per week. Taught in Semester 2

An introduction to Electrical Engineering (Circuit Analysis, a.c. Theory, Operational Amplifiers, Electromagnetism, Semiconductor Devices).

Prerequisites : Prior attendance at Engineering 1 or (in special circumstances) prior attendance at another half-course.

2nd YEAR

Analogue Circuits 2 (10 points)

This lecture course introduces theoretical and practical concepts in Analogue Circuit design. The role of feedback in active circuits is emphasised and illustrated with reference to operational amplifiers. It is shown how to design simple, but practical, bipolar amplifiers to a given specification. Bode and Nyquist diagrams are introduced and applied to the frequency compensation of op-amps and the analysis and design of first

order active filters. An important aim of the course is to provide the theoretical background required by the analogue project lab.

Dynamics 2 (10 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 4 hours per week. Taught in Semester 2

This course aims to provide a basic understanding of the Laws of Newtonian Mechanics for bodies and systems of bodies in plane motion, and to achieve proficiency in their use in conjunction with kinematic principles for a range of mechanical engineering applications.

Prerequisites: Students MUST have passed Engineering 1 or Mechanical Engineering 1 or Civil Engineering 1 or Chemical Engineering 1 or Physics 1A and 1B or Chemistry 1A and 1B.

Digital System Design 2 (10 points)

Taught in Semester 2.

An introduction to digital electronic circuits and systems. The lectures presume a basic knowledge of the current/voltage properties of resistors, capacitors and MOS transistors and some simple properties of number.

Starting with the creation of the discrete binary abstraction from continuous voltage/time circuits, the lectures cover the representation of information in simple codes and sequences of codewords, and the definition and design of logic gate networks and modules for processing such information. Simple tools and techniques are used to study the principles of analysis and design at the transistor, logic gate, register, transfer and algorithmic levels of organisation. By following alternative synthesis design flows in a top-down design process, the features of implementation fabric and their influence on the design process is revealed.

Electronics Project Laboratory 2C (10 points)

Taught in Semester 1

The students will design and analyse the analogue and digital sampling components for a speech digitiser circuit. The fundamental characteristics of the digital signal abstraction are investigated along with the properties of basic logic function gates. Using a progressive modular approach, simple arithmetic and control function hardware is constructed and its performance measured and analysed. The laboratory lays the foundation for measurement, analysis and interpretation of the performance of digital systems studied in later years. The content is directly linked to the course Digital System Design 2.

Electronics Project Laboratory 2A (10 points)

Taught in Semester 1

The students will design and analyse the analogue and digital sampling components for a speech digitiser circuit. The students will also undertake self-learning material that introduces them to the use of MATLAB software. The basic syntax of MATLAB is introduced, along with data plotting and scripting techniques for basic problem solving.

Fluid Mechanics 2 (10 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 4 hours per week. Taught in Semester 1.

The student should develop an awareness of the qualitive behaviour of fluids in typical situations so that models of problems can be set up for solution. The course's objectives are to:

1. Produce quantitative solutions for models derived from some useful applications in the fields of measurement and pipe flow;
2. Establish enough theoretical background to enable the range of validity of these basic solutions to be understood; and to
3. Provide a starting point with respect to terminology and theory for more advanced study in subsequent years.

Engineering Thermodynamics 2 (10 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 2 hours per week. Taught in Semester 2.

This course provides a basic grounding in the principles and methods of Classical Thermodynamics. It concentrates on: understanding the thermodynamic laws in relation to familiar experience; phase change, ideal gas and flow processes; using sources of data like thermodynamic tables and charts; application of the basic principles to the operation of various engine cycles.

Prerequisites: Students MUST have passed Engineering 1 or Mechanical Engineering 1 or Civil Engineering 1 or Chemical Engineering 1 or Physics 1A and Physics 1B or Chemistry 1A and Chemistry 1B or equivalent.

Structural Mechanics 2A (10 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 4 hours per week. Taught in Semester 1.

This course describes the basic principles of Structural Mechanics, focusing on one-dimensional beam members.

Prerequisites: Students MUST have passed Civil Engineering 1 or Mechanical Engineering 1.

Materials Science and Engineering 2 (10 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 4 hours per week. Taught in Semester 2

To provide a broad introduction to the materials used in engineering, their properties and structures

Prerequisites: Students MUST have passed Engineering 1 or Mechanical Engineering 1 or Civil Engineering 1 or Chemical Engineering 1 or Physics 1A and Physics 1B or Chemistry 1A and Chemistry 1B.

Electrical Power Engineering 2 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 2

This is an introduction course to the techniques and equipment used in the generation, transmission, distribution and utilisation of electrical power. It gives a basic understanding of how a power system operates and the problems facing electricity utilities. The design and main operating features of different types of motors and generators are also covered..

Mechanical Engineering Design 2A (10 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 3 hours per week. Taught in Semester 1

This course will introduce you to two software packages which are important tools in the design process. 'Mathcad' enables you to set up and solve mathematical and numerical models of engineering systems. 'Solid Edge' is a drawing and three-dimensional design program. The module is primarily aimed at developing skills in the use of the software, with the underpinning theory coming later in the degree. Although we shall be using particular pieces of software, the principles apply to the many similar programs which are available commercially. In addition, this course will introduce the various design phases in order to gain an appreciation of the relevant codes and standards and carry out the analysis of a range of simple machine elements. It encourages innovation and establishes an awareness of reliability, ergonomics and terotechnology.

Prerequisites: Students MUST have passed Mechanical Engineering 1 or Civil Engineering 1 or Chemical Engineering 1 or Physics 1A and Physics 1B or Chemistry 1A and Chemistry 1B.

Mechanical Engineering Design 2B (10 points)

Lectures = 2 hours per week. Taught in Semester 2

This course introduces the various design phases in order to gain an appreciation of the relevant codes and standards and carry out the analysis of a range of simple machine elements. It encourages innovation and establishes an awareness of reliability, ergonomics and terotechnology.

Prerequisites: Students MUST have passed Mechanical Engineering 1 or Civil Engineering 1 or Chemical Engineering 1 or Physics 1A and Physics 1B or Chemistry 1A and Chemistry 1B.

Industrial Management 1 (20 points)

Lectures = 3 hours per week. Taught in Semester 1

This course is a service course primarily for students in the College of Science and Engineering and provides a broad introduction to some aspects of business management and business organisation. The main topics are: the firm and its objectives, economic factors in management, marketing, accounting and human resource management.

Engineering Mathematics 2A (10 points)

Lectures: 2 hours per week. Taught in Semester 1

Ordinary differential equations, transforms and Fourier series with applications to engineering. Linear differential equations, homogeneous and non-homogeneous equations, particular solutions for standard forcings; Laplace transforms and applications; standard Fourier series, half range sine and cosine series, complex form; convergence of Fourier series, differentiation and integration of Fourier series.

Prerequisites: Students MUST have passed: Mathematics for Science and Engineering 1a AND Mathematics for Science and Engineering 1b

Engineering Mathematics 2B (10 points)

Lectures = 2 hours per week, Tutorials: at times to be arranged Taught in Semester 2

Multivariate integration, vector calculus and partial differential equations for engineering. Gradient, tangent plane, normals; Scalar and vector fields; divergence and curl; conservative fields and potential; vector differential identities; simple applications from properties of continua and electromagnetism. Repeated multiple integration (change of order of integration); integration in non-cartesian coordinates, Jacobian; line integrals (link to potential and work); surface integrals (flux); divergence, Green's and Stokes' theorems; applications and physical interpretations; standard partial differential equations, wave equation, heat equation and Laplace's equation, solution of standard equations, D'Alembert solution for wave equation, separation of variables with Fourier series, Laplace transform methods.

Prerequisites: Students MUST have passed Mathematics for Science and Engineering 2a

Techniques of Management (20 points)

Lectures = 3 hours per week. Laboratory sessions = 1 hour per week. Taught in Semester 2

This is a course in management which may be taken in combination with Industrial Management 1. The course includes tuition on the use of spreadsheets generally and makes use of these in practical sessions to cover, in a 'hands on' manner, topics such as: forecasting, discrete event simulation, simulation analysis, linear programming, budgeting, costing, book-keeping and financial reporting.

Electronics 2 (20 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 7 hours per week. Full year course.

This module introduces theoretical and practical concepts in Analogue and Digital Circuits. it consists of a lecture course covering key concepts and mathematical techniques as well as a substantial project to build a system to capture speech signals on a computer using analogue and digital hardware. The role of feedback in active circuits is emphasised and illustrated with reference to operational amplifiers. Bode and Nyquist diagrams are introduced and applied to the frequency compensation of op-amps and the analysis and design of first order active filters. The role of differential equations, phasors and Laplace transform for the steady state and transient analysis of linear circuits are explained. Logic circuit principles are developed from considerations of Boolean algebra and code construction. Primitive combinatorial gates are studied, from which a systematic approach to the design of larger combinatorial structures is developed. The development of gate structures exhibiting memory leads on to the design of simple state machine structures, where the sequential behaviour is described with simple graphical or tabular techniques. The project provides practical experience of developing and testing electronic circuits as well as using software tools to assist with the design process.

Prerequisites: Students MUST have passed Mathematical Methods 2 or Electrical Engineering 1 or Engineering 1.

Electronic Circuits and Devices 2 (10 points)

Lectures = 2 hours per week. Taught in Semester 1.

The objective here is to introduce the concepts underlying device operation and fabrication, without covering the detailed physics. Students will gain an appreciation of the basic semiconductor properties relevant to device operation and fabrication, and an understanding of the operation of the pn junction diode and transistors, together with their properties, such as /I-V/ characteristics. An introduction to circuits using transistors will also be provided, explaining how to bias a transistor for linear operation. Small signal models to explain transistor behaviour will also be described.

Prerequisites: Students MUST have passed Mathematical Methods 2 or Electrical Engineering 1 or Engineering 1.

Co requisites: Students MUST also take Electronics 2.

3rd Year

Computer Aided Engineering 3 (10 points)

Laboratory sessions =6 hours per week.

The course aims to develop an understanding of the techniques used in Computer Aided Design and Manufacture. This is undertaken through both industry-based CAD/CAM exercises and an introduction to the technologies involved in the research and development of CAD/CAM systems.

Dynamics 3 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 2

The course is designed to allow students to achieve competence in the methods of dynamic analysis for lumped parameter linear systems, covering dynamic response and vibration analysis and, their uses in engineering applications.

Pre-requisites: Students MUST have passed Dynamics 2.

Fluid Mechanics (Mechanical) 3 (10 points)

Lectures = 2 hours per week. Taught in Semester 2.

This course addresses four, broad areas of fluid mechanics. The aims are: 1. To develop and apply the concepts introduced in Fluid Mechanics 2 to engineering applications in turbomachinery and flow measurement; 2. To introduce and apply to concepts of similarity and scaling within fluid mechanics; 3. To introduce the Navier Stokes equation and demonstrate its use in simple flows; 4. To review flow measurement devices / techniques, from industrial machines to modern, laser-based methods.

Pre Requisites: Students MUST have passed Fluid Mechanics 2.

Manufacturing Technology 3 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 2.

Manufacturing is the creation, through one or several processing operation, of components or products from basic raw materials. The effectiveness of process selection will be based on the inter-related criterion of design parameters, material selection and process economies.

Solid Mechanics 3 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 1

The course is designed to give students a basic understanding of structural modelling and stress analysis to allow them to check design work for strength and stability, to check stress existing designs and to investigate failure problems.

Pre Requisites: Students MUST have passed Structural Mechanics 2A.

Thermodynamics 3 (10 points)

Lectures = 2 hours per week; tutorials = 2 hours per week. Taught in Semester 1.

The course presents thermodynamics as a real world subject and insists that there is a pattern to working with thermodynamics which is summarised as Principles, Properties, and Processes. This pattern is applied to a variety of machines and devices including turbines, reciprocating compressors, nozzles, power cycles, air conditioning systems and cooling towers. A final separate section introduces the basic ideas of heat transfer.

Pre Requisites: Students MUST have passed Engineering Thermodynamics 2.

Control and Instrumentation Engineering 3 (10 points)

Lectures = 2 hours per week; tutorials and laboratory sessions = 1 hours per week. Taught in Semester 2.

This is a first course in the design and analysis of instrumentation and control systems. The course starts with an introduction to instrumentation, covering the basics of sensor technology and measurement techniques, including the characteristics and real-world limitations of transducers as well as their interfacing with the control system. It then goes on to introduce Control Theory, providing a basic understanding and building the mathematical background for the modelling, design and analysis of linear single-input single-output feedback systems. It then introduces the concept of stability as well as the available methods for its assessment. It develops the analytical tools for the design of appropriate controllers to improve system performance. It allows students to appreciate the interdisciplinary nature and universal application of control engineering. Finally it introduces modern approaches including application of artificial intelligence to control systems.

The course also has a hands-on laboratory (3 hours in total split into 2 sessions) which allows the students to get practical experience in working with a dynamic system and designing a simple controller.

Mechanical Design Principles 3 (10 points)

Lectures = 3 hours per week. Taught in Semester 1.

Engineering design is often regarded as the central creative activity of engineering, requiring the skills of analysis and synthesis to develop solutions to open-ended problems. This module consolidates and builds on students' existing design experiences.

Mechanical Engineering Design 3 (10 points)

Lectures = 2 hours per week. Taught in Semester 2.

This course aims to give students experience of tackling an engineering design problem with all the uncertainties of the real world, personal interactions and time management.

Mechanical Design Project 3 (10 points)

Lectures = 2 hours per week. Taught in Semester 1.

This course aims to give mechanical engineering students experience of tackling a mechanical engineering design problem with all the uncertainties of the real world, personal interactions and time management.

Marketing Technical Products 3 (10 points)

Lectures = 3 hours per week. Taught in Semester 2

The course is aimed at third year undergraduate science and engineering students, or anyone with an interest in the process of turning science and technology into a product. The material is introduced through lectures, cases, videos, and additional multimedia resources.

Computer Methods in Structural Engineering 3 (10 points)

Lectures = 2 hour per week; tutorials and laboratory sessions = 1 hours per week.

This course introduces computational matrix methods (flexibility and stiffness) as a tool for numerical analysis of structures with an introduction to the mathematics of matrices.

Professional Issues for Mechanical Engineers (10 points)

Lectures = 2 hours per week; laboratory sessions = 9 hours per week. Full year course.

This course covers a range of issues and activity associated with mechanical engineering practice. These include legal issues and knowledge of real world activity through engineering applications and guest lectures.

Manufacturing Information Systems (MIS) 3 (10 points)

Lectures = 1 hour per week; laboratory sessions = 2 hours per week. Taught in Semester 1.

The course introduces the principles of a 'Product Lifecycle' and assesses the implications of advanced enterprise-wide informtation systems for the organisation of product development and beyond. By drawing on original case study materials, video resources, and industrial guest speakers, the course explores the philosophies of Product Lifecycle Management and Product Data Management and examines the interactions between information technologies, organisation and product data.

Sustainable Energy Group Design Project 3 (10 points)

Lectures = 2 hours per week. Taught in Semester 2.

This course aims to give students experience of tackling an engineering design problem in the area of renewable / sustainable energy, with all the uncertainties of the real world, personal interactions and time management.

Sustainable Energy: Principles and Processes 3 (10 points)

Lectures = 1 hour per week; tutorials = 2 hours per week. Taught in Semester 1.

This course aims to establish a basic understanding of global patterns of energy use and systems of energy supply, in the context of their sustainability: social, environmental and economic. It is structured so as to familiarise students with the wide range of literature on sustainability, and aims to develop independent study, analysis and presentation skills.

4th Year

Dynamics 4 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 1.

This course provides an understanding of core aspects of advanced dynamic analysis, dealing with system modelling, dynamic response and vibration analysis both linear and nonlinear. To obtain an appreciation of the limits of analytical solutions and the value of these in underpinning modern computer methods for simulating dynamic response.

Energy Systems 4 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 1

The course applies the principles and techniques of thermodynamics to a variety of energy conversion systems including power plant, combined heat and power systems and heat pumps. It provides an introduction to the engineering of nuclear power stations and the utilisation of renewable energy sources. It concludes with a survey of the UK energy scene.

Engineering Project Management 4 (10 points)

Lectures = 2 hours per week. Taught in Semester 1.

Project Management is the application of management principles to deliver a project to a specified timescale, budget and quality. This course will consider the principles of the management of engineering projects with respect to the life-cycle of the project, the parties, planning, estimating, risk management, contractor selection and contract management.

Fluid Mechanics (Mechanical) 4 (10 points)

Lectures = 2 hours per week; tutorials = 2 hours per week. Taught in Semester 1.

This course introduces concepts that go beyond the 'one-dimensional' treatment of flows in ME2 Fluid Mechanics. The linking theme is the generation of fluid forces on the surfaces of structures, typified by the lift and drag forces on an aerofoil.

The Finite Element Method 5 (10 points)

Lectures = 1 hour per week. Taught in Semester 1.

The finite element method is an indispensable tool for engineers in all disciplines. This course introduces students to the fundamental theory of the finite element method as a general tool for numerically solving differential equations for a wide range of engineering problems. A range of field problems described by the Laplace, Poisson and Fourier equations is presented first and all steps of the FE formulation is described. Specific applications in heat transfer and flow in porous media are demonstrated with associated tutorials. The application of the method to elasticity problems is then developed from fundamental principles. Specific classes of problem are then discussed based on abstractions and idealisations of 3D solids, such as plane stress and strain, Euler-Bernoulli and Timoshenko beams and Kirchoff and Mindlin-Reissner plates and shells.

Pre-requisites: Students MUST have passed Computer Methods in Structural Engineering 3 or Computer Methods for Mechanical Engineering 3. It is RECOMMENDED that students have passed Plastic Analysis of Frames and Slabs 4.

Polymers and Composite Materials 4 (10 points)

Lectures = 3 hours per week. Taught in Semester 2.

This course offers an overview of the applications and uses of polymeric and composite materials putting the subject in the context of the needs and advancements of society, industry and national well-being. It is primarily focused on their (thermal, rheological, mechanical) properties, processing and characterisation.

Supply Chain Management 4 (10 points)

Lectures = 3 hours per week. Taught in Semester 2.

This course focuses mainly on the materials management topics of operations management. Its goal is to help students become effective managers in today's competitive, global environment. This is because many of the students who take this course will progress to become managers in manufacturing (and service) organisations in a variety of functional areas. Students should gain an understanding what material managers do and realise that materials management involves many business functions.

BEng Mechanical Engineering Project 4 (40 points)

Taught in Semester 2

During their final year students undertake a significant piece of project work under the supervision of a member of the academic staff within the School. The duration of the project depends on the specific degree programme, but will normally span a period of several months. Students are encouraged to generate their own project outline, subject to approval from the School's Teaching Committee; alternatively students may choose to develop a project from a list of titles supplied by a member of the academic staff. Projects may also be carried out in collaboration with industry. The project is advanced through deployment of accepted engineering and research practices.

Finite Element Methods for Solids and Structures 4

Lectures = 4 hours per week; tutorials = 1 hour per week. Taught in Semester 1

The finite element method (FEM) (also called finite element analysis or FEA) originated from the need to solve complex problems in solid mechanics. FEM is used to obtain approximate numerical solutions to a variety of equations of calculus. Today it is used in a wide range of disciplines. This course is an introduction to FEA as applied to elasticity problems in solid and structural mechanics. The mathematical equations are developed using the virtual work basis of FEM and this is used to develop equations for one, two and three dimensional elements. As FEA is a computational tool this course includes practical exercises using the commercial package ABAQUS. A number of tutorials involving hand calculations are provided to aid understanding of the technique.

Students MUST have passed: Computer Methods in Structural Engineering 3 (CIVE09027)

Mechanical Engineering Group Project 4 (20 points)

Taught in Semester 1.

The Group Project is concerned with gathering, critically analysing and presenting a coherent body of information on an engineering-related topic. The group is allocated a theme and each member of the group is assigned a topic relevant to the theme. The students, operating as a group, are required to research the theme, developing a body of interrelated knowledge and an understanding of their topics. This is accomplished primarily through investigation of the published literature, and by making contact with industry and other organisations. The objective is to collect, distil, analyse and present in a logical fashion, a summary of the information collected.

Industrial/European Placement 4 (60 points)

Teaching time = 35 hours per week for 26 weeks

As an integral part of the MEng degree programme, students undertake an industrial or overseas academic placement consisting of six to eight months of full time engineering work, occupying the period from January to September of 4th Year.

The nature of the work the students do can vary enormously. In an industrially based placement, the host company will normally provide the student with a project (or projects) which will be started and completed during the placement period; alternatively the student will be assigned to an ongoing project and will be expected to make a significant contribution to that project. In a placement at an overseas academic institution, students are presented with a substantial research based project and expected to develop this project within the constraints of the accepted practices of the institution in which they are working.

Onus is placed on the student to secure the placement, although supporting advice is provided by members of the School and by the University Careers Service.

Group Design Project (Potable Water Supply) (20 points)

Group Design Project (Hydropower Scheme) (20 points)

Group Design Project (Design of Micro-system) (20 points)

Group Design Project (CO2 Capture Plant) (20 points)

Group Design Project (The Passive House) (20 points)

These projects are intended to introduce students to multidisciplinary planning and design. The project should develop creative thinking, team skills, and an improved understanding of other disciplines.

Operations Management 4 (10 points)

Lectures = 2 hours per week. Taught in Semester 1

The objectives of this course are to develop an understanding of the concepts, tools and practices relating to the operations of an organisation, with particular emphasis upon manufacturing, and also the ability to diagnose operational dysfunction and suggest possible solutions. It examines the process nature of operations, the strategic importance of operations and the issues influencing efficient, effective and adaptable operations.

Sustainable Energy Technologies 4 (10 points)

Lectures = 3 hours per week.

This course aims to provide an introduction to engineering principles and designs underpinning key sustainable/renewable energy technologies. It is structured so as to familiarise students with the wide range of literature on sustainable energy technologies, and aims to develop further independent study, analysis, synthesis and presentation skills.

Power Systems and Machines 4 (10 points)

Lectures = 1 hour per week; tutorials = 1 hour per week. Taught in Semester 1

This course deals with: the steady state performance of induction machines; the transient behaviour of synchronous machines; principles of operation of power system protection equipment; protection of power system components and machines; the operation and protection of distributed generators.

Prerequisites: It is RECOMMENDED that students have passed Electrical Power Engineering 3 and Electronic Engineering 3.

Digital System Design 4 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 2

This course is lecture based and is taken by all students taking the forth year of electronics and/or electrical engineering degree in Semester 2. It comprises one 20 lecture module. The course aims to present the principles of design re-use in the context of System-on-Chip (SoC) technology. The design and selection of soft, firm, and hard IP blocks are considered. Emerging design practices and standards are reviewed. Two target technologies are addressed: deep-submicron ASICs and field programmable gate arrays (FPGAs).

Prerequisites : Electronics 2 or Digital Electronics 3 or Electrical and Mechanical Engineering 3

Power Electronics 4 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 1.

This course aims to equip students to enter the power electronics industry by providing them with an understanding of the fundamental principles of power semiconductor devices and circuits, and the knowledge and skills required to analyse and design such circuits. Students will also be introduced to the central issues involved in the specification and design of power electronic systems in lower power applications, in particular switched mode power supplies.

Prerequisites: It is RECOMMENDED that students have passed Electrical Power Engineering 3.

Analogue Electronics (Circuits) 4

Lectures = 3 hours per week. Taught in Semester 1

This course introduces students to the important analogue circuits of active filters, sine wave oscillators, relaxation oscillators, current sources, voltage references and phase-locked loops. The aim is to present and instill the principles of circuit operation and the essential circuit analysis and design techniques to enable students to understand and design the simpler variants of the above circuits and to be capable of extending their understanding to more complex variants.

Pre-requisites: It is RECOMMENDED that students have passed Electronic Engineering 3.

Power Conversion 4 (10 points)

Lectures = 3 hours per week. Taught in Semester 2.

This course introduces students to electrical machine drives, including 4 quadrant operation control of both dc and induction machines. Different types of electrical generators used for renewable energy conversion are then studied, including induction generators, permanent magnet generators and linear generators. The course also includes the design and operation of power electronic converters as used in a variety of renewable energy systems (solar PV, wind, wave and tidal power), and in power systems (FACTS, HVDC).

Pre-requisites: It is RECOMMENDED that students have passed Power Electronics 4 and Electrical Power Engineering 3.

5th Year

Mechanical Engineering MEng Individual Project 5 (40 points)

Teaching time = 3 hours per week for 22 weeks. Full year course.

During their final year students undertake a significant piece of project work under the supervision of a member of the academic staff within the School. The duration of the project depends on the specific degree programme, but will normally span a period of several months. Students are encouraged to generate their own project outline, subject to approval from the School's Teaching Committee; alternatively students may choose to develop a project from a list of titles supplied by a member of the academic staff. Projects may also be carried out in collaboration with industry. The project is advanced through deployment of accepted engineering and research practices.

Energy and Environmental Economics (10 Points)

Lectures = 2 hours per week. Taught in Semester 1.

The aim of this course is to provide a theoretical grounding in economics from first principles, therein exploring the fundamental principles of efficiency in the distribution of resources in society. These principles are then applied in the fields of energy and environment, using case studies to discuss applications in practice.. The course covers both conventional (neo-classical) economics and also criticisms of this dominant paradigm. No prior knowledge of economics is assumed. Each topic is introduced in a lecture.

Computational Fluid Dynamics 5 (20 points)

Laboratory sessions = 3 hours per week. Taught in Semester 1.

This module introduces CFD by means of a set of lectures covering the background physics and mathematics, together with practical assignments that use commercial CFD software to solve flow problems. The need for error control and independent validation of results is stressed throughout. Although particular software (GAMBIT and FLUENT) is used for the assignments, the underlying themes of the module are generic.

Materials Engineering 5 (20 points)

Lectures = 3 hours per week. Taught in Semester 1.

This course will give insight into advanced materials science and engineering through the unifying theme of Deformation, Fracture and Failure. The module will be taught through the analysis of real engineering case-studies. Much of the course will be closely connected to research activities within the School.

Marine Energy 5 (10 points)

Lectures = 1 hour per week. Taught in Semester 2.

The seas and oceans appear to offer opportunities for the long term, cost effective, generation of energy. Waves and tidal currents represent high density energy resources which, in the case of the tides, are highly predictable in form. The wave resource, whilst not predictable in a true sense, is more easily forecast than is the wind. The engineering difficulties associated with effective exploitation of the marine resources are considerable, however. This course will guide the students through the process of understanding the resources and how to best develop and apply techniques for exploitation.

Pre-requisites: It is RECOMMENDED that students have passed Sustainable Energy Technologies 4.

Wind Energy 5 (10 points)

Lectures = 2 hours per week. Taught in Semester 2.

Wind energy is the fast growing renewable source for electricity generation. This course presents an introduction to the scientific and operational aspects of harnessing this resource. The objective is to present an overview of wind energy covering all aspects from planning a wind farm to how a wind turbine works. The main emphasis of the course is resource assessment starting with basic meteorology and understanding how this relates to wind farm design. Economics of wind energy are driven by both long and short-term variations in wind speed. This links to wind turbine control and grid issues. Finally other aspects such as environmental impacts will be detailed.

Pre-requisites: It is RECOMMENDED that students have passed Sustainable Energy Technologies 4.

Nanotechnology 5 (20 points)

Lectures = 3 hours per week. Taught in Semester 2.

This module will provide a broad introduction to nanotechnology. By considering the underpinning science and cases studies, insight will first be provided into why the nanoscale is so important and different from all other scales that have been considered by engineers to date. This is followed by consideration of nanotechnology from the perspectives of the main engineering activities of design, manufacture and testing.

Technology and Innovation Management 5 (10 points)

Lectures = 2 hours per week. Taught in Semester 2.

In an increasingly competitive and fast changing economic climate innovation represents a key route for organisations that want to survive and prosper. The course addresses the area of the management of technological innovation with a strong emphasis on the key role of organisations in creating, developing and transferring new knowledge, products and processes. In so doing, it provides students with a clear understanding and appreciation of innovation dynamics both within and across organisational boundaries. By drawing from state of the art innovation literatures as well as the extensive use of in-depth case study materials, the course analyses opportunities and challenges related to creating, sustaining and managing innovation with a specific focus on technology-based organisations.

Fire Safety Engineering 4 (10 points)

Lectures = 2 hours per week.

This course provides the principles of prescriptive design of structures for fire safety. All different aspects of design are discussed (i.e. flammability, detection & alarm, smoke management, fire suppression, fire resistance, egress, etc.), with particular attention to systems of classification and design applications. Although this module concentrates on prescriptive, rather than performance-based calculations, the emphasis is on intelligent application and use of codes and standards, and references will be made to more advanced methods and opportunities to use performance-based approaches in fire safety engineering. It is intended that the course will enable the student to carry out a prescriptive design in a critical manner with due consideration to any limitations, weaknesses or conservatisms which may be present.

Fire Science and Fire Dynamics 4 (10 points)

Lectures = 1 hour per week; tutorials = 1 hour per week. Taught in Semester 1.

This course is intended to provide the knowledge required for quantitative fire hazard analysis. Physical and chemical behaviour of combustion systems as well as the impact of fire on structures and materials will be addressed. The student will acquire skills for quantitative estimation of the different variables of fire growth. Basic principles of fire dynamics will be used to provide analytical formulations and empirical correlations that can serve as tools for design calculations and fire reconstruction. Focus will be given to the scientific aspects of fire but some basic features of fire safety engineering will be also developed.

Thin-Walled Members and Stability 4 (10 points)

Lectures = 2 hours per week; tutorials = 1 hour per week. Taught in Semester 1.

The two segments of this course introduce advanced elements of the theory of structures. The first provides an introduction to the behaviour and algebraic analysis of thin-walled structural members; the second covers the stability of structural elements and their analysis.

Pre-requisites: It is RECOMMENDED that students have passed Theory of Structures 3.

Power Systems Engineering 5 (20 points)

Lectures = 3 hours per week.

The aim of the course is to provide a hands-on experience of the problems created by transmission and distribution of energy from power stations to consumers and to cover a range of topics related to the privatisation and restructuring of electricity supply industry worldwide.The first part of the course will be simulation-based utilising PowerWorld load-flow simulation program. After some introductory lectures, the students will be investigating the problems of voltage drops, thermal transmission constraints, steady-state stability constraints, fault levels, transmission losses. In the second part of the course the students will be introduced to the principles of power system economics. Main regulatory regimes will be discussed together with the principles of marginal pricing. Then PowerWorld program will be used to evaluate network effects, i.e. locational marginal pricing. The module will finish with a simulation exercise in which the students will act as traders participating in an energy auction.

Prerequisites: It is RECOMMENDED that students have passed Power Systems and Machines 4.

Modern Economic Issues in Industry 5 (10 points)

Lectures = 3 hours per week. Taught in Semester 2.

The course aims to develop an understanding of economic principles and apply them to current industrial issues. Topics covered include investment, Pricing, sustainability and the EU.

Engineering in Medicine 5 (10 points)

Lectures = 2 hours per week. Taught in Semester 1.

This course will give an introduction to the applications of engineering within medicine. This will be a wide ranging course which will provide participants with knowledge of the essentials of skeletal, cardiovascular and nervous systems of the body and the principal biomedical devices developed for these systems. Current best practise and future developments will be studied with particular focus on where engineering can make a particular impact.

Note: The modules and programmes described in this document are meant as a guide only and therefore you might find when you are undertaking the degree programme the modules are different from that stated in this document.

University of Edinburgh
Mechanical Engineering Industrial Placements: 99/00 - 14/15

Company	Location
40South Energy	Plymouth
Abnormal Load Engineering	Stafford
Acergy	Norway
Acergy (Stolt Offshore)	Aberdeen
ACME Ferrite Products	Malaysia
Acordis	Derby
Active Education Solutions	Glasgow
Aeristech Ltd	Warwickshire
Aertec Solutions	Brussels
Afcons Infrastructure Ltd	Mumbai
AgaMatrix Inc	Boston, USA
AgustaWestland	Yeovil
AIRBUS Deutschland GmbH	Hamburg, Germany
Airflow Services	Cork, Ireland
AlbaTERN	Roslin
Alcatel Submarine Networks	Greenwich
Allen Gears	Worcestershire
Alstom Power Conversion	Rugby
AMEC Oil & Gas	Aberdeen
Anton LLP	Zalaegerszeg, Hungary
Apache North Sea Limited	Aberdeen
Apex Network Design	Singapore
Aquamarine Power	Edinburgh
Artemis Intelligent Power	Loanhead
Arup	Edinburgh
Arup	Leeds
Arup Building Services	London
Aston Martin	Graz, Austria
Atkins	Edinburgh
Atlantic Orient Corporation	Vermont, USA
AWS Ocean Energy	Inverness
Babcock Engineering Services	Rosyth
Babcock Marine	Dunfermline
Babcock Marine	Plymouth
BAE Systems	Barrow-in-Furness
BAE Systems	Preston
BAE Systems Avionics Ltd	Edinburgh
BAE Systems Marine	Glasgow
BHP Billiton	Trinidad
Bloodhound SSC	Bristol
Blue Energy	Vancouver
BMW	Munich, Germany
BMW-mini	Oxford
BNFL plc Seascale	Cumbria
Bodycote Materials Testing Group Ltd	Newbridge, Midlothian
Bosch Stuttgart,	Germany
Bosch Rexroth	Glenrothes
BP	Aberdeen

University of Edinburgh
Mechanical Engineering Industrial Placements: 99/00 - 14/15

Brecknell Willis & Co Ltd	Somerset
British Sugar	Norfolk
Buccleuch Bio Energy	Edinburgh
Buro Happold	Dublin
C2P Automotive	Milton Keynes
CA Group Ltd	Durham
Campbell Engineering and Design Ltd	Northern Ireland
Canadian Natural Resources	Aberdeen
Cargill Plc	Merseyside
CERN (Cryogenic Laboratory)	Geneva, Switzerland
Chevron Upstream Europe	Aberdeen
Connel Wagner	Auckland, New Zealand
Cool Consult ltd	Sofia, Bulgaria
Coors Brewery Limited	Burton-upon-Trent
Crofton Designs	London
Crown House	Stirling
Darchem Engineering	Stockton-on-Tees
Delmar Reynolds Medical	Edinburgh
Delphi Diesel Systems	Gloucestershire
DEM Solutions	Edinburgh
DERA	Dorchester, Dorset
Designworks	Brisbane, Australia
DFM	Wales
Diageo	Alloa
Diageo	Cameron Bridge
Diageo	Glasgow
Diageo	Leven
Diageo	Runcorn
Diageo	Alness
Diageo	Elgin
Divex Ltd	Aberdeenshire
Dvd. Richie (Implements) Ltd	Forfar
E.terras AG	München, Germany
EADS Astrium	Friedrichshafen, Germany
Earth Advantage Institute	Portland, OR, USA
ECN	Netherlands
Edinburgh Designs	Edinburgh
Edinburgh Instruments Ltd	Edinburgh
EDPR	Edinburgh
EG Technology	Cambridge
Ekium	Varsovie, Poland
EMI (Engineering Ministries International)	Colorado Springs, USA
Energeia Technologies	Antrin, NI
EnQuest	Aberdeen
Eon Climates and Renewables	Hamburg, Germany
Epitomy	Sheffield
ES Technology	Kingston
Exxon Mobil Production	Aberdeen
Federal-Mogul Camshafts Ltd	Godalming

Company	Location
Ferrari S.p.A.	Modena, Italy
Finforrest	Grangemouth
Flexitricity	Edinburgh
FloWave	Edinburgh
Fluor Daniel India Private Limited	India
FMC Technologies	Dunfermline
Ford Motor Company	Dunton, Essex
Frazer-Nash Consultancy	Glasgow
FR-HiTEMP Ltd	Wimborne, Dorset
Garrad-Hassan	Bristol
Garrad-Hassan	Glasgow
GE Caledonian	Prestwick
General Motors	Quito, Ecuador
Geoprober Drilling	Aberdeen
Gia Wind	Glasgow
Gilkes	Kendal
Glenmorangie plc	Livingston
Grontmij	Edinburgh
GT Railway Maintenance	Preston
Had-Fab	Tranent
Harley Haddow	Edinburgh
Highland Wood Energy	Torlundy, Fort William
Holset Engineering Co. Ltd	Huddersfield
Howden	Renfrew
Hulley & Kirkwood	Edinburgh
HW Energy	Fort William
Hydrasun Ltd	Aberdeen
Hydrogen Office	Edinburgh
Hydroplan	Fort William
IHC Engineering Business	Stocksfield
IMI Norgren Webber	Bristol
IMI plc	Birmingham
IMI Vision	Alcester, Warwickshire
Integrated Subsea Services (ISS)	Aberdeen
Interwell	Aberdeen
Irons Foulner	Edinburgh
Jacobs	Edinburgh
Jacobs-Babtie	Glasgow
Jaguar Cars Ltd	Coventry
Jaguar Land Rover	Birmingham
James Jones & Sons	Lockerbie
James Jones & Sons Ltd	Larbert
JAS Motorsport Honda Racing Team	Arluno, Italy
JCB Excavators	Staffordshire
John Deere Werke	Mannheim, Germany
John Huddleston Engineering	Greyabbey, Northern Ireland
JP Kenny	Aberdeen
KJ Tait Engineers	Edinburgh

University of Edinburgh
Mechanical Engineering Industrial Placements: 99/00 - 14/15

Lab901	Loanhead
Leyland Trucks	Preston
Linn	Eaglesham
Lloyds Register	Aberdeen
Lloyds Register	London
Lotus Cars Ltd	Norwich
Lotus F1 Team	Oxford
MacTaggart Scott	Loanhead
Marathon Oil	Aberdeen
Masdar Institute of Science and Technology	Abu Dhabi
MasterPower Electronics	Aberdeen
Max Fordham	Edinburgh
Max Fordham	London
MBDA	Stevenage
Mercedes-Benz Grand Prix Limited	Brackley, Northants
Mercedes-Benz Malaysia	Malaysia
Morgan Professional Services	Stratford upon Avon
m-sport	Carlisle
MTCe	Edinburgh
MTU-Maintainance	Munich
NCE Halden	Norway
Nexen	Aberdeen
NGenTec	Edinburgh
No Noise srl	Concorezzo, Italy
Oceaneering	Rosyth
Oceaneering Umbilical Solutions	Rosyth
ORLAU, Gobowen Hospital	Oswestry
OSBIT Power	Riding Mill
Össur	Iceland
PB Power	Newcastle
PEEDA	Kathmandu, Nepal
Pelamis Wave Power	Edinburgh
Philippine Department of Energy	Taguig City, Philippines
Portsmouth Aviation Ltd	Hampshire
Probe	Aberdeen
Proctor and Gamble	Brussels
Production Services Network	Aberdeen
PWAI	Dublin, Ireland
QinetiQ	Malvern
QinetiQ	Rosyth, Fife
Queensland Rail	Brisbane, Australia
RAAF- Aircraft Research and Development Unit	South Australia
Ramboll	Edinburgh
Reactec Ltd	Edinburgh
Reliance Precision Limited	Huddersfield
Renewable Devices Energy Solutions Ltd	Edinburgh
Renewable Energy Systems	Glasgow
Renewable Power Systems	Bedford
Robert Bosch GmbH	Stuttgart

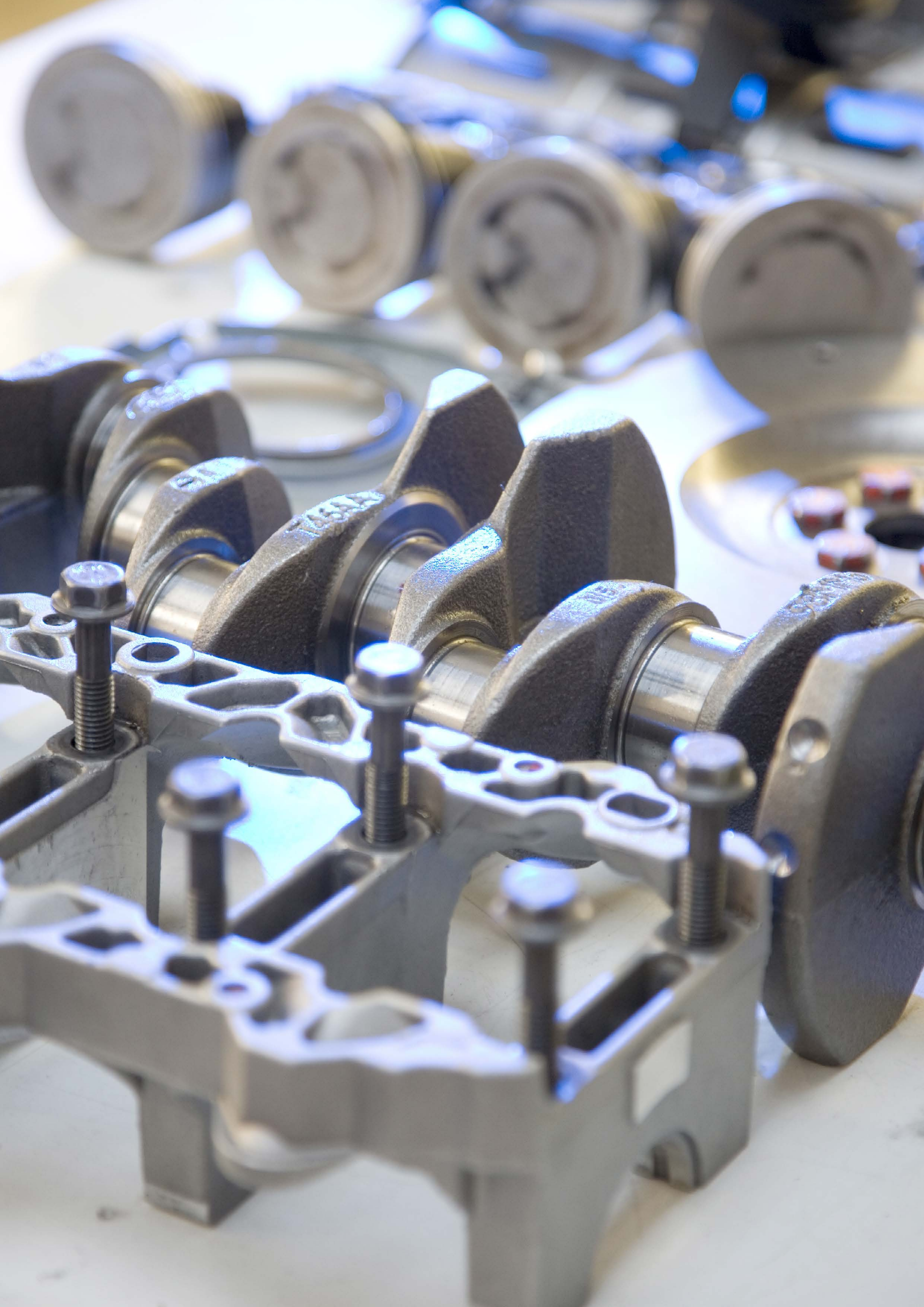
Company	Location
Rolls-Royce Aerospace	Bristol
Rolls-Royce Aerospace	Derby
Rolls-Royce Aerospace	Hucknall, UK
Rolls-Royce Motor Cars	Chichester
Ross Deeptech	Stonehaven
Russell Play	Edinburgh
RWE NPower Renewables	North Wales
Rybka	Edinburgh
Schlumberger	Aberdeen
Schlumberger	Cambridge
Schlumberger	Cheltnham
Schultz Steel	California, US
SCOT	Edinburgh
Scottish Institute for Solar Energy Research	Edinburgh
Scottish Power Renewables	Glasgow
Scottrenewables Ltd	Stromness, Orkney
SECO/WARWICK EUROPE S.A.	China
Selex Sensors and Airborne Systems (previously BAE Systems)	Edinburgh
Seradim Ltd	Holywood, NI
Sgurr Energy	Glasgow
Shapespace	Edinburgh
Shell	Aberdeen
Shell	Mossmoran
Shell	Norway
Shell UK Oil Products	Ellesmere Port, South Wirral
Shering Weighing Ltd	Dunfermline
Sibol ng Agham Teknolohiya (SIBAT)	Philippines
Sigtronics Ltd	Livingston
SMC	Edinburgh
SMIT	Rotterdam, The Netherlands
Smiths Aerospace	Cheltenham
Squrr Energy	Glasgow
SRISTI	Gujarat, India
SSE	Glasgow
Starboard Co Ltd	Thailand
STATS Group	Aberdeenshire
Stolt Offshore	Aberdeen
SVM plc	Edinburgh
Swindon Racing Engines	Wiltshire
Technip UK Limited	Westhill, Aberdeen
Tetra Engineering Group, Inc	Nice, France
The Dolomite Centre Ltd	Royston
Titan Systems Corporation, Lincom Division, NASA	JSC, Houston, Texas
Tokheim	Dundee
Total E&P	Aberdeen
Touch Bionics	Livingston
Toyota	Belgium

University of Edinburgh
Mechanical Engineering Industrial Placements: 99/00 - 14/15

Triomed	Lund, Sweden
TUV NEL East	Kilbride
V3	Nottingham
Valutec	Valenciennes, France
Vetco Gray	Oslo, Norway
VITO nv	Flanders, Belgium
Vodafone McLaren Mercedes	Woking
Volkswagen AG	Wolfsburg, Germany
Volvo Truck and Bus Ltd	Warwick
Wärtsilä Switzerland Ltd	Switzerland
Wave Dragon	Denmark
Wavegen	Inverness
Weatherford	Brisbane, Australia
Weatherford Pipeline and Speciality Services	Musselburgh
Weir Group	East Kilbride
White, Young and Green	Belfast
Wind Prospect	Edinburgh
WL Gore & Associates	Livingston
Wood Group	Aberdeen
Worley Parsons	Brentford
WSP Group	Edinburgh
Xodus Group	Aberdeen
Xodus Group	Edinburgh
Xodus Group	London
Xtrac	Thatcham
Yardmaster	Draperstown, NI

Overseas Universities

Technical University of Vienna	Vienna, Austria
ISI Pierrard Haute Ecole Blaise Pascal	Belgium
University of British Columbia	Canada
Fudan University	Fudan, China
Aalborg University	Denmark
L'Ecole Normale Superior, Paris	France
INSA, Rennes	France
INSA de Lyon	France
Universite Claude Bernard, Lyon	France
Université Pierre et Marie Curie-Paris 6, Paris	France
University of Duisburg-Essen	Germany
Leibniz Universität Hannover	Germany
CNRS at Universite de Corsica	Italy
TU Delft	Netherlands
The University of Leiden	Netherlands
University of Aukland	New Zealand
AGH University of Science and Technology, Krakow	Poland
Universidad de Málaga	Spain
Universidad de Zaragoza	Spain
Chalmers University of Technology, Gothenburg	Sweden
ETH Zurich	Switzerland



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