Electrical and Electronic Engineering with a Year in Industry  MEng

COURSE DETAILS
- A level requirements: AAB
- UCAS code: H607
- Study mode: Full-time
- Length: 5 years

KEY DATES
- Apply by: 25 January 2023
- Starts: 25 September 2023

Course overview
Studying Electrical and Electronic Engineering allows you to specialise in subjects as diverse as power generation and transmission, and antennas and digital systems design, preparing you for an exciting career within the world of modern electronics.

INTRODUCTION
Electrical engineering is not simply about the production and transmission of electrical energy, but also about how it is used. In both its transmission and usage there are significant and increasing challenges facing electrical engineers, many related to sustainability and the environment.
This programme is designed for students with an interest in communications engineering and associated electronics, covering a wide range of topics in electronic and communications engineering.
You will learn through the practical application of concepts and theory, always with awareness of their relevance to the real world.

The MEng is an enhanced BEng programme, which means that you have an extra year to study advanced topics and undertake a group project based on the needs of industry.
This programme includes a placement year, during which you will spend time working in an engineering company. This is an excellent opportunity to gain practical engineering experience.
Electrical and Electronic Engineering students graduate with skills sought after by a wide range of employers who are actively seeking engineers.

WHAT YOU’LL LEARN
- Practical problem-solving skills
- Advanced skills in hardware and/or software design and implementation
- Use of industry standard tools, technologies and working methods
- How to take projects from conception through to design, implementation and operation
- Solid training in both software and hardware information technology
- How to put learning into practice through your Year in Industry

ACCREDITATION
Our MEng and BEng programmes are accredited by the Institution of Engineering and Technology (IET).
Course content
Discover what you’ll learn, what you’ll study, and how you’ll be taught and assessed.

YEAR ONE
In your first year, module subjects covered range from digital electronics and electronics circuits, through to electromagnetism and electromechanics.

COMPULSORY MODULES

DIGITAL & INTEGRATED ELECTRONICS DESIGN (ELEC143)
Credits: 15 / Semester: semester 2
The module comprises of two parts Digital Electronics and Integrated Electronics. For the Digital part, students are provided with the knowledge of number systems, laws of Boolean algebra and introduced to the basic methods for designing combinational and sequential logic circuits. For the Integrated part, students are introduced to various silicon electronic devices and provided with the opportunity to understand the basic principles of silicon microelectronics designs processes including designing layouts for simple circuit.

ELECTRICAL CIRCUITS & SYSTEMS (ELEC142)
Credits: 15 / Semester: whole session
Fundamental course on circuit analysis techniques.

ELECTROMAGNETISM & ELECTROMECHANICS (ELEC120)
Credits: 15 / Semester: semester 2
This module includes two parts. The first part of this module covers electrostatics, current and permanent electromagnetism. The second part of the module covers electromechanics, including the principles and construction of DC and AC machines, transformers and linear actuators.

ELECTRONIC CIRCUITS (ELEC104)
Credits: 15 / Semester: whole session
This module aims to introduce students to fundamental electronic devices (diodes and transistors), and how these devices are used in amplifier and switching circuits. The module is assessed via two laboratory sessions (20%) and two coursework online assignments (80%).

ENGINEERING SKILLS (ELEC171)
Credits: 15 / Semester: whole session
Introductory module that teaches practical skills for electrical engineering students, focusing on basic laboratory skills. The practical skills are linked with theory presented in other Year 1 modules including those on analogue and digital electronics, and electromagnetics. The module includes an introduction to a technical programming language (MATLAB) and an introduction to the ethical and sustainability issues that face modern engineers.

INTRODUCTION TO PROGRAMMING IN C (ELEC129)
Credits: 15 / Semester: semester 1
This module is an introductory course to the C computer programming language. The module provides a comprehensive overview of the fundamentals of C programming (variables, data types, operators, pointers, arrays, strings, structures, functions, input/output operations and flow control) and the software development method (specification, analysis, design, implementation/coding and testing).

MATHEMATICS A FOR ELECTRICAL ENGINEERS (ELEC191)
Credits: 15 / Semester: semester 1
Mathematics for students registered in the Department of Electrical Engineering and Electronics, to support their technical modules.

MATHEMATICS B FOR ELECTRICAL ENGINEERS (ELEC192)
Credits: 15 / Semester: semester 2
Basic mathematics for students registered in the Department of Electrical Engineering and Electronics, concentrating on those groups of students who have, on the average, weaker preparation for University level Maths such as entrants with the BTEC qualification (but not limited to that group). Exam practice is another important component of this module. This module follows on from ELEC191.

Programme details and modules listed are illustrative only and subject to change.

YEAR TWO

In your second year, a range of module subjects similar to those in your first year is covered.

COMPULSORY MODULES

CMOS INTEGRATED CIRCUITS (ELEC212)
Credits: 7.5 / Semester: semester 2
An important feature of this module is the extent to which it combines design activity with very relevant industrial concepts and a deeper understanding of device physical principles and electromagnetism. Over a period of time an approach to the integration of such contrasting concepts has been developed and it is universally regarded by the students as being both stimulating and demanding. It aims to provide the background for later modules, relevant final year projects, but particularly for employment in those industries that are firmly based in microelectronics technology. It develops the concept of design as being more than simple problem solving, but something demanding high levels of innovation still based on sound physical principles. In this respect it builds on earlier work in Engineering Electromagnetism and Integrated Electronics and Design. They are not, however, essential for students to undertake this module. The module is assessed through Design Assignment (25%) and formal examination (75%).

COMMUNICATION SYSTEMS (ELEC202)
Credits: 7.5 / Semester: semester 2
This module will teach fundamental knowledge on communication systems.

DIGITAL ELECTRONICS & MICROPROCESSOR SYSTEMS (ELEC211)
Credits: 15 / Semester: semester 2
This module covers two areas. In digital electronics, it covers topics which build on the basic knowledge gained in the first year digital electronics programme and learning some hardware description language (HDL) programming. In microprocessor systems, it introduces the topic from the basics describing how a microprocessor works and learning some assembly language programming.

ELECTRICAL CIRCUITS & POWER SYSTEMS (ELEC209)
Credits: 15 / Semester: semester 1
This module is aimed at equipping students with tools to analyse inter-related electrical circuits and systems and to provide students with an introduction to the components and composition of an electric power system. It also covers the different primary energy sources and the way in which power is delivered to the customers. Teaching and learning are provided through variety of means like formal lectures, problem sheets, supplementary question sheets, worked example sheets along with formative and summative online tests (through CANVAS, the electronic VLE system). Assessment is carried out by means of coursework and final (written) exam.

ELECTROMAGNETICS (ELEC210)
Credits: 7.5 / Semester: semester 2
The objective of this module is to further enhance the students knowledge of electric field/magnetics field and use of Maxwells equations and their use in practical EM applications.

INSTRUMENTATION & CONTROL (ELEC207)
Credits: 15 / Semester: whole session
This module covers the design and operation of instrumentation devices as well as the design of continuous time control systems.

FIELD THEORY AND PARTIAL DIFFERENTIAL EQUATIONS (MATH283)
Credits: 7.5 / Semester: semester 1
For students in EEE who have not studied at XJTU only. Maxwell's equations elegantly describe the physical laws governing such things as electrodynamics. Related problems may be posed in terms of vector calculus, or in terms of differential equations. In this module, we revise vector calculus and field theory in three dimensions, using Stokes' theorem and Gauss' theorem to solve explicit physical problems; we evaluate path, surface and volume integrals, and derive general electrodynamic laws. We also consider both the ordinary and partial differential equations arising from real world problems related to Maxwell's equations, and solve them using Fourier series methods.

SIGNALS AND SYSTEMS (ELEC270)
Credits: 15 / Semester: semester 1
Introduces continuous and discrete signal operations and analysis, the frequency domain and spectral analysis, including Fourier Series and Fourier, Laplace and z Transforms. Introduces system quantification and analysis, including pole-zero plots, feedback, basic stability criteria and block diagrams.

APPLIED DESIGN & INDUSTRIAL AWARENESS (ELEC273)
Credits: 15 / Semester: whole session
The aim of this module is to provide students with practical work which underpins, confirms and gives application focus for academic study, while testing a wide range of skills.

Programme details and modules listed are illustrative only and subject to change.
OPTIONAL MODULES

ADVANCED MODERN MANAGEMENT (MNGT352)
Credits: 7.5 / Semester: semester 1

ANTENNAS (ELEC312)
Credits: 7.5 / Semester: semester 2
This module is to introduce antenna theory and applications.
Students will learn the fundamentals of the antenna theory and design, and understand the most important antennas.

APPLICATION DEVELOPMENT WITH C++ (ELEC362)
Credits: 15 / Semester: semester 1
This course will help student to understand the object-oriented design concept and to gain knowledge and practical skills of C++ as an advanced programming language.
On successful completion of the module, students should be able to understand/design/develop C++ applications (both console and GUI-based) with a specific emphasis on developing GUI-based applications.

DIGITAL AND WIRELESS COMMUNICATIONS (ELEC377)
Credits: 15 / Semester: semester 1
This module provides an extensive coverage of the theory and practice of digital and wireless communication systems, to allow the students to be able to design and develop digital and wireless communication systems, with an awareness of all the main factors involved and of existing and emerging technologies.

DIGITAL CONTROL AND OPTIMISATION (ELEC303)
Credits: 15 / Semester: semester 2
A broad range of topics are covered. Case studies and example tutorials emphasise the practical aspects of digital control design and optimisation.

DIGITAL SYSTEM DESIGN (ELEC373)
Credits: 15 / Semester: whole session
This module introduces students to the digital design techniques used in industry and research. The methods for describing digital systems using the Verilog Hardware Description Language (HDL) are introduced. Student will examine the operation of the MIPS Processor and will also be introduced to Altera’s NIOS-II Processor. The module is assessed via 4 assignments and two class tests. Altera’s Quartus package is used for synthesising the digital systems.

DRIVES (ELEC331)
Credits: 7.5 / Semester: semester 1
This module introduces students to a range of electrical machines (AC & DC) using the concepts of rotating magnetic fields and co-energy. This allow students to model their behaviour and select the most appropriate electrical machine for their application.

ELECTROMAGNETIC COMPATIBILITY (ELEC382)
Credits: 7.5 / Semester: semester 2
This module is aimed at developing an in-depth understanding of EMC, the scope of EMC, standards, typical EMC problems and solutions.
Based on the theory, the students are expected to be able to analyse and solve EMC problems, and also use relevant equipment for conducting EMC measurements.

ELECTRONICS FOR INSTRUMENTATION & COMMUNICATIONS (ELEC317)
Credits: 15 / Semester: semester 2
The module introduces basic concepts of the electronic circuits required for instrumentation and communication. It deals with a wide range of amplifiers and the problems that might be encountered in a actual application. It also deals with circuitry needed in communication for example oscillators and phase-locked-loops.

EMBEDDED COMPUTER SYSTEMS (ELEC370)
Programme details and modules listed are illustrative only and subject to change.

YEAR FIVE

During this year, students will have further options for compulsory modules and will undertake an extended group project. Each project has an advanced technical element, linked to a research group programme that is also supported by industry.

COMPULSORY MODULES
MANAGEMENT OF DESIGN (MNGT413)  
Credits: 7.5 / Semester: semester 2

MENG GROUP PROJECT (EEE) (ELEC450)  
Credits: 30 / Semester: whole session  
Final Group Project for MEng students

OPTIONAL MODULES

ADVANCED EMBEDDED SYSTEMS (ELEC470)  
Credits: 15 / Semester: whole session  
This module covers material for understanding and designing advanced embedded computer systems.  
Key topics include computer architecture, low-power design, hardware/software co-design and synthesis techniques.  
The module prepares students for research and employment in the leading research groups and embedded system companies in the world.

ADVANCED GUIDANCE SYSTEMS (AERO430)  
Credits: 7.5 / Semester: semester 2  
In this module students develop an understanding of the use of advanced guidance laws in autonomous air systems, including the interactions of airframe dynamics, sensors and control surfaces.

ADVANCED SIGNAL PROCESSING (ELEC474)  
Credits: 15 / Semester: whole session  
The module will teach students advanced techniques of signal processing.

COMMUNICATIONS NETWORKS (ELEC461)  
Credits: 15 / Semester: semester 2  
This module introduces the principles of communications networks, their components and protocols.  
Students are provided with basic concepts about network architectures, the reference models used to describe them, the major protocols used at each communications layer, and the tools to analyse the performance of link layer, medium access control, Network and Transport layer protocols.  
The main protocols for routing packets over the Internet are also introduced, along with an overview of the packet switching architectures used in the core of today's routers.

COMPUTATIONAL INTELLIGENCE (COMP575)  
Credits: 15 / Semester: semester 2  
Biologically inspired optimisation and introduction to neural networks for artificial intelligence.

DIGITAL AND WIRELESS COMMUNICATIONS (ELEC477)  
Credits: 15 / Semester: semester 1  
This module provides an extensive coverage of the theory and practice of digital and wireless communication systems, to allow the students to be able to design and develop digital and wireless communication systems at an advanced level, with an awareness of all the main factors involved and of existing and emerging technologies.

ELECTROMAGNETIC COMPATIBILITY (ELEC382)  
Credits: 7.5 / Semester: semester 2  
This module is aimed at developing an in-depth understanding of EMC, the scope of EMC, standards, typical EMC problems and solutions.  
Based on the theory, the students are expected to be able to analyse and solve EMC problems, and also use relevant equipment for conducting EMC measurements.

RENEWABLE ENERGY & SMART GRID (ELEC435)
Credits: 15 / Semester: semester 2
Core module for MSc Energy and Power Systems about knowledge of renewable energy source, energy conversion, smart grid and micro grid

HIGH VOLTAGE ENGINEERING (ELEC407)
Credits: 15 / Semester: semester 2
This is an advanced, research-led course on high-voltage engineering and electrical insulation. It covers the theories, principles and test methods in relation to the operation of power network and electrical apparatuses. In addition to standard lectures students will be given opportunities to visit the high power test laboratory in the Department which is unique among UK universities and a transmission/distribution substation to equip them with first-hand experience in high voltage testing and power delivery.

INFORMATION THEORY AND CODING (ELEC415)
Credits: 7.5 / Semester: semester 2
This module is aimed to provide an extensive overview of the information theory and coding. Different source codes and channel codes are discussed. Cryptography is also covered.

INTEGRATED CIRCUITS - CONCEPTS AND DESIGN (ELEC472)
Credits: 15 / Semester: whole session
To understand the reasons for the predominance and importance of silicon-based microelectronics to the semiconductor industry. To understand how materials, devices and circuit issues are inter-related and exploited to make the microchips that underpin the information age. To gain experience in using a simulation tool (Multisim) in the design, simulation and analysis of digital and analogue circuit designs. To prepare students for entering the Silicon semiconductor industry.

MEASUREMENT, MONITORING AND SENSORS (ELEC421)
Credits: 15 / Semester: whole session
The module aims to provide an understanding of measurement and monitoring and the sensors that are used in power systems. It focusses on a limited number of examples in order to demonstrate the problems encountered in deploy measurement and monitoring systems.

MICROPROCESSOR SYSTEMS (ELEC422)
Credits: 15 / Semester: semester 2
This module will cover three aspects of ARM Cortex M Microprocessors.
The general functionality of the Cortex M series will be introduced along with the Instruction Set Architecture (ISA). Assignment one will be based on Assembly Language Programming.
The internal bus operation of the AHB-Lite interface will be introduced. For Assignment two students will be expected to interface a peripheral to the AHB-Lite bus using a Cortex-M0 soft core. The peripheral and the interface will be coded using Verilog. They will then be required to write a program to verify the operation of their peripheral. The final aspect will be on using Real-Time operating systems. This will include how synchronisation, communication and resource sharing is implemented using the RTX real-time operating system.
The third and final assignment will be on using RTX to implement a multi-threaded papplication.

RADIO PROPAGATION FOR WIRELESS SYSTEMS (ELEC411)
Credits: 7.5 / Semester: semester 2
This module is aimed for the students to gain a good understanding of radio propagation for wireless systems such as mobile radio and radar. The radio propagation characteristics and theories will be introduced and discussed. Radio propagation models in various medium and scenarios will also be introduced and discussed, and then applied to some systems.

ENGINEERING PROGRAMMING (ELEC431)
Credits: 15 / Semester: semester 1
This module gives a comprehensive coverage of two most popular programming languages, C++ and MATLAB. It aims to help students to gain an understanding of the Functional Decomposition method for program design, and practical skills of designing and coding software for engineering applications based on a problem specification.

ADVANCED SYSTEMS MODELLING & CONTROL (ELEC476)
Programme details and modules listed are illustrative only and subject to change.

HOW YOU’LL LEARN

All programmes are taught over two semesters with examinations at the end of each semester. Modules vary from those which are assessed by examination only to others which are continuous assessment only. All programmes incorporate a substantial practical component, with an increasing emphasis on project work as you progress through to the final year. You can select your final year individual project in consultation with members of staff.

HOW YOU’RE ASSESSED

Assessment for this course is undertaken through a range of exams, coursework and projects.

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

Graduates of this degree programme go on to a wide range of careers: you may be responsible for planning the electricity distribution network, or you may be designing the electronics of the next ‘must have’ item. It is an exciting time for the electronic and communications industry, with new and innovative products coming out every day.

100% OF ELECTRICAL ENGINEERING AND ELECTRONICS STUDENTS ARE IN WORK AND/OR FURTHER STUDY 15 MONTHS AFTER GRADUATION.

Graduate Outcomes, 2018-19.

Recent employers include:

- ARM Holdings Ltd
- British Nuclear Group
- Deva Electronic Controls
- Energetix Group PLC
- Ericsson Ltd
- Heap and Partners Ltd
- Logica CMG
- Marconi
- Ministry of Defence
- Royal Liverpool University Hospital (Clinical Engineering)
- Science and Technology Facilities Council
- Daresbury Laboratory
- Scottish Power
- The Highways Agency
- United Utilities PLC
- Siemens UK

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, how to pay, and other costs to consider.

TUITION FEES
Tuition fees cover the cost of your teaching, assessment, operating University facilities such as libraries, IT equipment, and access to academic and personal support.

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<tr>
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<th>UK fees</th>
<th>International fees</th>
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<tr>
<td>Full-time place, per year</td>
<td>£9,250</td>
<td>£24,500</td>
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<td>Year in industry fee</td>
<td>£1,850</td>
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<tr>
<td>Year abroad fee</td>
<td>£1,385</td>
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Fees stated are for the 2022-23 academic year and may rise for 2023-24.

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
Select your country or region for more scholarships and bursaries.
Entry requirements
The qualifications and exam results you’ll need to apply for this course.

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<th>Your qualification</th>
<th>Requirements</th>
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<tr>
<td><strong>A levels</strong></td>
<td>AAB</td>
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<td>You may automatically qualify for reduced entry requirements through our <a href="#">contextual offers scheme</a>.</td>
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<tr>
<td><strong>GCSE</strong></td>
<td>4/C in English and 4/C in Mathematics</td>
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<td><strong>Subject requirements</strong></td>
<td>A level Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).</td>
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<td>For applicants from England: For science A Levels that include the separately graded practical endorsement, a Pass is required.</td>
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<tr>
<td><strong>BTEC Level 3 Subsidiary Diploma</strong></td>
<td>Distinction* in BTEC (any subject) plus AB in A Levels.</td>
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<td>A Levels must include Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).</td>
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<td><strong>BTEC Level 3 Diploma</strong></td>
<td>D<em>D</em> in a relevant BTEC considered alongside grade B in A Level Mathematics.</td>
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<tr>
<td><strong>BTEC Level 3 National Extended Diploma</strong></td>
<td>D<em>D</em> and grade B in A Level Mathematics.</td>
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<td><strong>International Baccalaureate</strong></td>
<td>35 overall, including 5 in Higher Level Mathematics and 5 in a Higher Level science subject.</td>
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<td><strong>Irish Leaving Certificate</strong></td>
<td>H1, H1, H2, H2, H2, H3 including H2 or above in Mathematics and a science subject ((Chemistry, Computer Science, Further Mathematics, Physics or Electronics)).</td>
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<tr>
<td><strong>Scottish Higher/Advanced Higher</strong></td>
<td>AAB in Advanced Highers including Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).</td>
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<td><strong>Welsh Baccalaureate Advanced</strong></td>
<td>Accepted at grade B alongside A Level grades AA in Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).</td>
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<tr>
<td><strong>Cambridge Pre-U Diploma</strong></td>
<td>D3 in Cambridge Pre U Principal Subject is accepted as equivalent to A-Level grade A M2 in Cambridge Pre U Principal Subject is accepted as equivalent to A-Level grade B Global Perspectives and Short Courses are not accepted.</td>
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<td><strong>Access</strong></td>
<td>Considered if taking a relevant subject. 42 Level 3 credits at Distinction, including 15 Level 3 credits in Mathematics is required. GCSE English and Mathematics grade C/4 or above also required. Students will be required to take an online Mathematics assessment, please contact the University for further information.</td>
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<td>Your qualification</td>
<td>Requirements</td>
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<td>About our typical entry requirements</td>
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### International qualifications

Select your country or region to view specific entry requirements.

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.

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**ALTERNATIVE ENTRY REQUIREMENTS**

- If your qualification isn’t listed here, or you’re taking a combination of qualifications, contact us for advice
- Applications from mature students are welcome.

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**THE ORIGINAL REDEBRICK**