Course overview

Study Mechanical Engineering and learn to design, build and test new products, processes and systems. You'll develop holistic engineering knowledge and problem solving abilities as you work towards an industry-accredited degree that's sought after in a wide range of sectors.

INTRODUCTION

Mechanical engineering is one of the oldest and broadest engineering disciplines and is the basis for a wide range of careers in engineering and beyond.

Our professionally accredited Mechanical Engineering programme offers an exciting blend of learning experiences. You’ll master the fundamentals of mechanical engineering science and develop the skills, attitudes and experience demanded by 21st century engineering and society. You'll spend as much time outside the lecture theatre as possible, working in teams to apply your learning in the solution of practical problems. Graduates are well prepared for their careers ahead, and industry recognises them as highly employable.

Mechanical engineering students learn a wide range of theory and skills. This includes engineering science and practical skills such as project management and computer programming.

You'll learn in a modern, well-equipped environment that includes up-to-date laboratories, tools and computing hardware and software.

As you progress through your degree, you can choose to specialise in one of five themes: biomedical engineering, materials engineering, manufacturing, management, or simulation and analytics.
WHAT YOU’LL LEARN

- Design, build and test products and systems
- Mechanical engineering scientific fundamentals
- Thermodynamics
- Fluid and solid mechanics
- Dynamic systems
- Materials
- Electronics and mathematics
- Project management
- Computer programming
- Engineering design
- Collaborative design

ACCREDITATION

Mechanical engineering programmes are accredited (or pending accreditation), by the Institution of Mechanical Engineers.

They’re a recognised qualification on the route to Chartered Engineer status.
Course content
Discover what you'll learn, what you'll study, and how you'll be taught and assessed.

YEAR ONE
Years one and two give students the scientific understanding underpinning the practice of professional engineering. You'll also learn about project management, computer programming, and engineering design.

COMPULSORY MODULES

ELECTRICAL CIRCUITS FOR ENGINEERS (ELEC121)
Credits: 7.5 / Semester: semester 1
To provide students with a basic understanding of electronics from first principles covering analogue and electromechanical systems. Basic circuits and theory will be introduced including the use of semiconductor devices such as diodes and transistors. Electromechanics will be developed to provide the student with a fundamental knowledge of the principles of DC and AC machines, transformers and linear actuators.

ELECTROMECHANICAL SYSTEMS (ENGG121)
Credits: 7.5 / Semester: semester 2
To provide students with a basic understanding of modelling and simulation techniques. Mathematical modelling and graph theory will be introduced to develop practical skills in the modelling and designing of different types of systems including electromechanical systems.

INTRODUCTION TO PROGRAMMING (ENGG185)
Credits: 7.5 / Semester: semester 1
This module introduces students to the basic concepts and principles of elementary statistics and programming. It explains the purposes and advantages of analysing data collected specifically to solve problems in engineering, reviews available software tools and programming languages used to formulate and answer basic engineering questions. It draws on examples from applications across the range of School of Engineering program areas.

INTRODUCTION TO STRUCTURAL MATERIALS (ENGG108)
Credits: 7.5 / Semester: semester 1
This module introduces students to important mechanical properties of metallic alloys, polymers, ceramics, construction materials and composites used in engineering industry. It also introduces the mechanical testing techniques used to measure such properties, the common mechanisms of materials and component failure in use, and some appreciation of materials processing. The laboratory sessions are designed to familiarise students with engineering laboratory methods and procedures, as well as providing an experience of hands-on mechanical testing techniques.

**ENGINEERING MATHEMATICS (MATH198)**

**Credits: 22.5 / Semester: whole session**

MATH198 is a Year 1 mathematics module for students of programmes taught in the School of Engineering, e.g. Aerospace, Civil, Mechanical or Industrial Design Engineering. It is designed to reinforce and build upon A-level mathematics, providing you with the strong background required in your engineering studies and preparing you for the Year 2 mathematics module MATH299 (Mathematics engineering II). In the first semester, the foundations are laid: differential calculus, vector algebra, integration and applications. Semester two covers complex numbers, differential equations, Laplace transformations and functions of two variables.

**MECHANICAL PRODUCT DISSECTION (MECH109)**

**Credits: 7.5 / Semester: semester 2**

This is predominantly a practical module in which students work in small groups to examine in detail the workings and manufacture of a single-cylinder, 4-stroke petrol engine by dismantling it into component parts and documenting the disassembly process in a Wiki.

**SOLIDS AND STRUCTURES 1 (ENG110)**

**Credits: 15 / Semester: whole session**

This module aims to introduce students to the fundamental concepts and theory of how engineering structures work to sustain loads. It will also show how stress analysis leads to the design of safer structures. It will also provide students with the means to analyse and design basic structural elements as used in modern engineering structures.

**ENERGY SCIENCE (ENG116)**

**Credits: 15 / Semester: whole session**

To develop an understanding of the basic principles of fluid mechanics and appreciation of how to solve simple engineering problems. To develop skills in performing simple experiments.

To develop an understanding of the laws of thermodynamics and an appreciation of their consequences. To develop some elementary analysis skills using the first and second laws of thermodynamics. To develop skills in performing and reporting simple experiments.

**PROFESSIONAL ENGINEERING: A SKILLS TOOLKIT (ENG111)**
**YEAR TWO**

Years one and two give students the scientific understanding underpinning the practice of professional engineering. You'll also learn about project management,

**COMPULSORY MODULES**

**AEROENGINES (AERO213)**

*Credits: 15 / Semester: whole session*

This module covers the main technical aspects of gas turbine engines used on aircraft and other mechanical applications (e.g. power generation, marine). It covers many topics from the basic principles of aeroengines (e.g. production of thrust) through to the design of axial flow turbomachinery (compressors and turbines). An understanding of the principles of compressible flow is also developed. Students do a laboratory using the Virtual Engine Test Bench to explore aeroengine components, thermodynamics and performance. In addition, they use a commercial CFD package to perform a compressible flow simulation.
DYNAMIC SYSTEMS (MECH215)
Credits: 15 / Semester: whole session
Dynamic systems are encountered in most engineering disciplines such as mechanical engineering, aerospace engineering, electrical engineering. These systems require specific techniques to be analysed for design or monitoring purpose.
In this module, students will learn the main methods for analysing dynamic systems in time and frequency domains. They will learn how to solve dynamical problems, how to evaluate and control the stability, the accuracy and the rapidity of a dynamical system.
This module will be mainly delivered through class lectures and assessed through a final exam. Additionally, students will be taught some experimental techniques related to second-order dynamical systems through an assessed laboratory work.

ENGINEERING DESIGN (MECH212)
Credits: 15 / Semester: whole session
Professional Engineering can be defined as the application of science in the solution of problems and the development of new products, processes and systems. It is vital that all Engineering graduates have a solid design education; and this module is a core part of that.
In Year 1 students are introduced to the basic tools and techniques involved in engineering design.
In this module students are taught the basics of design theory in a lecture setting; but crucially they are required to apply this learning in a 24-week group project to design an innovative engineering product.
Students are given a design brief and are “coached” through product design specification; creative conceptual design; detailed design; 3D CAD modelling; design for manufacture, assembly and environment; and materials selection.

The module also enables students to develop and practice teamwork, communication, project management and problem solving skills.

ENGINEERING MATHEMATICS II (MATH299)
Credits: 7.5 / Semester: semester 1
To introduce some advanced Mathematics required by Engineers, Aerospace Engineers, Civil Engineers and Mechanical Engineers. To assist students in acquiring the skills necessary to use the mathematics developed in the module.

EXPERIMENTAL METHODS (ENGG201)
Credits: 7.5 / Semester: semester 1
The module focusses on the essentials of data analysis and interpretation, engineering experimentation, measurement techniques and principles of instrumentation.

MATERIALS PROCESSING AND SELECTION I (MATS214)
Credits: 7.5 / Semester: semester 1

This module introduces the main materials processing and manufacturing techniques used to shape metals. It also introduces technologies used to modify the surface properties of metal components, and heat-treatment procedures used to change materials’ mechanical properties.

MATERIALS PROCESSING AND SELECTION II (MATS210)

Credits: 7.5 / Semester: semester 2

This module covers non-metallic materials and materials selection. The students will understand the processing, microstructure and properties of ceramic, polymer and composite materials. The students will also learn how to derive materials performance indices and select materials for mechanical design.

PROGRAMMING FOR ENGINEERS 1 (ENGG286)

Credits: 7.5 / Semester: semester 1

Students will be introduced to the basic concepts of computer programming in the MATLAB language to solve engineering problems. This will include basic programming constructs, mathematical operations, file input and output, and data visualization.

PROJECT MANAGEMENT (MNGT202)

Credits: 7.5 / Semester: semester 1

Project Management is a core skill for professional engineers of all types and a sound education in this subject area is required by the professional accrediting bodies. The knowledge and skills developed in this module will equip students for their future UG project work and for their careers ahead. This module teaches students the theory of fundamental techniques in project management, risk management, and cost management. In this module students undertake a group "virtual project" in which they undertake all stages of project management involved in a major construction projects. The five virtual project tasks require students to apply their theoretical learning; and they provide an opportunity to develop key professional skills.

SOLIDS & STRUCTURES 2 (ENGG209)

Credits: 15 / Semester: whole session

This module aims to introduce students to techniques for load and displacement analysis of simple structures.
Programme details and modules listed are illustrative only and subject to change.

YEAR THREE
In year three, you'll study advanced engineering science and undertake a 300-hour research project on a topic of your choice. You can also choose one of the following engineering specialisms:

COMPULSORY MODULES

ADVANCED MODERN MANAGEMENT (MNGT352)
Credits: 7.5 / Semester: semester 1
The Aims of this module are as follows:
To introduce the student to various aspects of advanced modern management.
To develop a knowledge and understanding of modern management tools.
To stimulate an appreciation of management and its importance in organisational success.

ENGINEERING FLUID MECHANICS (MECH326)
Credits: 15 / Semester: semester 1
The module provides students with the fundamental concepts of Engineering Fluid Mechanics, and in particular: the role of viscosity in fluid mechanics, including the no-slip condition and the concept of vorticity; the basic principles of laminar and turbulent flow through pipes including definition and evaluation of the Fanning and Darcy friction factors; the concept of a boundary layer, including separation and transition, and basic equations for friction factor in laminar and turbulent flow with zero pressure gradient; the calculation methods of bluff-body drag using drag coefficients with qualitative explanations the potential-flow theory including the concept of irrationality and the principle of superposition; the analysis of compressible flow through constant-area ducts accounting for friction or heat transfer and to use the Fanno- and Rayleigh-flow tables; the analysis of external compressible flow including expansion and compression turns (Prandtl-Meyer expansions and oblique shock waves).

HEAT TRANSFER (MECH301)
Credits: 15 / Semester: semester 2
The aim of this module is to give the students a good understanding of the basic mechanisms of heat transfer and to equip them to solve significant engineering problems.
They will also learn about different designs of heat exchanger and how to carry out performance/design calculations.

**INDIVIDUAL PROJECT (ENGG341)**

*Credits: 30 / Semester: whole session*

The Year 3 individual research project; 300 hours student work over 2 semesters; 3 assessment stages (proposal 5%, interim 20%, final 75%).

**INTRODUCTION TO FINITE ELEMENTS (ENGG302)**

*Credits: 7.5 / Semester: semester 1*

In this module the students will gain a basic understanding of the Finite Element method and learn to use some Finite Element software. This software will then be used to analyse a variety of different problems which are relevant to both mechanical and civil engineers.

**MECHATRONICS (MECH316)**

*Credits: 7.5 / Semester: semester 1*

This module aims to provide students with an appreciation of the challenges related to the design of Mechatronics systems.

Both hardware and software integration issues will be studied within this module.

General design principles will be introduced first and learning will focus on the popular Arduino platform.

**SOLID MECHANICS – STRUCTURAL FAILURE MODES (MECH307)**

*Credits: 7.5 / Semester: semester 1*

Students taking this module will be given an understanding of potential structural failure modes in the early stages of design that can lead to a more appropriate selection of materials, prevent premature failure and lengthen the life of a machine or component; ultimately resulting in increased safety and reduced cost of ownership.

**VIBRATION AND CONTROL (MECH303)**

*Credits: 15 / Semester: semester 2*

This module is built on MECH215. It consists of Vibration and Control as 2 main components. Both are on an advanced level and basically deal with multi-degree-of-freedom (or multi-input multi-output) systems.

The main mathematical tools are Laplace transforms, differential equations, simultaneous linear equations, complex numbers, trigonometry, vectors and matrices, eigenvalues and eigenvectors.
OPTIONAL MODULES

ADDITIVE MANUFACTURING (MNFG308)
Credits: 7.5 / Semester: semester 1
To provide an overview on the role of additive manufacturing in new product development. To develop a generic understanding on the principles and the complete process chain of additive manufacturing processes. To provide an awareness on recent developments in additive manufacturing and associated technologies.

ADVANCED ENGINEERING MATERIALS (MATS301)
Credits: 7.5 / Semester: semester 1
This module aims to understand advanced engineering materials, focusing on non-ferrous alloys and composite materials. It covers the processing, heat treatment, microstructure and properties of Al, Ti and Ni alloys. It introduces constituent materials, manufacturing methods, test methods and mechanical response of composite materials.

BIOMEDICAL ENGINEERING (MECH305)
Credits: 7.5 / Semester: semester 1
This module will introduce the inter-disciplinary subject of biomedical engineering to engineering students with a focus on biomechanics of the cardiovascular system, the eye and bone.

The module will cover ageing and disease of tissues and prosthetic devices including their design and optimisation for tissue repair. The course will be delivered with lectures containing interactive elements.

Assessment will be via an exam and two pieces of coursework.

CARDIOVASCULAR BIOENGINEERING (ENGG311)
Credits: 7.5 / Semester: semester 2
To introduce engineering students to various bio fluid mechanics problems. In particular the fluid mechanics of blood flow will be presented in terms that are familiar to students of engineering. Students will be expected to relate the biological structure of components of the circulatory system to mechanical and physical function.

ENTERPRISE STUDIES (MNGT324)
Credits: 7.5 / Semester: semester 2
The module comprises a group based initiative to conceptualise design and develop a technology based business plan. Successful students will gain an understanding of enterprise and top level strategic company management. Assessment is through a combination of a report and a formal presentation.
LASERS IN ENGINEERING (ENGG312)

Credits: 7.5 / Semester: semester 2

The Module provides an overview of the fundamental principles of laser technology including optical principles, key features and attributes of lasers, laser beam properties and the engineering applications context of the material.

MANAGING PRODUCT DEVELOPMENT (MNGT205)

Credits: 7.5 / Semester: semester 1

The module teaches the management of new product development. It is taught in a traditional lecture style culminating in an exam.

Successful students will have acquired knowledge and understanding at a broad level of the process and how it is executed in a modern industrial environment.

PROGRAMMING FOR ENGINEERS 2 (ENGG387)

Credits: 7.5 / Semester: semester 2

This module extends the coverage of Matlab and introduces Simulink as a tool for creating simulation models of dynamical systems.

UNCERTAINTY, RELIABILITY AND RISK 1 (ENGG304)

Credits: 7.5 / Semester: semester 1

This module covers broad aspects of uncertainty quantification methods, reliability analysis and risk assessment in engineering applications. It also provides understanding of statistical analysis of engineering data and computational methods for dealing with uncertainty in engineering problems.

SMART MATERIALS (MATS315)

Credits: 7.5 / Semester: semester 2

This module introduces students to the facilitating world of ‘Smart Materials’. The term ‘Smart Materials’ is used to define a broad collection of materials that have the in-built ability to ‘actuate’ in some way in response to external stimulus. Examples of ‘Smart materials’ include piezoelectrics, electrostrictive materials, shape memory alloys, ferrofluids, various biomimetic materials plus a host of others. This module looks at a selection of smart materials and considers the underlying reasons for the actuating behavior, key performance indicators that aid materials selection, aspects of manufacturing associated with the exploitation of the materials, plus engineering applications of these facilitating and highly useful materials.
HOW YOU’LL LEARN

We are leading the UK’s involvement in the international Conceive-Design-Implement-Operate (CDIO) initiative – an innovative educational framework for producing the next generation of engineers.

Our degree programmes encompass the development of a holistic, systems approach to engineering. Technical knowledge and skills are complemented by a sound appreciation of the life-cycle processes involved in engineering and an awareness of the ethical, safety, environmental, economic, and social considerations involved in practicing as a professional engineer.

You will be taught through a combination of face-to-face teaching in group lectures, laboratory sessions, tutorials, and seminars. Our programmes include a substantial practical component, with an increasing emphasis on project work as you progress through to the final year. You will be supported throughout by an individual academic adviser.

HOW YOU’RE ASSESSED

Assessment takes many forms, each appropriate to the learning outcomes of the particular module studied. The main modes of assessment are coursework and examination. Depending on the modules taken, you may encounter project work, presentations (individual and/or group), and specific tests or tasks focused on solidifying learning outcomes.

LIVERPOOL HALLMARKS

We have a distinctive approach to education, the Liverpool Curriculum Framework, which focuses on research-connected teaching, active learning, and authentic assessment to ensure our students graduate as digitally fluent and confident global citizens.
Careers and employability

Mechanical engineering graduates are sought after in engineering fields and a wide range of other sectors. Graduates go on to work in engineering fields including healthcare, food production, aerospace, construction, power generation and manufacturing.

4 IN 5 OF OUR ENGINEERING STUDENTS FIND THEIR MAIN ACTIVITY AFTER GRADUATION MEANINGFUL.

Graduate Outcomes, 2018-19.

Recent employers of Mechanical Engineering graduates include:

- Airbus
- Arup
- BAE Systems
- Balfour Beatty
- Bentley
- BMI
- British Airways
- British Army
- Corus
- Highways Agency
- Jaguar Land Rover
- Mott Macdonald
- Mouchel
- National Grid Transco
- National Nuclear Laboratory
- Network Rail
- Pilkington
- RAF
- Rolls Royce
- Royal Navy
- Siemens
- Tarmac
- United Utilities.

PREPARING YOU FOR FUTURE SUCCESS

At Liverpool, our goal is to support you to build your intellectual, social, and cultural capital so that you graduate as a socially-conscious global citizen who is prepared for future success. We achieve this by:

- Embedding employability within your curriculum, through the modules you take and the opportunities to gain real-world experience offered by many of our courses.
- Providing you with opportunities to gain experience and develop connections with people and organisations, including student and graduate employers as well as our global alumni.
- Providing you with the latest tools and skills to thrive in a competitive world, including access to Handshake, a platform which allows you to create your personalised job shortlist and apply with ease.
- Supporting you through our peer-to-peer led Careers Studio, where our career coaches provide you with tailored advice and support.
Fees and funding
Your tuition fees, funding your studies, and other costs to consider.

TUITION FEES

<table>
<thead>
<tr>
<th>UK fees (applies to Channel Islands, Isle of Man and Republic of Ireland)</th>
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<tbody>
<tr>
<td>Full-time place, per year</td>
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<tr>
<td>Year in industry fee</td>
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<td>Year abroad fee</td>
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<tr>
<th>International fees</th>
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<tbody>
<tr>
<td>Full-time place, per year</td>
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<tr>
<td>Year in industry fee</td>
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<tr>
<td>Year abroad fee</td>
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Fees stated are for the 2023-24 academic year and may rise for 2024-25. Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support. Learn more about tuition fees, funding and student finance.

ADDITIONAL COSTS
We understand that budgeting for your time at university is important, and we want to make sure you understand any course-related costs that are not covered by your tuition fee. This may include a laptop, books, or stationery. All safety equipment, other than boots, is provided free of charge by the department.

Find out more about the additional study costs that may apply to this course.
SCHOLARSHIPS AND BURSARIES

We offer a range of scholarships and bursaries to help cover tuition fees and help with living expenses while at university.

Scholarships and bursaries you can apply for from the United Kingdom
## Entry requirements

The qualifications and exam results you’ll need to apply for this course.

<table>
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<tr>
<th>Your qualification</th>
<th>Requirements</th>
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</table>
| **A levels**       | AAB including Mathematics and a second science. Applicants with the Extended Project Qualification (EPQ) are eligible for a reduction in grade requirements. For this course, the offer is **ABB** with **A** in the EPQ. You may automatically qualify for reduced entry requirements through our contextual offers scheme. If you don’t meet the entry requirements, you may be able to complete a foundation year which would allow you to progress to this course. Available foundation years:  
- **Engineering Foundation BEng (Hons) (4 year route)** |
| **GCSE**           | 4/C in English and 4/C in Mathematics |

Mathematics and a second science. Applicants following the modular Mathematics A Level must be studying **A Level Physics or Further Mathematics** as the second
<table>
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<tr>
<th><strong>Your qualification</strong></th>
<th><strong>Requirements</strong></th>
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<tr>
<td>Subject requirements</td>
<td>About our typical entry requirements</td>
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<tr>
<td></td>
<td>Accepted Science subjects are Biology, Chemistry, Computing, Economics, Electronics, Environmental Science, Further Mathematics, Geography, Geology, Human Biology, Physics and Statistics. For applicants from England: For science A levels that include the separately graded practical endorsement, a &quot;Pass&quot; is required.</td>
</tr>
<tr>
<td>BTEC Level 3 Subsidiary Diploma</td>
<td>Acceptable at grade Distinction* alongside BB in A Level Mathematics and a second science.</td>
</tr>
<tr>
<td>BTEC Level 3 Diploma</td>
<td>Distinction* Distinction* in relevant BTEC considered alongside A Level Mathematics grade B. Accepted BTECs include Aeronautical, Aerospace, Construction, Mechanical, Mechatronics and Engineering.</td>
</tr>
<tr>
<td>BTEC Level 3 National Extended Diploma</td>
<td>D*DD in acceptable BTEC, plus B in A level Maths (not accepted without B in A level Maths)</td>
</tr>
<tr>
<td>International Baccalaureate</td>
<td>35 overall including 5 in Higher Level Mathematics and 5 in Higher Level Physics.</td>
</tr>
<tr>
<td>Irish Leaving Certificate</td>
<td>H1,H1,H2,H2,H2,H3, including H2 in Higher Maths and Higher Second Science. We also require a minimum of H6 in Higher English or O3 in Ordinary English</td>
</tr>
<tr>
<td>Scottish Higher/Advanced Higher</td>
<td>Pass Scottish Advanced Highers with grades AAB including Mathematics and a second science</td>
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<td>Your Qualification</td>
<td>Requirements</td>
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<tr>
<td>Baccalaureate</td>
<td>About our typical entry requirements Acceptable at grade B alongside AA in A Level Mathematics and a second science.</td>
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<tr>
<td>Advanced</td>
<td>Considered if taking a relevant subject. Check with Department or Admissions team.</td>
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</table>

| International qualifications | Many countries have a different education system to that of the UK, meaning your qualifications may not meet our entry requirements. Completing your Foundation Certificate, such as that offered by the University of Liverpool International College, means you’re guaranteed a place on your chosen course. |

**ALTERNATIVE ENTRY REQUIREMENTS**

- If your qualification isn’t listed here, or you’re taking a combination of qualifications, [contact us](mailto:contactus) for advice.

- [Applications from mature students](mailto:applications@maturestudents) are welcome.