UNIVERSITY OF LIVERPOOL

Advanced Mechanical Engineering MSc (Eng)

COURSE DETAILS

- Full-time: 12 months

SEPTEMBER START

- Apply by: 29 August 2025
- Starts: 22 September 2025

JANUARY START

- Apply by: 31 October 2025
- Starts: 26 January 2026

Course overview

Study Advanced Mechanical Engineering and learn to design, build and test new products, processes and systems. You will develop a sound understanding of Advanced Mechanical Engineering principles and the ability to undertake teamwork and communicate ideas, valuable skills for your future career.

INTRODUCTION

The core modules studied on the programme will develop your understanding and knowledge of the principles of Advanced Mechanical Engineering to an advanced level. They include specialist knowledge in thermo and fluid dynamics, combustion in IC engines, alternative and conventional energy generation methods and nuclear engineering. You will be taught techniques for managing projects and research, giving you highly desirable skills for working in industry.

This programme aligns with the current accredited undergraduate integrated Masters MEng 4th year in Mechanical Engineering with co-taught M level modules from the existing programme organised in two 12-week semesters with examinations at the end of each semester worth 120 credits from a total of 180. This is then combined with an MSc advanced research project over the summer term worth the remaining 60 credits.

WHAT YOU'LL LEARN

- Thermo and fluid dynamics
- Combustion in internal combustion engines

- An understanding of the advantages and disadvantages of alternative and conventional energy generation methods
- An understanding of nuclear engineering, with coverage going from the atomic scale through to the bulk scale
- An understanding of material failure analysis
- The principles of advanced manufacturing techniques using lasers
- The properties and limitations of a range of ‘smart materials’
- Technical writing skills to support project planning.

ACCREDITATION

This programme is fully accredited by the Institution of Mechanical Engineers.

Course content

Discover what you'll learn, what you'll study, and how you'll be taught and assessed.

SEMESTER ONE

This course is available to start in September or January. If you choose to start in January, you'll undertake the Semester two modules first, from January to May. This will be followed by your research project over the summer and then your Semester one modules from September to January. On successful completion of the course, following a January start, you can expect to graduate at our summer graduation ceremonies.

Please note, UK students are exempt from Technical Writing for Engineers and should instead take Project Management. EU/International students with strong English language skills can be exempt as well, subject to Programme Director's approval.

If you're a University of Liverpool Engineering graduate or have a relevant background, you may be able to replace Engineering Fluid Mechanics with Advanced Fluid Mechanics.

COMPULSORY MODULES

ENGINEERING FLUID MECHANICS (MECH627)

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).

NUCLEAR TECHNOLOGIES (MECH434)

Credits: 7.5 / Semester: semester 1

The module provides an understanding of nuclear engineering, with coverage going from the atomic scale through to the bulk scale. The topics will cover reactor dynamics, design and operation, lifetime behaviour, evolution of technologies and nuclear waste. For example, understanding the implications of the fission/fusion processes themselves on the behaviour of the core.

TECHNICAL WRITING FOR ENGINEERS (ENGG596)

Credits: 7.5 / Semester: semester 1

To develop technical writing skills for engineers. English Language Centre deliver the module for non-native English speakers, Engineering staff deliver identical syllabus, assessments and learning outcomes for other students.

ADDITIVE MANUFACTURING (MNFG603)

Credits: 15 / Semester: semester 1

This module aligns our graduates with the market needs. The UK additive manufacturing market was valued at 0.54 billion pounds sterling in 2022 and is predicted to reach 2.01 billion pounds sterling by 2030, with a compound annual growth rate of 18.0% from 2023 to 2030.

OPTIONAL MODULES

PROJECT MANAGEMENT (MNGT502)

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 modules student undertake a group "virtual project" in which they undertake all stages of project management involved n 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.

COMPUTER AIDED DESIGN (MNFG604)

Credits: 7.5 / Semester: semester 1

To introduce the student to the latest 3D tools and techniques used by designers.

To develop a wider knowledge and understanding of integrated systems design.

To stimulate an appreciation of modern design and development methodologies.

FINITE ELEMENT ANALYSIS (MECH452)

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 Abaqus 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

LASER MATERIALS PROCESSING (MECH605)

Credits: 15 / Semester: semester 1

The module will cover: how lasers work, what are the key beam properties of high power lasers, how the beam is deployed and delivered to the process/workpiece, safety in laser materials processing, and the working principles and industry practice for a range of laser processes.

ADVANCED FLUID MECHANICS AND AERODYNAMICS (AERO406)

Credits: 15 / Semester: semester 1

To reinforce and deepen the students' understanding of:

— the mathematical description of fluid kinematics.

— the physical laws expressed by the equations of fluid motion.

— the assumptions associated with particular limits of the equations of fluid motion.

— simple exact solutions of the equations of motion.

— the governing equations for compressible flows.

— the differences between laminar and turbulent flow.

— the origins of laminar-turbulent flow transition.

— the physics of turbulence.

— the need for turbulence modelling and fundamental concepts of turbulence modelling.

To introduce students to advanced concepts in potential flow theory building upon existing knowledge of:

— the analytical generation of inviscid flow over two-dimensional objects using elementary potential flows.

— the analytical calculation of resulting forces and moments on lifting surfaces.

— the numerical computation of aerodynamic properties using panel methods

To enable student to:

— recognize the capabilities and weaknesses of CFD.

— choose appropriate levels of CFD analysis for a specific problem.

— use a suitable CFD package, including meshing and setting up a simulation.

— understand preliminary aerodynamic knowledge related to turbomachinery.

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Any optional modules listed above are illustrative only and may vary from year to year. Modules may be subject to minimum student numbers being achieved and staff availability. This means that the availability of specific optional modules cannot be guaranteed.

SEMESTER TWO

This course is available to start in September or January. If you choose to start in January, you'll undertake the Semester two modules first, from January to May. This will be followed by your research project over the summer and then your Semester one modules from September to January. On successful completion of the course, following a January start, you can expect to graduate at our summer graduation ceremonies.

COMPULSORY MODULES

ADVANCED MANUFACTURING WITH LASERS (MECH607)

Credits: 15 / Semester: semester 2

This module provides an understanding of the principles of advanced manufacturing techniques using lasers and how these are being explored through current/recent research and adopted by industry.

DESIGN FOR ENVIRONMENT, MANUFACTURE AND ASSEMBLY (MNFG413)

Credits: 7.5 / Semester: semester 2

The aim of this module is to provide an introduction to the tools and methods of Eco-design, Design for Manufacture and Assembly using real, everyday products as examples.

ENERGY AND THE ENVIRONMENT (MECH433)

Credits: 15 / Semester: semester 2

This modules discusses energy generation and usage, and how they complement each other. The topics are introduced in lectures that then lead onto a case study on a specific topic.

STRUCTURAL INTEGRITY (ENGG409)

Credits: 15 / Semester: semester 2

This module introduces the concepts required to maintain structural integrity. Topics covered are: detecting structural defects, predicting when defects will cause failure, and mitigating against failure.

ADVANCED ENGINEERING MATERIALS (MATS631)

Credits: 15 / Semester: semester 2

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.

SMART MATERIALS (MATS515)

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.

OPTIONAL MODULES

ADVANCED ENGINEERING MATERIALS (MATS631)

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FINAL PROJECT

This course is available to start in September or January. If you choose to start in January, you'll undertake the Semester two modules first, from January to May. This will be followed by

your research project over the summer and then your Semester one modules from September to January. On successful completion of the course, following a January start, you can expect to graduate at our summer graduation ceremonies.

COMPULSORY MODULES

MSC(ENG) PROJECT (60 CREDITS) (ENGG660)

Credits: 60 / Semester: summer

The purpose of the project is to provide students with the opportunity to plan, carry out and control a research project at the forefront of their academic discipline, field of study or area of professional practice. The student will report findings both orally and in writing. Detailed instructions are provided in the PG handbook distributed at the outset of the programme.

Any optional modules listed above are illustrative only and may vary from year to year. Modules may be subject to minimum student numbers being achieved and staff availability. This means that the availability of specific optional modules cannot be guaranteed.

HOW YOU'LL LEARN

You'll learn across a variety of teaching methods, like lectures, seminars, and tutorials – some online and some in person. You'll also access asynchronous online content on a weekly basis with personal tutorials and take part in group work projects, based on engineering grand challenges faced by global society today.

There's opportunity to get hands-on too with active learning lab sessions, laser micromachining and lab work using special design software such as Finite Element.

HOW YOU'RE ASSESSED

Across your modules, you'll be assessed in a number of different ways, including exams, lab activity, case studies, reports and a design of a product for assembly.

Your final project work will be based on a topic of industrial or scientific relevance and will be carried out in laboratories in the University or at an approved placement in industry. You'll examine this project in your dissertation and show evidence of in-depth understanding, mastery of research techniques, ability to analyse assembled data, and assessment of 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

We equip our students for rewarding careers and our graduates have found jobs in a wide range of industries and organisations, both in the UK and abroad.

Programmes include a strong practical element and incorporate the latest academic and industry research, enabling you to work effectively at the forefront of engineering.

Career support from day one to graduation and beyond

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Career planning

Our Careers Studio and career coaches can provide tailored support for your future plans.

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From education to employment

Employability in your curriculum for a successful transition

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Networking events

Make meaningful connections with like-minded professionals

YOUR FUTURE

Career Destinations are wide and varied**.** Some employers include:

- Agusta Westland
- NHS
- BAE Systems
- Ford
- Jaguar
- Unilever
- Armed Forces
- QinetiQ

- National and International bodies such as EPSRC and the European Commission.

Fees and funding

Your tuition fees, funding your studies, 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	£13,300

International fees	
Full-time place, per year	£29,900

Fees stated are for the 2025-26 academic year.
Tuition fees cover the cost of your teaching and assessment, operating facilities such as libraries, IT equipment, and access to academic and personal support.

- You can pay your tuition fees in instalments.
- All or part of your tuition fees can be funded by external sponsorship.
- International applicants who accept an offer of a place will need to pay a tuition fee deposit.

If you're a UK national, or have settled status in the UK, you may be eligible to apply for a Postgraduate Loan worth up to £12,167 to help with course fees and living costs. **Learn more about fees and funding**.

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 could include buying a laptop, books, or stationery.

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 that could help pay your tuition and living expenses.

We've set the country or region your qualifications are from as United Kingdom. Change it here

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POSTGRADUATE GLOBAL ADVANCEMENT SCHOLARSHIP – ACHIEVEMENT

- International students

If you're an international student joining a master's course with us, you could be eligible to receive a tuition fee discount of £2,500, based on your prior academic achievement, choice of course, and you not having studied with us before.

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POSTGRADUATE GLOBAL ADVANCEMENT SCHOLARSHIP – COUNTRY

- International students
- Antigua and Barbuda
- Australia
- Bangladesh
- Barbados
- Belize
- Brunei
- Canada
- China
- Cyprus
- Dominica
- Egypt
- Ghana
- Grenada
- Guyana
- India
- Jamaica
- Japan
- Kenya
- Malaysia
- Mauritius
- Mexico
- New Zealand
- Nigeria
- Pakistan
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and The Grenadines
- Singapore
- South Africa
- South Korea
- Sri Lanka
- Tanzania
- Thailand
- Trinidad and Tobago

- Turkey
- Uganda
- Vietnam

If you're an international student joining a master's course with us, you could be eligible to receive a tuition fee discount of £2,500, based on your nationality, choice of course, and you not having studied with us before.

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GRADUATE LOYALTY ADVANCEMENT SCHOLARSHIP

- Home and international students

If you're a University of Liverpool graduate starting this master's degree with us, you could be eligible to receive a loyalty discount of up to £2,500 off your master's tuition fees.

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CHILEAN NATIONAL AGENCY FOR RESEARCH AND DEVELOPMENT (ANID) SCHOLARSHIP

- International students
- Chile

If you're a Chilean student joining a master's degree, you could be eligible to apply for a 20% discount on your tuition fees with a Chilean National Agency for Research and Development (ANID) Scholarship. Scholarship.

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CHEVENING SCHOLARSHIPS

- International students
- Albania
- Algeria
- Anguilla
- Antigua and Barbuda
- Argentina
- Australia
- Azerbaijan
- Bangladesh
- Barbados
- Belize
- Bolivia
- Brazil
- British Virgin Islands
- Brunei
- Canada
- Cayman Islands
- Chile
- China
- Columbia
- Costa Rica
- Cuba
- Dominica

- Ecuador
- Egypt
- El Salvador
- Ghana
- Guatemala
- Guyana
- Honduras
- Hong Kong
- Iceland
- India
- Indonesia
- Iraq
- Jamaica
- Japan
- Jordan
- Kazakhstan
- Kenya
- Libya
- Malaysia
- Mauritius
- Mexico
- Moldova
- Mongolia
- Montserrat
- Morocco
- Nepal
- New Zealand
- Nicaragua
- Nigeria
- Pakistan
- Panama
- Paraguay
- Peru
- Philippines
- Russia
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and The Grenadines
- Serbia
- Singapore
- South Africa
- South Korea
- South Sudan
- Sri Lanka
- Sudan
- Taiwan
- Tanzania
- Thailand

- Trinidad and Tobago
- Turkey
- Turks and Caicos Islands
- Uganda
- Ukraine
- Uruguay
- Venezuela
- Vietnam
- Zimbabwe

If you're an international student from an eligible country, joining a one-year master's course, you could be eligible to apply for a Chevening Scholarship. If your application is successful, you could expect to have your master's fees paid, up to a maximum of £18,000, and receive additional help with living costs.

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CONSEJO NACIONAL DE CIENCIA Y TECNOLOGIA (CONACYT) AWARD

- International students
- Mexico

If you're a Mexican student joining a master's degree, you could be eligible to apply for a 30% discount on your tuition fees with a CONACyT Award.

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FUND FOR THE DEVELOPMENT OF HUMAN RESOURCES (FIDERH) AWARD

- International students
- Mexico

If you're a Mexican student joining a master's degree and you're in receipt of a FIDERH graduate loan, you could be eligible to benefit from a 20% discount on your tuition fees with a FIDERH Award.

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FUNED AWARD

- International students
- Mexico

If you're a Mexican student joining a master's degree and you're in receipt of a FUNED loan, you can apply to be considered for a 20% tuition fee discount. A total of up to 50 awards will be available to master's and PhD students per academic year.

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FUNED SCHOLARSHIP FOR WOMEN IN STEM SUBJECTS

- International students
- Mexico

If you're a female Mexican student joining an eligible master's course in a science, technology, engineering or maths (STEM) subject and you're in receipt of a FUNED loan, you can apply to be considered for a 25% tuition fee discount. Up to five awards are available in each academic year.

- ## HONG KONG GRADUATE ASSOCIATION & TUNG FOUNDATION POSTGRADUATE SCHOLARSHIPS

  - International students
  - China
  - Hong Kong

  If you're a master's student from Hong Kong or the People's Republic of China who can demonstrate academic excellence, you may be eligible to apply for a scholarship worth up to £10,000 in partnership with the Tung Foundation.

- ## HRH PRINCESS SIRINDHORN UNIVERSITY OF LIVERPOOL SCHOLARSHIP (THAILAND)

  - International students
  - Thailand

  If you're a student from Thailand joining a one-year master's degree, you might be eligible to apply to have your tuition fees paid in full and receive help with living costs. One award is available and only students who are new to the University will be considered.

- ## HUMANITARIAN SCHOLARSHIPS FOR MASTER'S PROGRAMMES

  - International students

  Do you have recognised status as a refugee or person with humanitarian protection outside the UK? Or are you a Ukrainian who's sought temporary protection in the EU? You could be eligible to apply for the full payment of your master's fees and additional financial support.

- ## JOHN LENNON MEMORIAL SCHOLARSHIP

  - Home students

  If you're a UK student, either born in or with strong family connections to Merseyside, you could be eligible to apply for a fee discount of up to £4,500. You'll need to demonstrate an active interest in global, community and environmental issues to be considered.

- ## JUVENTUDESGTO SCHOLARSHIP

  - International students
  - Mexico

  If you're a resident of the state of Guanajuato in Mexico joining a master's degree, you could be eligible for a 10% discount on your tuition fees with a JuventudEsGto Scholarship.

- ## KAPLAN DIGITAL PATHWAYS EXCELLENCE SCHOLARSHIP

  - International students

  Completed a Kaplan Digital Pathways Pre-Master's? We're offering a £5,000 fee discount off the first year of master's study for a maximum of two high achieving students joining one of our non-clinical master's courses from an online Kaplan Pre-Master's programme.

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MARSHALL SCHOLARSHIP

- International students
- United States

If you're a USA student joining an eligible master's with us, you could be eligible to apply for a Marshall Scholarship. If your application is successful, your master's tuition fees will be paid in full. One Marshall Scholarship for master's study is available in each academic year.

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POSTGRADUATE OPPORTUNITY BURSARY

- Home students

If you're a UK University of Liverpool graduate joining a master's degree with us, you could be eligible to receive £3,000 off your tuition fees. You must have graduated in the last two years and received a widening access scholarship during your undergraduate studies.

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SCOTTISH POWER SCHOLARSHIPS

- Home students

Are you a UK student joining a master's course focused on sustainable energy or environmental protection? You could be eligible to apply for a Scottish Power Scholarship. This award offers full payment of your master's fees and a monthly bursary while you study.

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SPORT LIVERPOOL PERFORMANCE PROGRAMME

- Home and international students

Apply to receive tailored training support to enhance your sporting performance. Our athlete support package includes a range of benefits, from bespoke strength and conditioning training to physiotherapy sessions and one-to-one nutritional advice.

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TURKISH MINISTRY OF EDUCATION SCHOLARSHIP

- International students
- Turkey

If you're a Turkish student joining a master's degree, you could be eligible to apply for a 20% discount on your tuition fees with a Turkish Ministry of Education Scholarship.

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UNIVERSITY OF LIVERPOOL INTERNATIONAL COLLEGE EXCELLENCE SCHOLARSHIP

- International students

Completed a Pre-Master's at University of Liverpool International College (UoLIC)? We're offering a £5,000 fee discount off the first year of master's study to some of the highest achieving students joining one of our non-clinical master's courses from UoLIC.

- ## UNIVERSITY OF LIVERPOOL INTERNATIONAL COLLEGE IMPACT PROGRESSION SCHOLARSHIPS

  - International students

If you're a University of Liverpool International College student awarded a Kaplan Impact Scholarship, we'll also consider you for an Impact Progression Scholarship. If selected, you'll receive a fee discount worth £3,000 off the first year of your master's course.

- ## VICE-CHANCELLOR'S INTERNATIONAL ATTAINMENT SCHOLARSHIP FOR MAINLAND CHINA

  - International students
  - China

Are you a high-achieving graduate from the People's Republic of China with a degree from a Chinese university? You could be eligible to apply for a £5,000 fee discount if you're joining an eligible master's course. Up to 15 eligible students will receive this scholarship.

Entry requirements

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

Your qualification	**Requirements** About our typical entry requirements
GCSE	4/C in English and 4/C in Mathematics
Postgraduate entry requirements	We accept a 2:2 honours degree from a UK university, or an equivalent academic qualification from a similar non-UK institution. This should be in an Engineering or Science subject that provides appropriate knowledge of core engineering science topics.
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.

THE ORIGINAL REDBRICK