Electrical, Electronic and Mechatronic Engineering
Our School of Electrical and Electronic Engineering is one of the largest in the UK, with over 70 academic staff, a similar number of support staff and a student population of over 1000. More than 650 undergraduate students benefit from our wealth of expertise—and a warm welcome.

We have been involved in education and research for over a century. The first stored-program computer was designed and built by Frederic C Williams and Tom Kilburn in our School at The University of Manchester; its first program ran on June 21, 1948.

Since then, computing has advanced enormously—and we are proud to remain at the forefront of these developments. Computing equipment at the University alone now requires a 2MW electrical supply system; thankfully, we contribute towards providing this as well.

Our research activities equip us with the expertise to educate the next generation of electrical, electronic and mechatronic engineers, who will continue to be responsible for major changes to the world that we live in. After all, can you now imagine a world without computers, smart phones, interactive video games, flat-screen 3D smart televisions, or Twitter? Join our School and you could become one of these engineers.
Employability

Our courses are practical-based to ensure you leave us with not just the theory behind electrical, electronic and mechatronic engineering, but also the skills to put that theory into practice. Our Industrial Advisory Group offers guidance on the knowledge and skills industry will need in 3 or 4 years’ time so we are able to offer courses that produce graduates prized by industry.

All our courses are available with an Industrial placement year which means you can get paid for a year of your study while gaining hands-on experience as a real engineer. We also offer summer jobs within our school which offers you the opportunity to contribute to world leading research projects.

Student Lead Experience

With our Electrical and Electronic Engineering Society (EEESoc), Electronics Club (E4C), Robotics Society, Peer-Assisted Study Scheme (PASS) and Formula Student on offer, we give you lots of opportunities to put your studies to work in a social and fun environment.

IET accreditation

This is the professional body that accredits our degrees so that you can apply to become a chartered engineer when you graduate. Our courses are also accredited by the Institution of Measurements and Control.

Flexible Degrees

We want to ensure that you obtain the most appropriate degree for your future needs so we offer you flexibility. All our courses are available with an Industrial placement and as BEng or MEng degrees; you can change between these options during your study.

Happy students

Based on the National Student Survey (NSS) we have achieved an average of more than 95% in overall student satisfaction over the last five years. This shows our continued commitment to one of our key assets, YOU!
Entry requirements

GCSE
Grade C in Mathematics and English language. Grade 4 for applicants holding newly reformed GCSEs in England.

GCE A-level / Unit grades
BEng: AAB including Mathematics and either Physics, Electronics or Further Mathematics.
MEng: AAA including Mathematics and either Physics, Electronics or Further Mathematics.

IEC Diploma
BEng: 34 points overall, including 6 points in Mathematics and Physics at Higher level and a minimum of 5 points in one other Higher level subject.
MEng: 34 points overall, including 6 points in Mathematics and Physics at Higher level and 6 points in one other Higher level subject.

Pearson BTEC Level 3 National Extended Diploma
In addition to the following requirements applicants must achieve grade B in GCE A/S Level Mathematics. You must also pass an interview.

BEng: BTEC Extended Diploma in Electrical and Electronic Engineering with Distinction in the Further Engineering Maths Module.
MEng: BTEC Extended Diploma in Electrical and Electronic Engineering with Distinction* in the Further Engineering Maths Module.

Welsh Baccalaureate (including A-levels)
BEng: Pass WB with a minimum grade A and obtain AB in A-Level, including Mathematics and either Physics, Electronics, or Further Mathematics.
MEng: Pass WB with a minimum grade A and obtain AA in A-Level, including Mathematics and either Physics, Electronics, or Further Mathematics.

Scottish requirements
BEng: Grades AAABB in Scottish Highers including Mathematics and either Physics, Electronics or Further Mathematics. In addition, 2 Scottish Advanced Highers are normally required at grades AB including Mathematics and either Physics, Further Mathematics or Electronics.
MEng: Grades AABBB in Scottish Highers including Mathematics and either Physics, Electronics or Further Mathematics. In addition, 2 Scottish Advanced Highers are normally required at grades AA including Mathematics and either Physics, Further Mathematics or Electronics.

Irish Leaving Certificate
BEng: H1 H1 H1 H2 in Irish Leaving Certificate including H1 in Maths and Physics and H2 in English.
MEng: H1 H1 H1 H1 in Irish Leaving Certificate including H1 in Maths and Physics and H2 in English.

English Language qualifications
One of the following: GCSE English Language Grade C or Grade 4 for applicants holding newly reformed GCSEs in England. IELTS 6 (minimum of 5.5 in any component), TOEFL 80 overall with no subtest less than 18.

Requirements are subject to change, for the most up to date information on entry requirements to specific courses, visit: http://man.ac.uk/hFvbe0

How will you be taught?

A typical course unit structure comprises:
• Two laboratory exercises (each of three hours)
• 20 lectures
• Four example classes
• Two personal tutorials

Laboratory exercises
Laboratory exercises are specifically designed for each course unit to give you the best possible learning experience as you put theory into practice. In some instances, in-lab marking will be used, giving you immediate feedback on your understanding of the subject. Alternatively, you may need to submit a concise report after the practical session, which should combine the lecture material with the laboratory exercise. It is in the laboratory sessions that you will use ELVIS. This Educational Laboratory Virtual Instrumentation Suite is a leading educational platform by National Instruments (NI). We use it in our laboratory sessions for course units such as Electronic Circuit Design.

Find out more: www.ni.com/ielvis

myDAQ – a lab in a bag. Designed specifically for students, myDAQ provides you with the technology to experience hands-on learning anytime, anywhere.

Find out more: www.manchester.ac.uk/eee/mydaq

LabVIEW – this is an integral part of our courses. You will be taught Data Acquisition and Industrial Control applications in the LabVIEW structured environment. You will be able to take a free exam on your knowledge of LabVIEW and if successful, will be accredited by NI with a Certified LabVIEW Associate Developer certificate, an accreditation that is coveted by Industry.

Find out more: www.ni.com/academy

Lectures
We provide course notes in both printed and electronic format, the latter via our e-learning system. Your lecturers deliver material using a range of teaching media, such as PowerPoint, black/white board, video and demonstrations. Most of the lectures are recorded so that podcasts are available to aid revision.

Example classes
These are interspersed with the lectures at appropriate points and help you to understand key topics. As with lectures, your entire class will be present as the lecturer works through specific examples. You usually have the chance to prepare your own solutions before the class. Of course, we encourage you to participate; asking questions in front of a large audience is an important skill for you to learn and gain confidence in.

Personal tutorials
You will meet your personal tutor on a weekly basis, in a tutor group of about six students. During these sessions, you present your worked solutions to the lecturer. You will have the opportunity to ask questions in front of a large audience is an important skill for you to learn and gain confidence in.

Example classes
These are interspersed with the lectures at appropriate points and help you to understand key topics. As with lectures, your entire class will be present as the lecturer works through specific examples. You usually have the chance to prepare your own solutions before the class. Of course, we encourage you to participate; asking questions in front of a large audience is an important skill for you to learn and gain confidence in.

Project work
This runs through all years of your course. You will build a microcontroller development system as a project in your first year and then use it in the embedded systems group project in your second year.

A substantial feature of your third year is the individual project, which allows you to show innovation and application of the knowledge and techniques you have learned.

In your fourth year, you will work on a team project with six to eight other students.
Electrical and Electronic Engineering (EEE)
The use of electricity is an everyday part of our lives. It has to be generated as efficiently and cleanly as possible, and distributed safely to homes and industry. Our homes require electrical power for lighting, cooking, washing machines, refrigerators and freezers. Electrical power is also needed by computers, tablets, games consoles, smartphones, MP3 players, digital cameras and any other electronic gadget that you can think of.

The domestic mains voltage needs to be converted to a much lower voltage in other household equipment, such as music and video streaming systems, televisions, DVD and hard disk recorders, PCs, and peripherals, all of which contain sophisticated electronic circuitry. Industry needs power at a higher level for use in heavy machinery, which must be controlled and monitored by sophisticated electronic systems. Increasingly in transport, electrical systems are being used in electric vehicles (road and rail), hybrid drives (part electric motor, part internal combustion), engine management electronics, climate control, on-board entertainment and navigation systems. Some of the activities that the graduates from this course are involved with include:

- Design and operation of large-scale power systems and their integration with renewable energy sources.
- Design of electrical machines and the associated power conversion systems.
- High voltage engineering.
- Oil and gas exploitation.
- Design of mobile and wireless communications systems.
- Development of real-time speech and image processing algorithms.
- Design of guidance and control systems for unmanned intelligent underwater, ground and aerial vehicles.
- Development of microcontroller-based embedded systems and robotics.

Electronic Engineering (EE)
In the 21st century, we look to electronics to provide answers for more and more complicated problems. Take the mobile phone: a very sophisticated computer and communications system that links to a worldwide network of antennas to allow it to connect to any other mobile or landline. Or the digital camera, at the heart of which is a sophisticated electronic device containing millions of individual light-level detectors.

Modern electronics requires an understanding of basic analogue and digital circuits to enable the design of simple elements, which can be connected together to make small systems, which can be connected together to make bigger systems. When the systems become complicated, we require techniques to allow us to design and use them, such as digital signal processing – for images and audio signals, concurrent processing – to allow the manipulation of the massive amounts of data, data networking and digital communication systems - for local distribution and across the internet. Some of the activities that the graduates from this course are involved with include:

- Development of microcontroller-based embedded systems.
- Computer systems engineering.
- Robotics.
- Avionics.
- Automotive electronics.
- Design of automation and control systems for various industrial processes.
- Design of mobile and wireless communications systems.
- Development of real-time speech and image processing algorithms.
- Design of guidance and control systems for unmanned intelligent underwater, ground and aerial vehicles.

Mechatronic Engineering (MTE)
Mechatronics is the marriage of mechanical engineering with smart electronics and is vital to industrial automation and robotics.

To interact with an object, a system must know where the object is, be able to move the object and be able to place it in the required new position. The electronics therefore require information from sensors that can detect position, orientation and visual or audio signals. The electrical inputs from the sensors have to be interpreted and the appropriate signals sent out to the actuators to perform the required operation. This process relies on sophisticated software and hardware capable of translating low- voltage, low-current signals into power signals of sufficient current to drive the actuators.

A good understanding of feedback control is also required in order to make changes in the system from one steady position to another, without oscillations or unpredictable movements.

Some of the activities that the graduates from this course are involved with include:

- Development of microcontroller-based embedded systems.
- Robotics.
- Integration of renewable energy sources and the design of the associated power conversion systems.
- Development of automation and control systems for various industrial processes.
- Automotive electronics.
- Design of electrical machines and the development of guidance and control systems for unmanned intelligent underwater.
- Ground and aerial vehicles.

Which course is for you?
Many students studying for a degree in engineering aim to become Chartered Engineers, and accredited MEng courses give you the required educational base to achieve this.

Accredited BEng degree courses require you to complete further study in order to achieve the same status. This could take the form of full or part-time postgraduate study, distance learning, or work-based learning.

Of course your career path is still developing so our courses are designed to allow you the flexibility to switch between MEng and BEng during years one to three.
Industrial experience

Why ‘with Industrial Experience’?
All our courses can be combined with an accredited, year-long industrial placement for the award of a ‘with Industrial Experience’ degree.

Students on these extended courses spend a year in industry after their second year. Placements can be accredited by the IET towards the training required for attaining Chartered Engineer status. We encourage you to spend time in industry during your course as it develops your business, team-working and transferable skills, all of which are sought after by graduate employers. It will also increase your awareness of the broad range of careers on offer and guide your choice of optional subjects.

We have strong links with industry and our students find industrial placements with high profile companies, such as Red Bull Racing, Jaguar Land Rover, National Grid, BP, National Instruments, AstraZeneca, Texas Instruments and many others. During an industrial placement year you are paid a salary by the company you are working for.

Accreditation

IET
The IET [www.theiet.org](http://www.theiet.org) is the professional body that accredits all of our courses at MEng and BEng level; this accreditation is required if you want to become a chartered engineer. Here are some comments from their most recent accreditation visit:

“...the structure of the School’s BEng and MEng courses enables many opportunities for students to transfer between courses (including to the MSc). This is a helpful feature which when coupled with the annual review of each student’s situation ensures that students pursue the educational route that is to their best advantage.”

“The second year Embedded Systems project unit is an excellent example of students developing their team working skills in a multi-disciplinary project, noting that this acts as an early introduction to team working in a technical environment.”

“The support given to encourage students to pursue and secure placements is excellent, particularly the two day ‘managing my future’ programme that all students follow at the start of the 2nd year.”

“The level and amount of influence of the School’s research into the undergraduate and postgraduate programmes is exceptional.”

“The 'open surgery' sessions of two hours per week which most staff have in place is appreciated by the students and is considered a useful model which facilitates early resolution of any issues which students may have, without resorting to a formal appointment system.”

Our MEng and BEng courses are also accredited by the Institution of Measurements and Control [www.instmc.org](http://www.instmc.org).
As a student in our School of Electrical and Electronic Engineering, you will benefit from our strong links with industry.

Our Industrial Advisory Group is the forum where industry tells us of its vision for the future and offers guidance on the knowledge and skills that industry will expect of the best graduates in three or four years’ time. Through the guidance of this group and our annual course review, we are able to offer courses that produce the graduates prized by industry.

Industry-linked facilities and funding
Our strong, ever-growing links with industry not only help to inform our courses, but also boost our excellent teaching and research facilities which include:

- National Instruments Undergraduate Teaching Lab (including LabVIEW, LabView Academy and Multisim).
- National Grid High Voltage facility, including the National Grid Power Systems Research Centre.
- Rolls-Royce University Technology Centre (Electrical Systems for Extreme Environments).
- Oxford Instruments VG Semicon Molecular Beam Epitaxy facility.
- Agilent Technologies Millimetre-Wave Laboratory Industry also provides direct support for our teaching.
- National Graphene Institute.
- Centre for International Research for Clearance of Landmines and Explosives.
- Dalton Nuclear Institute.

As part of a research-led university, research is naturally very important to our School and students.

Research is important to you because you will be studying a subject that is very dynamic. The fundamental concepts of the subject are fixed (almost) but the technology and applications are continually changing and expanding. You need an education that can take this into account and, with academic staff who are research active, this is what you get at Manchester.

This means when you graduate you will have the education and knowledge needed by industry now and in the future, which is what makes our graduates so popular.

We cover research in all aspects of Electrical, Electronic and Mechatronic Engineering, our key themes are:

- Electronics in Agriculture – eAgri
- Functional Materials and Devices
- Power and Energy
- Robotics for Extreme Environments
- Sensing Technologies.
What you study?

The following sections briefly describe the content of each year of study. For more detailed information, visit:  http://man.ac.uk/hFvbe0

Year 1
The first year of study is common for all of our courses, the course units studied are:

Electronics Project
Introduces you to the practical skills associated with the design, electronic assembly, mechanical fabrication, testing and fault finding of electronic systems. You will assemble and test an interface board for a microcontroller development system, which is used as a teaching vehicle in later course units.

Electronic Materials
Introduces you to states of matter and classifications, such as metals, insulators and semiconductors; to electronic devices in nanoelectronics and nanophotonics; to sensors for applications in robotics, renewable energies, medicine and healthcare.

Measurements and Analytical Software
Systematically introduces you to the process of electrical measurement and the treatment and analysis of measurements and errors, as well as various types of instruments. The course unit also introduces you to LabVIEW, a widely used programming and computing platform for numerical analysis, modelling and electrical system simulation.

Circuit Analysis
Introduces you to the techniques used to analyse electric circuits, starting with DC circuits, progressing through Thévenin and Norton equivalent, moving on to RL, RC and RLC circuits, and finishing with AC circuits.

Digital System Design I
Starting with the principles of logic design, for example Boolean algebra, progressing through combinatorial specification and minimisation, and culminating with sequential design using finite state machines.

Electronic Circuit Design I
Explains the fundamentals of amplification using electronic components. Introduces you to the characteristics of electronic components and the concept of functional flexibility with respect to operational amplifiers, diodes and transistors. Practical implementation of electronic circuit design is a key part of the learning outcomes.

Energy Transport and Conversion
You discuss the various sources and forms of energy. The principles governing mechanics, AC electrical circuits, energy conversion and electrical transmission are described.

Electromagnetic Fields
Introduces you to the fundamental concepts and basic laws of electromagnetic fields and demonstrates their application to the solution of field problems, such as the fields produced by metal security detectors and RFID tag readers. We also link field concepts to the passive circuit components and the methods by which they are calculated.

Microcontroller Engineering I
Introduces the fundamental concepts of microcontroller architecture, digital interfacing and programming. The workings of a simple microprocessor is exemplified by a Microchip Technology microcontroller. You will learn how to control the interface board assembled in the Electronics Project, in both Assembly and C using an 8-bit PIC18F and a 32-bit ARM microcontroller.

C Programming
A foundation in practical programming skills with an emphasis on problem solving, data structures and algorithms.

Engineering Mathematics I and II
Engineers need the appropriate mathematical skills: functions and geometry, differentiation, integration, vectors, complex numbers, hyperbolic functions, matrices, ordinary differential equations, partial differentiation and series. These form a skill set that is applied in the other course units that we teach and are taught in this context.

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Electrical and Electronic Engineering
What you study?

Year 2

The first semester of the second year is common for all three courses; the second semester introduces the topics that lead to the specialisations of each course. You have the opportunity at this point to change course if you want to.

The theme of practical application and project work continues with the Embedded Systems Team Project. In this team project, you work in a small group to solve a realistic engineering design problem, using the microcontroller development system built in your first year.

The project centres on the design, construction and testing of a robotic buggy and culminates in a race day, when your buggy will be competing to be the fastest, most energy-efficient, cheapest, or simply the most innovative design. To win, your team needs to be able to bring together the very best skills in sensing, circuit design and building, chassis construction, programming, and navigation.

<table>
<thead>
<tr>
<th>Year 2 course units</th>
<th>Credits</th>
<th>EEE</th>
<th>EE</th>
<th>MTE</th>
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<tbody>
<tr>
<td>Embedded Systems Project (full year)</td>
<td>20</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Microcontroller Engineering II</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Sustainable Development for EEE</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<tr>
<td>Signals and Systems</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Engineering Mathematics</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Digital System Design II</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Control Systems I</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Electronic Circuit Design II</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Analogue and Digital Communications</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<tr>
<td>Machines, Drives and Power Electronics</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Applied Mechanics and Industrial Robotics</td>
<td>20</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<tr>
<td>Microelectronic Components</td>
<td>10</td>
<td>C</td>
<td></td>
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<tr>
<td>Generation and Transport of Electrical Energy</td>
<td>10</td>
<td>C</td>
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<tr>
<td>VLSI Design</td>
<td>10</td>
<td>C</td>
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</tbody>
</table>

C = Compulsory course unit  E = Elective course unit  120 credits per year

Year 3

By the third year, our courses are quite distinct and you will be studying towards your chosen area of specialism. The table below illustrates the structure of the third year, including the elective course units available to each course. Your third year also contains an individual project that consolidates your knowledge, skills and understanding. Some of our projects are organised around ‘themes’, such as Photovoltaics, e-Agri (electronics in agriculture), Green Communications, Smart Grids and Autonomous Systems. We run over 160 different individual projects in the third year. Example projects include:

- Active control of vehicle vibration
- Design and build a symmetrical hexapod robot with autonomous navigation
- Integration of wind turbines into the electric distribution network
- Water droplet movement in a High Voltage (HV) environment
- Transparent flexible electronic devices
- Financial time series modelling using neural networks
- Colour readers for the blind/visually impaired
- A smart data legacy for education

<table>
<thead>
<tr>
<th>Year 3 course units</th>
<th>Credits</th>
<th>EEE</th>
<th>EE</th>
<th>MTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Project (full year)</td>
<td>30</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<tr>
<td>Leadership in Action</td>
<td>10</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>Numerical Analysis</td>
<td>10</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>Data Networking</td>
<td>10</td>
<td>E</td>
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<td>E</td>
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<tr>
<td>Computer Systems Architecture</td>
<td>10</td>
<td>E</td>
<td>C</td>
<td></td>
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<tr>
<td>Power Electronics</td>
<td>10</td>
<td>E</td>
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<tr>
<td>Power System Analysis</td>
<td>10</td>
<td>E</td>
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<tr>
<td>Concurrent Systems</td>
<td>10</td>
<td>E</td>
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<tr>
<td>Mechatronic Analysis and Design</td>
<td>10</td>
<td>C</td>
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<tr>
<td>Digital Mobile Communications</td>
<td>10</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>High Speed Digital and Mixed Signal Design</td>
<td>10</td>
<td>E</td>
<td>C</td>
<td>E</td>
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<tr>
<td>Tools and Techniques for Enterprise</td>
<td>10</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<tr>
<td>Digital Signal Processing</td>
<td>10</td>
<td>E</td>
<td>C</td>
<td>E</td>
</tr>
<tr>
<td>Control Systems II</td>
<td>10</td>
<td>E</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>Sensors and Instrumentation</td>
<td>10</td>
<td>E</td>
<td>E</td>
<td>C</td>
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<tr>
<td>Current Trends in Optical Devices</td>
<td>10</td>
<td>C</td>
<td></td>
<td></td>
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<tr>
<td>Power System Plant</td>
<td>10</td>
<td>E</td>
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<tr>
<td>Electrical Drive Systems</td>
<td>10</td>
<td>E</td>
<td>E</td>
<td></td>
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<tr>
<td>Mobile Robots and Autonomous Systems</td>
<td>10</td>
<td>C</td>
<td></td>
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<tr>
<td>Transmission Lines and Optical Fibres</td>
<td>10</td>
<td>E</td>
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<td>E</td>
</tr>
</tbody>
</table>

C = Compulsory course unit  E = Elective course unit  120 credits per year
Year 4 (MEng)

The MEng fourth year comprises a team project, an Enterprise course unit and a range of advanced study course units taught at masters level.

Industrial problems are not solved by individuals working alone, so being able to work effectively as a team member is a sought-after skill. Our fourth-year team project provides you with this challenge and accounts for 50% of the assessment for the year. Many of the projects are directly funded by industry, or inspired by industrial needs.

Recent projects have included:
- Improving Humanitarian Demining Operations; creating a low-cost ground penetrating radar (GPR) system including augmented reality to improve operator feedback
- Flying a remote inspection vehicle and its sensing scheme for use inside high voltage direct current voltage source converter stations
- Smart campus energy system
- Integrated electric vehicle energy management system
- Photometric stereo hyperspectral vision system for precision agriculture
- Autonomous cable detection and tracking using quantum well Hall-effect.

<table>
<thead>
<tr>
<th>Year 4 course units</th>
<th>Credits</th>
<th>EEE</th>
<th>EE</th>
<th>MTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Project (full year)</td>
<td>60</td>
<td>C</td>
<td>C</td>
<td>C</td>
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<tr>
<td>Advanced Technology Enterprise</td>
<td>15</td>
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<tr>
<td>Process Control and Automation</td>
<td>15</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>Antennas and RF Systems</td>
<td>15</td>
<td>E</td>
<td></td>
<td>E</td>
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<tr>
<td>Analysis of Electrical Power and Energy</td>
<td>15</td>
<td></td>
<td>E</td>
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<tr>
<td>Nanoelectronic Devices and Nanomaterials</td>
<td>15</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>Design of Electrical Machines</td>
<td>15</td>
<td>E</td>
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<td>E</td>
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<tr>
<td>Power System Operation and Economics</td>
<td>15</td>
<td>E</td>
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<tr>
<td>Solar Energy Technologies</td>
<td>15</td>
<td>E</td>
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<tr>
<td>Digital Control and System Identification</td>
<td>15</td>
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<td>E</td>
<td></td>
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<tr>
<td>Microwave Circuit Principles and Design</td>
<td>15</td>
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C = Compulsory course unit  E = Elective course unit  120 credits per year
Once in high school, my teacher taught me the physics behind a simple electric motor. I was so amazed that something simple can also be so sophisticated. That lesson was what motivated me to learn electrical engineering at university.

After researching different universities around the UK, it was clear to me that the University of Manchester was the right choice. Its incredible reputation, history, and location had made me want to become part of it.

Having missed the orientation week, I was nervous that I wouldn’t know what to do on my first day. But I remember the staff were very friendly and I settled in quickly.

What I like most about my course is that it is never repetitive. Each year, there is always something new to look forward to; new project, new software, even new friends. There is a wide range of different software application that I got to try throughout my university career, and it’s very exciting.

I have gained many technical and leadership skill throughout my time at the university. Other than the theories that I learn in lectures, I also get to learn how to plan a project, be a part of a team, and work under pressure. This course requires me to actively interact with other students, which has helped boost my confidence and get me out of my shell.

Studying at Manchester, with students from various backgrounds, has not only made me become a better critical and creative thinker, but also helped me learn how to appreciate and work with other people despite any cultural and character differences.

Amy Maharati, fourth year student
MEng Electrical and Electronic Engineering

Ever since a very young age, I’ve been interested in how the world works in all respects and this naturally attracted me to engineering. Yet, what pulled me towards to electronic engineering was a paper I wrote in my final year of secondary school where I had to conduct experiments on resonant circuits. This was the first time I was exposed to electronics and I knew I wanted to know more.

When I first arrived at the university, the first impression I got was how friendly an atmosphere the place had and how welcoming the staff and lecturers were. In making my final decision on UCAS, what appealed about Manchester was the quality of teaching, the facilities available and, after speaking to other students, I got the impression they really loved the university; which was great to see!

I lived my entire childhood in the countryside in Scotland, so any city was going to have a huge impact on me. But, what was unique about Manchester was the energy, the vibe and the character of the place. It is hugely multicultural and, if you like international food as much as me, then you’ll love it here because there is a restaurant for every type of food you could imagine!

The main aspect of the university I liked was how international it was. Right now, my friends on my course consist of a Cypriot, a Belgian, several Greeks, Chinese, Indian students but that’s just a taste of how wide spreading the cohort is!

Engineering is a hands-on subject and the university makes sure it upholds this with plenty of labs associated with all the course units. Before coming to Manchester, I didn’t spend much time building circuits in school so felt anxious before the first lab but the staff are incredibly supportive. Not only this, we also get to use state-of-the-art equipment which gives us a lot of vital skills which are attractive to companies when applying for summer placements or internships.

Joshua Fried
MEng Electronic Engineering with Industrial Experience

I believe in having a very busy university life, so my extra-curricular activities include being rep to first year electronic engineering students and a rep for the faculty at the student staff liaison committee (SSLC), the general secretary to the electrical and electronic engineering society (EEESoc) and I train with the university’s competitive swim team. Being involved in all this, I become very good at helping to organise events and work in small teams.

What’s fantastic about Manchester is not only is it a very successful university and offers brilliant teaching, it also creates an incredibly relaxed and friendly atmosphere so you can enjoy your university career as much as you can. The studying facilities throughout the university (Barnes Wallis, Sackville St building, Renold’s to name a few) are all fantastic and create the perfect environment to study.

Joshua Fried
MEng Electronic Engineering with Industrial Experience
EEE Society

Our Electrical and Electronic Engineering Society (EEESoc) is the School’s social society. It is run by students, but our events are attended by everyone from undergraduates to lecturers. Some past events have included paintballing, a pool tournament, go-karting, a football mini-league and a pub quiz.

The society also organises industrial visits. In the past, we have visited: Drax Power Station in Selby, North Yorkshire; Electric Mountain in Llanberis, North-West Wales; and the Jaguar Land Rover site in Gaydon, Warwick.

The biggest event of the year is the annual ball and prize-giving in spring. This is a formal event where everyone has the chance to celebrate all their hard work over the year and students and staff are honoured for their contributions to life in the School.

Many of our events are sponsored and attended by high-profile engineering companies, giving you a great chance to network with people in the industry in a more social environment.

To see more of what EEESoc get up to, add us on Facebook: www.facebook.com/eeesoc

PASS

PASS sessions are informal weekly study sessions where first-year students get together in groups and discuss any challenging academic material, revision questions, or even their experience in adjusting to university life. The sessions are facilitated by students who are mostly in their second year, who are there to share their experiences and to act as a first point of contact for the attendees, guiding them in the right direction in case of any particular issues.

You will find these sessions very beneficial. It is a chance for you to discuss questions, go over the basic concepts taught during that week and explore different approaches to difficult tutorial questions with fellow classmates. It is an ideal way for you to meet new people on the course and make long-lasting friendships.

EEE Electronics Club (E4C)

E4C provides technical support and workshop facilities that enable you to create, develop and promote your own ideas for electrical, electronic, or mechatronic systems. In addition to practical work, the club organises presentations by industrial speakers, and a formal project evening. The club has a Facebook page and a website describing past and present projects. Find out more at the E4C webpage: www.manchester.ac.uk/eee/e4c

Robotics Society

The Robotics Society is a student-led society which aims to encourage students of all levels to get involved in robotics. It offers a great opportunity to develop your practical skills outside of the course curriculum; you’ll be able build exciting projects with state-of-the-art technology in a relaxed environment. More importantly, it’s a great chance to meet others who are interested in robotics. The society is open to students from across the university, at all study levels. We have members studying the Foundation Year through to Postgraduates, who are on a range of courses such as EEE, Mechanical Engineering, Computer Science and Physics.

We run workshops in Semester 1 where we teach participants some of the basics of robotics, such as programming and electronic and mechanical design including 3d printing. Throughout the semester we encourage members to be actively thinking of ideas for a robotics-based project, then as Semester 1 draws to a close, we’ll work together to form a manageable plan which you can work on in Semester 2. This is where the fun starts!

We’ll order everything you need for your robot and open up our large robotics research lab to you – providing everything you need to get it built and start using it. There’s a range of robotics postgraduate expertise on hand when you hit a sticking point, or just to discuss which direction to take your design, as well as the society’s online community to take advantage of.

This year we have a number of exciting projects underway. A ‘core-group’ of long term members are working on developing a lunar rover for a competition. Other projects include a Toy Story dolls-head spider robot, a tank which collects a ball and fires it at a target, open source quadrupeds and dual extrusion 3d printing with flexible materials.

WISE

Members of our School are actively involved in WISE: Women in Science, Engineering and Technology.

This is a network for all female students, research and academic staff in our Faculty of Engineering and Physical Sciences. The network organises a series of social networking events, industrial site visits, skills workshops and debates.

The WISE award recognises the efforts of early-career female engineers in encouraging women and girls to participate in science and engineering.

Student-run activities
Summer placements in our School

As well as studying in our School for a degree, many of our students take on summer placements (jobs/ internships) with us as well. These are a fantastic way to enhance your understanding of the subject and, in many cases, experience research work first-hand. It will give you work-based experience, which is a very important factor that will be taken into account when you apply for graduate jobs.

Careers

Opportunities are available to our graduates across a massive range of industry areas and companies, including:

- Research and development – Siemens, ABB, National Grid
- Design – ARUP, Rolls-Royce
- Process engineering – BP, AMEC
- Control – Bentley, ABB, BP, P&G
- Manufacturing – FKI plc, DIODES Inc
- Information technology – Intel, IBM
- Consultancy – Accenture, Detica
- Investment banking – Goldman Sachs, Deutsche Bank, Citi, Deloitte
- Communications – BT, Agilent Technologies, Vodafone, Nortel Networks
- Automotive and aviation – Bentley, Jaguar Land Rover, Red Bull Racing, Rolls-Royce

Around 15% of our graduates decide to continue their studies by following a postgraduate degree course. This could be in the form of a specialist taught course, or a research programme, either of which can give you a further boost in the jobs market, or lead you into a research career.

For more information on postgraduate opportunities, see our website: www.manchester.ac.uk/eee/study

Graduate Profile

I graduated with a first class BEng in Mechatronic Engineering from the University of Manchester. I also gained professional year-long industrial experience by working as software development engineer within the Research and Development department at PBSI Group Limited.

I am currently working as a Graduate Engineer at Babcock International, employed under the three-year rotational graduate scheme within the Network Engineering – Rail department.

Apart from doing well in my exams, I made sure that I had fun during university and got myself involved in various volunteering activities, networking events, part time jobs, cultural and academic societies to develop relevant experience and soft skills that most employers look for within a graduate. I realised that work experience is a must before graduating in today’s highly competitive environment. With help and support from the School’s career advice team, I made sure that I did a year-long industrial placement relevant to my degree. This was immensely helpful during graduate job applications and interviews.

My degree not only attracted employers, but played a major role in equipping me with practical engineering experiences; strong academia and challenging projects which helped me stand out amongst the crowd. The second year group project that involved developing an autonomous line following robot, helped me develop expertise in sensors and gave me a broader understanding on motors profiles, gearbox, PIC microcontroller programming, mechanical chassis design, control systems, PCB design software along with cost analysis, safety constraints, innovation and other soft skills.

Third year individual projects are always challenging but the level of complexity and immediate application into industries makes sure that you have a product that has never been developed before. My “Capacitance Based Car Mist Clearing Sensor” project was selected as one of the highly commended projects and gave me the opportunity to attend the three day conference at the global Undergraduate Awards 2014 Summit held in Dublin. The project was selected amongst 3000 applicants over 26 countries. This is the level of expertise and knowledge one can develop at the University of Manchester.

The excitement of what each day can bring is something I enjoy the most. The multi-disciplinary work experience and the opportunities to work with experts from various engineering and non-engineering backgrounds are truly intriguing. One day I can be in the office, working on design. Another day, I will be on site walking alongside live railway lines, doing surveys. Once a month I meet up with other graduates for a professional development training course that takes place in Manchester.

Mechatronic Engineering is a relatively new subject and awards you with the opportunity to excel in integrating mechanical systems with smart electronics. With the global revolution of automation and technology, a degree in Mechatronic Engineering is exceptionally valuable in global industrial development.

University of Manchester’s outstanding student life, friendly environment, helpful staff along with solid teaching and learning facilities makes it one of the best universities to graduate from. You can be successful by just enjoying the course, gaining some experience and relishing every single day at the University.

Harish Gautham Kathiresan
BEng Mechatronic Engineering with Industrial Experience

Graduate Mechatronic Rail engineering at Babcock International group.
Power Academy
conferences.theiet.org/power-academy

has established an Engineering Scholarship Fund for European Union students who would like to study electrical engineering. The bursary involves £2,750 per year in addition to IET membership, an industry mentor, £250 towards books and software and summer training provided by partner companies. The University of Manchester is one of just seven universities involved with this initiative, along with The IET and the following companies:

• Atkins
• BAE Systems
• Culham Centre for Fusion Energy (CCFE)
• Costain
• London Underground
• Mitsubishi Electric
• National Grid
• Network Rail
• Northern Ireland Electricity
• Northern Powergrid
• RWE Generation
• Rolls-Royce
• Scottish Power
• Scottish and Southern Energy
• Western Power Distribution.

BP Awards
BP offers a range of awards for students within our School. The aim is to recognise academic excellence and support the potential for future achievement. Students who receive a BP award not only benefit from financial contribution, but also get the opportunity to gain an insight into the exciting careers available in BP. They will be able to forge strong relationships with industry experts and gain practical knowledge. The BP awards range from £1,000 to £5,000 per year.

NI Engineering Scholarship Programme
We are actively involved with NI and use their teaching platform, ELVIS, in our laboratories. NI also contributes to our project work by providing instrumentation systems and training for students. This scholarship programme allows students who have shown outstanding academic achievement to develop their professional engineering career. In order to be eligible for the NI Engineering Scholarship Programme, you must be in your first year at university.

UK Electronics Skills Foundation (UKESF)
We are a university partner in the UKESF, which offers scholarships to home/EU students studying MEng and BEng degrees in Electrical, Electronic and Mechatronic Engineering. Successful candidates are matched with sponsoring companies for scholarships that include: an annual bursary of around £1,000, a £200 Blackwell’s gift card, paid summer work placement, industrial mentoring, professional development training at summer workshops and opportunities to build relationships with potential employers.

Partner companies offering scholarships include:

• Aptina Imaging
• ARM Ltd
• Broadcom
• C-MAC MicroTechnology
• Cambridge Silicon Radio Ltd
• Dialog Semiconductor
• Fujitsu Semiconductor Europe GmbH (FSEU)
• Imagination Technologies
• Infineon Technologies UK Ltd
• Renesas Electronics Europe Ltd
• Swindon Silicon Systems
• Wolfson Microelectronics PLC

For further information please see:
www.ukesf.org/scholarship-scheme

For more information on these and other scholarships, check online:
http://man.ac.uk/VeM091

University funding
For the latest information on funding awards available from the University, visit our student finance webpages:
www.manchester.ac.uk/studentfinance
What our students say

At the University there are plenty of societies that you can get involved with, covering such a wide variety of interests, meaning that time outside of studying can still be put to good use! The electronics club in particular provides an excellent framework for anyone who would like to get involved in additional electronics projects. It provides an opportunity to speak with experienced staff and other students to gain guidance on any technical issues. The fact that Manchester is such a well-established university means that there are many diverse options for extra-curricular activities—even outside electronics.

Ben Scott
Mechatronic Engineering with Industrial Experience (4years) BEng

The team project in the fourth year, which has been sponsored by industry, prepares you extremely well for the world of work, with the team having its own office and lab facilities. Deciding to study Electronic Engineering at The University of Manchester was the best decision I ever made and I can’t thank the staff here enough for the effort they put in to ensure we all reach our full potential. My advice to any new students is to ask for help when you need it, all the lecturers are extremely approachable and also get involved in some extracurricular activities, whether it is EEESoc or the Electronics Club or whatever else takes your fancy! In todays competitive job market little things like this will set you apart from the competition.

Maria McKavanagh
Electronic Engineering (4 Years) MEng

I had always wanted to go to a top University and Manchester fit the bill with membership of the Russell Group, along with its academic history and high league table position for Electrical and Electronic Engineering. But, it wasn’t until I visited the University that I knew this is where I wanted to be. I was blown away by the facilities and the friendliness and enthusiasm of the staff and students. All of this topped off with being in such a vibrant city as Manchester made my decision to come here easy.

Thomas Wright
Electrical and Electronic Engineering (4years) MEng

I adapted to multicultural student life at Manchester with ease. The Manchester city offered many educational opportunities to admire such as the Manchester Museuern, theMmuseum of Science and Industry (MOSI) and the Central library, places to eat such as the Curry mile - which is known for the largest concentration of south Asian restaurants outside India. As a student it’s a great place to be.

John Samarasinge
Mechatronic Engineering with Industrial Experience (4years) [BEng]
Social impact

What we do to support social and economic change

We live in interesting but also challenging times. Growing world population is putting pressure on water, food, energy, healthcare, shelter and sanitation.

Issues of poverty, world security and sustainability remain intractable. Therefore one of the key objectives of research must be to deliver knowledge, skills and attitudes needed to address these global challenges. We show cases here of how our work in the School is contributing to solving these challenges and impacting lives around the world.

e-Agri in Developing countries

Applying close-proximity hyperspectral imaging of the early onset of crop diseases to minimise preventable losses in emerging food production via the application of contemporary concepts into a new low-cost mobile attachment.

The pilot is being undertaken in India due to existing industrial infrastructure but the smartphone based technology has the potential to impact global farming communities, food supply and even animal wellbeing all over the world.

http://man.ac.uk/IMQj6F

Electrical and Electronic Engineering

Social impact Spotlight

Landmine detection and body scanners

A team of staff and students from the School of Electrical and Electronic Engineering are investigating ways to use electromagnetics for a range of inspection applications. The research involves formulating algorithms to describe the signals received. It has a huge range of applications, including revealing the microstructure of a steel component, testing the quality of food, detecting whether a person is carrying a hidden weapon or just a mobile phone and locating buried objects.

http://man.ac.uk/EH7vMx

Nanotechnology for cancer therapy

In the past several years new forms of therapy have emerged which rely not on x-rays (which are photon beams) but on hadrons with ionised protons and carbon ions. These charged particle beams have great advantages: they can be electrostatically scanned and can deliver most of their energy to the tumour sit.

http://man.ac.uk/rHqtj9

Establish strategic partnerships in Africa

The School has established a partnership with the School of Engineering at the University of Zambia to develop structured final year undergraduate project modules. This ensures that the engineering training given to these undergraduates is of the highest standard so that their qualification can be internationally recognised.

http://man.ac.uk/yN6u7t

Professor Dame Nancy Rothwell visits the School of EEE

On Wednesday 31st May, Professor Dame Nancy Rothwell visited the School of Electrical and Electronic Engineering to witness a pioneering training aid for Wheelchair racers. The instrumented training wheelchair suite was created by a team of MEng Final Year students to address the performance training gap between able-bodied athletes and Paralympic athletes. The training suite which comprises of multiple subsystems which record various parameters such as speed, relative power, heart rate and the biomechanics of the athlete during a training session.

The project was designed and built for the Stockport Wheelchair Racing Team and 11 year old racer, Anya Waugh demonstrated the suite during the visit. The team of students involved in this project were Richard Allen, William Beresford, Siddharth Castelino, Vishal Devji, Thomas Lowe and Victor Tan. The project was supervised by Dr. Alex Casson and Dr. Sinisa Durovic.

http://man.ac.uk/IMQj6F

http://man.ac.uk/EH7vMx
This brochure was printed on June 2017 for the purposes of the 2018 intake. It has therefore been printed in advance of course starting dates. For this reason, information contained within this publication for example about campus life, may be amended prior to you applying for a place on a course of study. Course entry requirements are listed for the purposes of the 2018 intake only.

Prospective students are reminded that they are responsible for ensuring, prior to applying for a course of study at The University of Manchester, that they review up-to-date course information, including checking entry requirements. Visit: www.manchester.ac.uk/study/undergraduate/courses and searching for the relevant course.

Further information describing the teaching, examination, assessment and other educational services offered by The University of Manchester is available from: www.manchester.ac.uk/study/undergraduate