UNIVERSITY OF LIVERPOOL

Electrical and Electronic Engineering with a Year Abroad BEng (Hons)

COURSE DETAILS

- A level requirements: ABB
- UCAS code: H611
- Study mode: Full-time
- Length: 4 years

KEY DATES

- Apply by: 31 January 2024
- Starts: 23 September 2024

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.

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

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ACCREDITATION

Accredited by the Institution of Engineering and Technology (IET) on behalf of the Engineering Council for the purposes of fully meeting the academic requirement for registration as an Incorporated Engineer and partly meeting the academic requirement for registration as a Chartered Engineer.

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.

ELECTRONIC CIRCUITS AND SYSTEMS (ELEC271)

Credits: 15 / Semester: semester 2

The module concerns the understanding of how electronic amplifier circuits work and some basic ideas on how to design them. This requires an appreciation of linear small-signal equivalent circuits based on device physics and how to use them to assist the design process. Students will also learn how to break down complex circuits into simpler building blocks and how these blocks in turn, represented by linear equivalent circuits, can be combined to achieve the desired functionality. How negative feedback can be applied to produce high performance, stable circuits with high tolerance. The current state of the art is emphasised together with a historical perspective, noting some of the pioneers in the field.

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

(This module is for those EEE students who have not studied at XJTLU).

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.

FIELD THEORY, PARTIAL DIFFERENTIAL EQUATIONS & METHODS OF SOLUTION (MATH282)

Credits: 7.5 / Semester: semester 1

For XJTLU Students 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 introduce some advanced methods for solving these (i.e. Fourier series, Fourier transforms, Laplace transforms), and further methods for approximating solutions (central difference methods in one and two dimensions).

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

YEAR ABROAD (YEAR THREE)

You are required to spend the year abroad on an approved placement at a European or overseas partner institution.

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

YEAR FOUR

In your final year, you will undertake a major individual project that is either linked to research work or has some industrial relevance.

Other modules are studied which reflect your personal interest, providing an opportunity either to focus on your preferred specialisation, or keep your options open with a broad range of subjects.

In addition to compulsory modules, you choose two from the indicative list of optional modules.

COMPULSORY MODULES

ENGINEERING MANAGEMENT & ENTREPRENEURIAL SKILLS (ELEC352)

Credits: 7.5 / Semester: semester 1

This module covers project management for year 3 students registered in the Department of Electrical Engineering and Electronics. Entrepreneurial skills are also be covered.

BENG PROJECT (ELEC340)

Credits: 30 / Semester: whole session

Students undertake an extended individual project. Projects are specified by academic staff and cover the whole range of Electrical and Electronic Engineering including hardware (both analogue and digital), software and simulation or a mixture of these. Students can also suggest their own projects which need to be approved by an academic supervisor. Students work closely with their academic supervisor to realize their project aims and assessment is split between a preliminary report, an oral presentation, the bench inspection and the final report.

OPTIONAL 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.

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.

LOW POWER COMPUTER ARCHITECTURE (ELEC370)

Credits: 15 / Semester: semester 1

In this module students gain an understanding of the architecture and operation of embedded computer systems and their components. Furthermore, they gain an understanding of how computer performance is dependent upon the design of computer architectures and sub-circuits.

IMAGE PROCESSING (ELEC319)

Credits: 7.5 / Semester: semester 1

This module covers the fundamentals of how images are generated, represented, compressed and processed to extract features of interest.

NEURAL NETWORKS (ELEC320)

Credits: 7.5 / Semester: semester 2

Introduction to neural network theory, applications and artificial intelligence.

PHOTONICS AND OPTICAL INFORMATION SYSTEMS (ELEC313)

Credits: 15 / Semester: semester 1

The aims of this module are: To introduce students to the fundamental principles of opto/electronic systems for the transfer of information. To introduce the duality of light as both wave and ray. To show intensity and phase related optical principles. To demonstrate optical information transfer through a number of applications.

RF ENGINEERING AND APPLIED ELECTROMAGNETICS (ELEC311)

Credits: 7.5 / Semester: semester 1

This module will introduce students to the fundamental concepts of high frequency electromagnetics, and circuit design techniques that must be considered in the design of high frequency circuits and systems.

Students will learn in-depth knowledge of transmission lines, the Smith Chart, standing waves and scattering parameters etc.

After this module, students will be able to appreciate the microwave and RF circuit design for contemporary communication systems.

SIGNAL PROCESSING AND DIGITAL FILTERING (ELEC309)

Credits: 15 / Semester: semester 2

This module is aimed at developing the basic framework for signal processing and to demonstrate its applications. Also, the module provides students with a good understanding of the types, behaviours and design of FIR and IIR digital filters.

Teaching and learning are provided through a variety of means like formal lectures, problem sheets, supplementary questions, along with formative and summative online tests (through CANVAS, the electronic VLE system).

Assessment is carried out by means of two assignments and final (written) exam.

PLASMA SYSTEM ENGINEERING (ELEC391)

Credits: 7.5 / Semester: semester 1

The module introduces to the students the basic concepts of electrical plasmas and how they are used in industry. It concentrates on the engineering principles behind plasma technology rather than the physics of the discharge, however some mathematical approaches are explored so that quantification of the action of plasmas upon material surfaces can be made. The module explains how a gas can turn into a plasma and how high energy ions in the plasma can be generated to process a substrate, such as silicon wafer in micro-electronics fabrication. The module is taught by a mixture of power points notes and chalk and talk. There are a number of question sheets given out to help the students understand the basis plasma-material processes. On completion, students will understand how plasmas are used in industry, they will have an appreciation of some aspects of simple design and how plasmas can be configured for the next generation of fusion power stations.

POWER SYSTEMS AND POWER ELECTRONICS (ELEC301)

Credits: 15 / Semester: semester 1

A core module of electrical engineering for delivering fundamental principles of power systems: including electricity generation, transmission and distribution, and power electronics for conversion of electricity with different frequency and magnitude.

INTEGRATED CIRCUITS - CONCEPTS AND DESIGN (ELEC372)

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.

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.

Some of our graduates go on to work in the industrial sector, in government and in education, whilst others enter non-technical professions such as banking, accountancy, management and law.

Specific career paths are many and varied, and have previously included:

- Design Engineer
- Systems Engineer
- Medical Physicist
- Postdoctoral Research Scientist
- Radio Frequency Scientist.

Many graduates have moved on to have careers with employers in the following industries:

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

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

Discover Uni, 2018-19.

Fees and funding

Your tuition fees, how to pay, and other costs to consider.

TUITION FEES

UK fees (applies to Channel Islands, Isle of Man and Republic of Ireland)	
Full-time place, per year	£9,250

International fees	
Full-time place, per year	£27,200

Fees are correct for the academic year 2024/25
Tuition fees cover the cost of your teaching, assessment, operating University facilities such as libraries, IT equipment, and access to academic and personal support.

ADDITIONAL COSTS

Your tuition fee covers almost everything. but you may have additional study costs to consider, such as books, specialist equipment or field trips.

All essential 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 provide tuition fee discounts and help with living expenses while at university.

Check out our Undergraduate Global Advancement Scholarship. This offers a tuition fee discount of up to £5,000 for eligible students starting an undergraduate degree from September 2024. There's also the Liverpool Bursary which is worth £2,000 per year for eligible students.

Discover our full range of undergraduate scholarships and bursaries

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Entry requirements

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

Your qualification	**Requirements** About our typical entry requirements
A levels	ABB 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 including a Foundation Year at Carmel College)
GCSE	4/C in English and 4/C in Mathematics
Subject requirements	For applicants from England: For science A Levels that include the separately graded practical endorsement, a Pass is required.
BTEC Level 3 Subsidiary Diploma	Distinction in BTEC (any subject) plus AB in A Levels. A Levels must include Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).
BTEC Level 3 Diploma	D*D in a relevant BTEC considered alongside grade B in A Level Mathematics.
BTEC Level 3 National Extended Diploma	D*D*D in a relevant Diploma, including Distinction in 'Further Mathematics for Engineering Technicians' unit. Students will

Your qualification	**Requirements** About our typical entry requirements
	also be required to take an online Mathematics assessment, please contact the University for further information.
International Baccalaureate	33 overall, including 5 in Higher Level Mathematics and 5 in a Higher Level science subject.
Irish Leaving Certificate	H1, H2, H2, H2, H3, H3 including H2 or above in Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).
Scottish Higher/Advanced Higher	ABB in Advanced Highers including Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).
Welsh Baccalaureate Advanced	Accepted at grade B alongside A Level grades AB in Mathematics and a science subject (Chemistry, Computer Science, Further Mathematics, Physics or Electronics).
Cambridge Pre-U Diploma	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.
Access	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.
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

Your qualification	Requirements About our typical entry requirements
	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 for advice
- Applications from mature students are welcome.

THE ORIGINAL REDBRICK