



electrical and electronic engineering

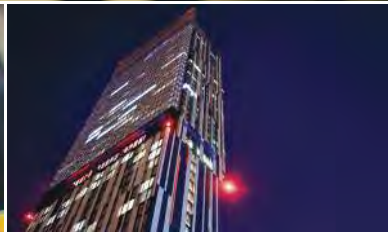
engineering and physical sciences



the facts



contents



- Ranked 2nd in the UK for research quality in this subject area in the latest Research Assessment Exercise
- Pioneering teaching informed by the latest research
- One of the largest schools of this discipline in the UK
- Prestigious industrial partners, such as Rolls-Royce and National Grid, keep courses and research cutting-edge
- 4 million books in one of the UK's best-resourced university libraries
- University Careers Service voted the best in the UK
- Exciting and diverse environment in one of the best student cities in the world



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'The University has superb industrial links, which serve me well... I have no doubt that this will stand me in good stead when I graduate.'

Tom Feehally, PhD Electrical and Electronic Engineering

Part of the distinguished Russell Group of universities, with a proud history of academic achievement and an ambitious agenda for the future, The University of Manchester offers you a learning experience rooted in a rich educational heritage and boosted by cutting-edge research and innovation – all at the heart of one of the world’s most vibrant cities.

the university



Our tradition of success stretches back over 180 years. The birth of the computer, the splitting of the atom, the founding principles of modern economics – these and many more world-altering innovations have their roots at our University.

Today, our research is internationally renowned across diverse disciplines and we actively assist our staff and students in turning many research and entrepreneurial ideas into commercial business ventures.

The Russell Group represents the 20 leading UK universities that are committed to maintaining the very best research, an outstanding teaching and learning experience, and unrivalled links with business and the public sector.

Our mission at Manchester – backed by an ongoing investment of more than £650 million in facilities, staff and buildings – is to become one of the world’s top 25 universities and the preferred destination for the best tutors, researchers and students.

Research, discovery and innovation

The 2008 Research Assessment Exercise placed us third in the UK in terms of “research power” and assessed virtually all of our research as reaching

international or national standards of excellence. We research in a wider range of areas than any other UK university, and are continuing to increase our number of first-rate professorships, improve our strong links to industry and public services, and invest in world-class facilities.

Whether studying for a taught or research postgraduate degree, you’ll be directly involved with groundbreaking research, encouraged to adopt innovative approaches under the tutelage of distinguished international scholars, and to discover interdisciplinary ways of working that open up exciting new areas of discovery.

Turning knowledge into enterprise

Your postgraduate work could contribute towards business and economic development outside academia. Manchester has an impressive track record of turning ideas into commercial reality, attracting world-class academics by providing a dynamic, first-class support system for them to participate and succeed in commercialisation projects. More than 100 ‘spin-out’ companies have been created in recent years based on our research.





Career opportunities

As a Manchester graduate, you will be in good company. No fewer than 25 Nobel Prize winners have worked or studied here, and our alumni have an impressive track record of becoming leaders in their fields: from philosopher Wittgenstein, to women's rights campaigner Christabel Pankhurst, and from George Richards, President of Trinidad and Tobago, to recent Nobel Laureates for Physics, Andre Geim and Konstantin Novoselov.

More than 4,000 recruiters each year from countries around the globe target our graduates. Consistently voted the best in the UK by employers, our Careers Service offers diverse practical, innovative services – many exclusively for postgraduates – to make you more employable.

See our Facilities and Support section at the back of this brochure for more information on the Careers Service.

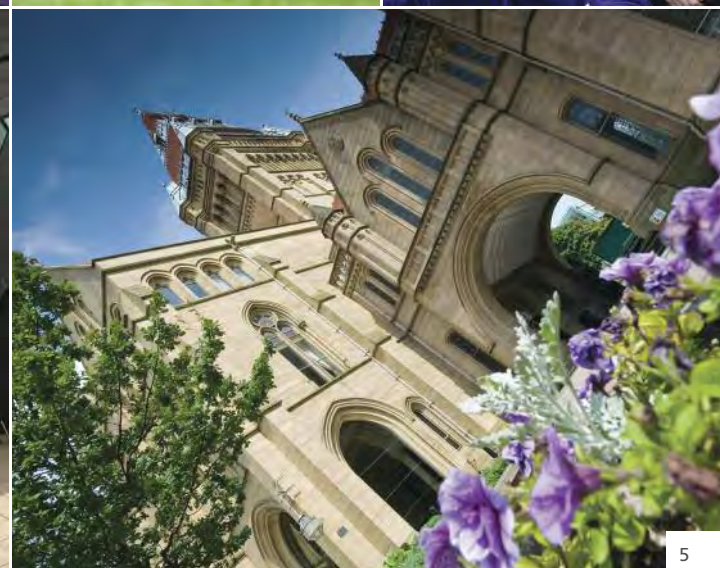
Cosmopolitan campus

One of the UK's largest and best-resourced academic libraries, premier IT services and extensive student support services are all on our campus, along with impressive sports facilities, restaurants, bars, cafés and a shopping centre. Campus-based cultural attractions include The Manchester Museum, Whitworth Art Gallery and Contact Theatre, while the University's Jodrell Bank Observatory lies further afield in Macclesfield.

Europe's largest Students' Union provides excellent support services, hundreds of active student societies and four live venues, including the famous Academy, attracting the best big name and upcoming bands.

Join The University of Manchester...

... and you will become part of one of Britain's most forward-thinking universities, which builds on its success year on year – and invites you to do the same.





electrical and electronic engineering at manchester



The School of Electrical and Electronic Engineering at The University of Manchester is one of the largest and most successful schools of this discipline in the UK.

Our diverse student population exceeds 450 undergraduates and 350 postgraduates. Currently, we have 60 members of academic staff working in specialist research clusters focusing on: control systems, electrical energy and power systems, microelectronics and nanostructures, microwave and communications engineering, power conversion and sensing, imaging and signal processing.

Well-resourced, cutting-edge research

You'll find excellent, well-equipped laboratories in each of our research areas, several of which have been established or refurbished by grants and donations, including some from industry. Distinguished industrial partners include National Instruments, National Grid, Rolls-Royce, Syngenta, Agilent Technologies and Oxford Instruments, among many others.

We aim to sustain an environment where world-leading fundamental and applications-oriented research is conducted in the broad and fast-moving field of electrical and electronic engineering. Wherever appropriate, our research is carried out by working in partnership with industry, national facilities and national and international university groups, or by pursuing commercial exploitation.

This means we continue to recognise the changing priorities within our discipline, which are influenced by, and influence in turn, society, government (UK and EU) and commerce – and we remain responsive to them.

Outstanding Research Assessment Exercise (RAE) results

The RAE 2008 measured the quality of research conducted in universities and other higher education institutions in the UK against international standards of excellence. Our School confirmed its position at the forefront of research in this subject area by being ranked second in the UK in terms of research quality, with over 70% of our research output assessed as "internationally excellent" or "world leading", confirming our world-class research reputation.

The University of Manchester as a whole also performed exceptionally well, rated third in the UK in terms of research power.

Research highlights

We have an extremely broad range of research activities within the School, and can therefore summarise here only a few of the recent major research breakthroughs achieved by members of our academic and research staff:

- Development of a new framework for assessing the security of a power system, ie its ability to avoid blackouts
- Acoustek, a patented technique for the detection of leakage and blockage in long lengths of gas filled pipelines, is now being commercialised by Pipeline Engineering Ltd www.pipelineengineering.com
- Process control and condition monitoring work developed over the last ten years is currently being commercialised by the spin-out company Perceptive Engineering www.perceptive-engineering.co.uk
- Development of a novel form of rotary aircraft for military organisations and companies involved in nuclear decommissioning – which, when finished, will be able to roll along the ground and up walls, land and take off from uneven ground, and perch and observe from suitable urban structures



- Establishment of the Syngenta University Innovation Centre to explore the use of sensors, information and communication technology in addressing the emerging challenges in food and water processes
- Wireless sensor networks for applications in grain storage and nuclear decommissioning
- First online measurements of moisture in fluidised beds by electrical capacitance tomography
- Development of Signal Wizard, a unique hardware and software system developed in the School, for designing, downloading and executing in real time almost any kind of digital filter or audio processing algorithm
- Currently researching the impact that lightning protection systems for the new generation of super large wind turbines will make on radar performance and how to mitigate its effects
- Rolls Royce has established a University Technology Centre to pursue research into innovative electrical technologies for aerospace, marine and energy applications.
- State-of-the-art molecular beam epitaxial growth facilities are generating atom-scale precision III-V structures for ultra-high-speed devices
- Provision of leading semiconductor device technology for the multinational Square Kilometre Array telescope project for 21st century cosmology research
- Novel photonic technologies for THz and light emission and detection

Key research themes

As one of the largest schools of this discipline in the UK, we are home to a full range of activities within the spectrum of electrical and electronic engineering. The great breadth and depth of our academic staff's research interests provide you with excellent opportunities for challenging and stimulating projects.

We have recently added new major research themes in the subjects of Energy, E-Agri and Autonomous Systems, areas that are critically important in the world today.

It is predicted that the global demand for food and energy will increase by 50% by 2030 as the population grows to 8.3 billion. Such overpopulation, together with the effects of climate change, will put further pressure on fragile infrastructures that provide energy, food and water for the mass population.

In recognition of these global problems, our School has research themes centred on the provision of sustainable technologies to support energy delivery and agricultural processes.

Energy

As nations move to low-carbon energy, electricity plays an increasingly important role. The Low Carbon Transition Plan sets out the steps by which the UK will move to a low-carbon energy mix.

An essential part of this plan is the need for the UK electricity system to transport larger quantities of electrical energy supporting the electrification of heating and the predicted growth in electric vehicles. The electricity system will also be required to support sources of generation such as wind turbines, which are intermittent. These issues combine to mean the electricity system is facing a period of change that has not been seen in the UK for decades.

Sensors, control systems and communications at the heart of the transformation will allow the existing electricity infrastructure to be used more effectively. Customers will be asked to change their demand according to the available generation, assets will be monitored to detect impending failure and overhead lines will be operated dynamically to maximise their capability – these are all features of the smart grid.

With access to a bespoke monitoring system installed on the University's own high voltage network and involvement in a number of major research projects, there are significant opportunities for teaching and research in this area. We host the National Grid Power Systems Research Centre, which includes not only the largest and best-equipped high voltage laboratory in the UK, but also the most modern control and protection laboratory in UK Academia.

e-Agri

Integrating sensors, electronics, control, power systems and ICT engineering into agriculture is a key enabler for delivering improved food supply and sustainable energy production without increased burden on the limited fertile land-bank. This exploitation of non-traditional technologies to improve global farming is extremely timely. In addition to climate change and overpopulation, the westernisation of world diets is producing even greater pressure on agriculture – approximately seven kilograms of grain is required to produce one kilogram of meat. Many of the benefits of fertilisation, irrigation and seed selection have already been realised and a new impetus is required to deliver the necessary yield improvements.

We believe that this impetus will come from sensor and ICT-based control processes applied to agricultural processes. There are no precedents for a large, dedicated electrical and electronics team to lead the effort to make future farming and food supply viable using technical expertise.

The term e-Agri is suggested to reflect the pivotal role to be played by the electronics community in addressing these challenges. As such, central to our team's e-Agri philosophy is partnering with the principal bioscience based Agri-Food universities and research institutes in the UK and elsewhere.

The e-Agri theme is only four years old, but has already attracted the interest of national figures, including the Chief Scientific Adviser to the UK Government, who opened our recent e-Agri event in Manchester.

Autonomous Systems

A new and exciting research theme for the School, Autonomous Systems deals with unmanned aerial, ground or underwater vehicles that operate autonomously. As such, this theme draws significant expertise within electrical and electronic engineering from fields as diverse as control systems, signal and visual processing, communications, power management, microelectronics, mechatronics, etc.

Traditional methods of remotely controlling systems via manual operation become inadequate as the complexity of systems and the required tasks increase, particularly in changing and challenging environments. In recent times, we have seen an exponential increase in the demand for technologies that operate with minimal human intervention.

These emerging technologies, with varying degrees of autonomy, leverage on the ability to accurately and swiftly capture detailed information about their environment and act upon this information. These systems are also designed to perform well under considerable uncertainty in the environment for extended periods of time and to handle safely system failures without external intervention. Autonomy is underpinned by several supporting technologies and the development of autonomous systems requires highly interdisciplinary research carried out in collaboration with industry.



Our School has a Rolls-Royce University Technology Centre (UTC) hosting the Systems Engineering for Autonomous Systems Defence Technology Centre's (SEAS DTC) Integrated Electrical Power Networks Evaluation Facility (IEPNEF), a 100kVA experimental platform for UAV electrical systems tests. We offer several MSc courses within the School that prepare you for theoretical and experimental studies in Autonomous Systems.

Collaboration with industry

Our School offers excellent teaching and research facilities and has strong and growing links with industry. These have recently been amply demonstrated by the formation of:

- The National Grid Power Systems Research Centre
- The Oxford Instruments VG Semicon Molecular Beam Epitaxy Facility
- The Centre for Electromagnetics, which includes the Millimetre Wave Laboratory that is sponsored by Agilent Technologies
- The Rolls-Royce University Technology Centre in Electrical Systems for Extreme Environments
- The Syngenta Sensors University Innovation Centre

Career opportunities

Our graduates are highly sought after by employers, as indicated by independent surveys on employability, which consistently show our graduates to be the first choice of employers.

Versatility, logical thinking, a wide experience in engineering, as well as the development of analytical skills, provide you with openings into many careers.

After graduation, many of our PhD students take up research positions in industry or move into management positions in top engineering companies. Others take up postdoctoral research positions. Many of our higher degree graduates are now in senior industrial and academic positions throughout the world.

taught courses

We currently offer six MSc courses:

- **Advanced Control and System Engineering (ACSE)**
- **Communication Engineering (CE)**
- **Digital Image and Signal Processing (DISP)**
- **Electrical Energy Conversion System (EECS)**
- **Electrical Power System Engineering (EPSE)**
- **Renewable Energy and Clean Technology (REaCT)**

MSc course structure

Each course consists of 180 credits and shares a common structure:

- Seven taught course units (15 credits each)
- Feasibility study (15 credits)
- Dissertation project (60 credits)

Four of the taught course units are delivered in the first semester and three in the second semester; each unit is delivered over a three-week period. Each taught unit is assessed by coursework along with a written examination at the end of either semester one or two. The course unit titles are given in the table below.

During the second semester, you produce a feasibility study, which then forms the basis of your dissertation project. The feasibility study will be assessed via a report and a presentation. Students who pass the taught elements and feasibility study will progress to the dissertation project stage; the final dissertation report is submitted in September.

Our University e-learning environment is a repository for all your course-related information and for information exchange between you and your lecturing staff.

Each MSc course lasts 12 months on a full-time basis, commencing in September. Some courses are offered on a part-time basis and can last up to five years.

Entry requirements

This is normally an Upper Second class UK Honours degree, or international equivalent, in a relevant engineering or science discipline. You will need an appropriate English language qualification (typically IELTS 6.5 or equivalent). See our website for details: www.manchester.ac.uk/eee/postgraduate/taught

course unit structure

Semester 1

Course	Unit 1	Unit 2	Unit 3	Unit 4
Advanced Control and Systems Engineering	Control Fundamentals	Process Control and Automation	Digital Control and System Identification	Sensing and Transduction
Communication Engineering	Principles of Communication Systems	Antennas and RF Systems	Digital Communication Engineering	Wireless Communication and Mobile Networks
Digital Image and Signal Processing	Signals and Data Capture Engineering	Digital Image Processing	Digital Communication Engineering	Sensing and Transduction
Electrical Energy Conversion Systems	Introduction to Electrical Energy Conversion Systems	Analysis and Modelling of Electrical Systems	Principles of Power Electronics	Design of Electrical Machines
Electrical Power Systems Engineering	Power System Modelling	Power System Analysis	Power system Plant, Asset Management, Condition Monitoring	Power System Operation and Economics
Renewable Energy and Clean Technology	Introduction to Renewable Energy and Clean Technology Concepts	Understanding Energy as a 'System' Driving Modern Society	Solar Energy Technologies	Wind and Marine Energy Technologies
Semester 1: September – January (12 weeks teaching plus examination period)				

Semester 2

Course	Unit 5	Unit 6	Unit 7
Advanced Control and Systems Engineering	Nonlinear and Adaptive Control Systems	Intelligent Control and Robotics	Optimal and Robust Control
Communication Engineering	Adhoc Communication Network and Optical Communication	Microwave Systems Engineering	Advanced Digital Signal Processing
Digital Image and Signal Processing	Digital Image Engineering	Tomography Engineering Applications	Advanced Digital Signal Processing
Electrical Energy Conversion Systems	Modelling of Electrical Machines	Advanced Power Electronics	Design and Control of Electrical Drives
Electrical Power Systems Engineering	Smart Grids and Sustainable Electricity Systems	Power System Protection	Power System Dynamics and Quality of Supply
Renewable Energy and Clean Technology	Smart Grids and Sustainable Electricity Systems	Interfacing of Clean Energy Systems	Zero Carbon Built Infrastructure
Semester 2: February – May (12 weeks plus examination period)			

taught courses

MSc in Advanced Control and Systems Engineering (ACSE)

Control engineering is a multidisciplinary subject with applications across a wide range of industrial sectors. While an introduction is usually provided during undergraduate engineering courses, especially in electrical engineering, these cannot allow sufficient time to cover modern developments in detail and develop sufficient practical skills.

What you study

This MSc aims to equip its graduates – who come from a variety of scientific and engineering disciplines – with both the theoretical and the practical skills necessary to apply modern control techniques to a wide range of industrial problems and/or embark on further research. A strong feature of the course is the dissertation project, which constitutes one-third of the credit rating and is the means by which you can be introduced to some of the most important topics in modern control.

The MSc course is run by the Control Systems Group, which has a long and distinguished history of advanced teaching and research in the field. This dates back to the group's foundation in the 1960s by Emeritus Professor H H Rosenbrock FRS, whose connection with the research group is maintained today through the award of the Howard Rosenbrock Prize to the best student in the taught part of the MSc course.

All members of our academic staff are active in research, in areas ranging from process control to robotics. The group also has strong links with other research groups in the University and with industry, enabling you to undertake dissertation projects that are industrially based, or supervised by staff from other disciplines.

Outstanding students on the MSc course have opportunities to continue with research leading to a PhD.

Career opportunities

You will be well equipped for a wide variety of control and automation career opportunities in industry, research institutes and consultancies, amongst others. A significant percentage of our graduates progressed to PhD research in our University, as well as to other prestigious universities worldwide.

Duration

Full-time
12 months

For further information, visit:
www.manchester.ac.uk/eee/acse

MSc in Communication Engineering (CE)

The explosive industrial and social evolution of today is largely owed to the rise and continued success of telecommunications, which have eliminated the barriers of delivering information in real time.

Our MSc in Communication Engineering is one of the most successful and long-standing postgraduate courses in the country. It has strong links with industries such as Agilent Technologies, Vodafone Group, the BBC and Her Majesty's Government Communication Centre (HMGCC), amongst many others, through student awards and new and ongoing project collaborations.

What you study

Evolving continually in line with the latest developments and industrial practices, and making extensive use of the knowledge and expertise of our established Microwave and Communication Systems Group, this course explores up-to-date topics on telecommunications and microwave engineering. It covers comprehensive contents and in-depth materials, ranging from communication systems and network design levels, through to implementation using microwave circuits and systems.

Starting with a wide range of basic fundamental materials, you progress through to advanced knowledge in existing cutting edge technologies and recent research developments. You will also be allocated a unique dissertation project in a specialised topic of research with industrial relevance.



Career opportunities

We aim to develop critical skills and train high quality graduates in communication and microwave engineering, in preparation for fast-moving and highly demanding industries and world-class institutions globally.

You will therefore be well equipped for a wide variety of communication and microwave engineering career opportunities in industry, research institutes, and consultancies. A significant percentage of our graduates have also progressed to PhD research in our University, as well as in other prestigious universities worldwide.

Duration

Full-time
12 months

For further information, visit:
www.manchester.ac.uk/eee/ce

taught courses

MSc in Digital Image and Signal Processing (DISP)

Over the last 15 years, there has been a paradigm shift respecting the transduction, representation and manipulation of information and signals in almost every conceivable arena. Analogue techniques have been supplanted by digital modalities. Although the introduction of digital systems may at first appear as an incremental advancement, the digital revolution is in fact fundamentally and qualitatively different from all technological revolutions that have gone before. With image and digital signal processing, it is possible to effectively re-write reality – because, just as the currency of the human brain is thought, so the currency of the digital domain is number.

This has profound philosophical consequences, not only for science and technology, but also for wider society, the manner in which human beings conduct their everyday affairs and the relationships between individuals, organisations and communities.

Young people considering the option of embarking on postgraduate study are deeply familiar with, and intuitively connected to, the digital world. They understand how to use it and to take advantage of its many manifestations. However, they rarely understand at a detailed level how it operates, what its limitations are, or indeed how digital systems can be employed in new circumstances, environments and applications.

What you study

This course gives you a thorough, methodical and wide-ranging education in the visionary, dynamic and entertaining world of digital signal and image processing.

We provide a rigorous mathematical and engineering framework for the discipline, and additionally consider how the technologies are deployed, and the areas – both present and anticipated – that most benefit from its exploitation. The course is congruent with current global research themes in information acquisition, the digital representation of such information, its manipulation, processing and interpretation.

Career opportunities

Digital technology is rightly regarded as a key driver in relation to the technological and economic advancement of a nation. Critically, education in digital imaging and signal processing will generate graduates who are eminently employable.

You will therefore be well equipped for a wide variety of careers in digital systems design, imaging, signal processing and software design. A significant percentage of our graduates also progress to PhD research in our University, as well as to other prestigious universities worldwide.

Duration

Full-time
12 months

To find out more, visit:
www.manchester.ac.uk/eee/disp

MSc in Electrical Energy Conversion Systems (EECS)

The efficient control and conversion of energy is now internationally recognised as important to the welfare of the world. Energy is used extensively in many sectors of industry and, in particular, plays an essential role in the major sectors of transport, manufacturing and electricity supply.

These industries require efficient Electrical Energy Conversion Systems (EECS) to reduce their carbon footprints. As a result of recent power electronic technology advances, EECS are becoming commonplace and can be found in more electric aircraft and ships, electric vehicles, railway systems, renewable power generation, power distribution and transmission systems, automation systems for factories and industrial processes.

What you study

This MSc course has been specially formulated to equip electrical engineers with knowledge and skills to design modern Electrical Energy Conversion Systems.

The course is hosted by the Power Conversion Group, which has an international reputation for research excellence, and enjoys close working relationships with leading companies, such as Rolls-Royce. You are therefore taught by academics working at the forefront of research in energy conversion systems, covering the fundamentals of electrical machine and power electronics design, system integration, control, energy management and protection.



Career opportunities

Established to help create the research and design engineers of tomorrow, this course offers you an excellent springboard to a career in industry or research. You will acquire in-depth knowledge of modern design, broad exposure to the expanding range of applications, and hands-on experience and integration into state-of-the-art electrical energy conversion systems. You will therefore be well equipped to meet the rapidly increasing demand for engineers in the area of energy conversion systems for key power electronic/drives/automation industries.

Opportunities also exist for further study in the Power Conversion Group's recently re-equipped and expanding research laboratories.

Duration

Full-time
12 months

Part-time
Up to five years

For further information, visit:
www.manchester.ac.uk/eee/eecs

taught courses

MSc in Electrical Power Systems Engineering (EPSE)

Power system engineering is about keeping things in balance. This extends not only to the balance between generation and load, or between production and consumption of reactive power, but also to the balance between the cost of energy and its environmental impact, or the balance between the reliability of the supply and the investments needed to develop the system.

What you study

This course will teach you how to quantify both sides of these equations, and then how to improve the balances through technological advances and the implementation of sophisticated computing techniques.

In semester one, you learn how power systems are designed and operated. This involves studying not only the characteristics of the various components (generators, lines, cables, transformers, power electronics devices), but also how these components interact. Through lectures and computer-based exercises, you become familiar with power flow and fault calculations and you learn how the techniques used to study the behaviour of large systems. Experiments in our high-voltage laboratory give you an appreciation for the challenges designing power system plant.

During the summer, your MSc dissertation project gives you a chance to develop your research skills and to explore in depth one of the topics discussed during the course.

Career opportunities

Over the last 30 years, hundreds of students from around the world have come to the University to obtain an MSc in Electrical Power Engineering or similar. After graduation, they went on to work for electric utilities, equipment manufacturers, specialised software houses, universities and consultancy companies throughout the world.

Duration

Full-time
12 months

Part-time
Up to five years

For further information, visit:
www.manchester.ac.uk/eee/epse

MSc in Renewable Energy and Clean Technology (REaCT)

Replacing fossil fuels with renewable forms of energy and developing energy-efficient technologies for electronics, transport and buildings, are all at the heart of reducing global CO₂ emissions. The engineering and science required to create a new, low carbon, renewable energy landscape represents a defining challenge for the 21st century. As we move towards the middle of this century, the use of electrical energy will become dominant and ultimately the renewable generation and exploitation of electrical energy is at the heart of this subject.

This exciting, multidisciplinary subject requires knowledge of energy sources, energy conversion and storage, and power distribution. Optimal exploitation of renewable energy sources depends critically on the local environment and on the way in which climate change will influence that environment.

What you study

The REaCT MSc course is designed to provide you with a sound engineering background of the technology of renewable generation of electricity, and its conversion into form that can be efficiently distributed – and to provide technological insight into the new grid distribution systems that will be needed to exploit renewable power. A truly low-carbon economy will also depend on successful energy demand reduction technologies, not only for transport and electronics, but also for space heating and heat loss in both domestic and industrial buildings. To plan and organise such dramatic changes in any given geographical location requires knowledge of the energy flow in society and on the dynamics of optimal energy provision in response to climate change.



You will address these interrelated themes, guided by expertise drawn from the School of Electrical and Electronic Engineering, the School of Mechanical and Civil Engineering, The Tyndall Institute for Climate Change and the Sustainable Consumption Institute. Lectures are consolidated with laboratory classes and computer-based modelling exercises, which lend a strong practical dimension to the course. Your MSc dissertation project, which takes place during the summer, is designed to give you practical experience in the development of renewable energy and planning of low-carbon resources.

Career opportunities

The move to low-carbon societies is recognised to be an urgent priority by all national governments of both developed and emerging nations. The REaCT MSc provides you with a sound training in the key technology areas required to contribute to what amounts to a new industrial revolution. The course develops the broad understanding of energy utilisation in response to climate change, which is required for planning new resources at a regional level.

These skills provide the basis for a strong professional contribution in this rapidly expanding employment sector.

Duration

Full-time
12 months

For further information, visit:
www.manchester.ac.uk/eee/react

research programmes

PhD degrees

If you are a postgraduate student who relishes the opportunity to undertake a research project with intellectual, scientific, industrial, or commercial challenges, a PhD is for you. Those from industrial backgrounds may also find it possible to partake in this level of graduate work, which is particularly valuable to your training and development.

Teaching and learning

The degree of Doctor of Philosophy (PhD) is awarded by the University in recognition of the successful completion of a period of supervised research and training, the results of which show convincing evidence of your capacity to pursue research and scholarship and make an original contribution and substantial addition to knowledge.

The results of this research shall then be embodied in a thesis, or other appropriate form, and must contain material of a standard appropriate for peer-reviewed publication.

You will undertake a skills audit at the beginning of your degree, and annually thereafter throughout your degree, to determine your research, transferable and generic skills requirements. The audit will provide the basis for a planned programme of skills training and development, appropriate to your individual needs.

Both you and your supervisory team must agree the outcomes of the audit and programme of skills development. Your supervisory team will be responsible for ensuring that you have access to the skills training and development opportunities required to boost your progress. You need to demonstrate satisfactory progress before the end of the first year of your research degree by submitting a substantial progress report, which will be discussed at a formal progress meeting with your supervisory team and an independent assessor.

Application requirements

The standard academic entry requirements for a doctorate-level programme (eg PhD) is an Upper Second UK Honours degree, or international equivalent, in a relevant science or engineering discipline, or a first degree with an additional UK masters degree (or international equivalent), plus English language at IELTS 6.5.

If you do not meet the above criteria, but hold a bachelors degree with Lower Second class Honours (or equivalent qualification) you may be admitted to the degree of MPhil.

How to apply

Online applications are available at:
www.manchester.ac.uk/postgraduate/howtoapply

Expected duration

Full-time
36/48 months

Part-time
72 months

Entry dates
January, April, July, September.

MPhil degrees

The degree of Master of Philosophy (MPhil) is awarded by the University in recognition of the successful completion of a period of supervised research and training, the results of which show convincing evidence of your capacity to pursue research and scholarship and represent original work that is appropriately located by you within a wider field of knowledge and investigation. The results of this research shall then be embodied in a thesis, or other appropriate form.

You will undertake a skills audit at the beginning of your degree and annually thereafter throughout your degree to determine your research, transferable and generic skills requirements. The audit will provide the basis for a planned programme of skills training and development, appropriate to your individual needs.

Both you and your supervisory team must agree the outcomes of the audit and programme of skills development. Your supervisory team will be responsible for ensuring that you have access to the skills training and development opportunities required to boost your progress.

You may decide not to write up your research for an MPhil degree, but may instead apply to transfer to PhD as a result of your MPhil work. The School's postgraduate committee will decide whether or not you may do this. Significant factors affecting the decision include your research progress and the likelihood of successfully completing the project at an appropriate level for PhD.

Application requirements

The standard academic entry requirements for an MPhil-level programme is a Second class UK Honours degree, or international equivalent, in a relevant science or engineering discipline, or a first degree with an additional UK masters degree (or international equivalent), plus English language at IELTS 6.5.



Teaching and learning

An MPhil degree provides research opportunities if you wish to qualify for a masters degree by the submission of a research thesis. This should detail the results of original work in any one of the School's research fields. The total time required to complete this programme is a minimum of 12 months full time, or the equivalent part-time study. You may also register as a writing-up student for 12 months at the end of the degree to complete your dissertation.

How to apply

Online applications are available at:
www.manchester.ac.uk/postgraduate/howtoapply

Expected duration

Full-time
12 months

Part-time
24 months

Entry dates
January, April, July and September.

profiles



Postgraduate profile

Simon Watson

I have been at the University of Manchester since 2003 and completed my undergraduate degree (MEng in Mechatronic Engineering with Industrial Experience) in 2008. My industrial placement was as a robotic systems engineer at a company designing bespoke laboratory robots. I started my PhD in 2008 on the design and control of small-scale underwater robots. The aim is to use them to form a wireless sensor network for use in nuclear storage ponds.

My research covers a broad range of topics such as control systems, embedded systems, software, mechatronics and mechanics. The project is very practical in nature which provides a good

compliment to the purely theoretical work. As well as developing my research skills, I have also had the opportunity to present my work at two international conferences. This allowed my work to be peer reviewed and offered me the chance to develop networks for the future.

When I graduate from the University, I will leave with not only a large range of technical and transferable skills, but with a self-belief that I can apply these to any engineering challenge I may face in the future. This is due to the excellent teaching and research opportunities which I have received.

Postgraduate profile

Abdullah Abuelma'atti

From July 2004 until July 2007, Abdullah worked as a Research Engineer with COM DEV Europe Limited, a global designer and manufacturer of space hardware, as part of his PhD programme with The University of Manchester.

After completing his PhD, Abdullah joined COM DEV as a member of the RF design team, with advanced microwave design capabilities from UHF to millimeter-wave frequencies for applications in communications, earth observation and scientific satellite systems. While with the company, Abdullah progressed to Technical Lead on various space programmes, where he was responsible for facilitating solutions on technical deliverables and taking an overview of complete flight systems.

In 2010, Abdullah joined a Fortune 500 company, a global supplier of systems and services to the aerospace and defense markets, where he is currently working in an international role between the UK, USA, France, Russia and India as a Systems Engineer.



research groups

Microwave and Communication Systems Group

The Microwave and Communication Systems (MACS) group has the combined strength of microwave engineering and communication systems. With 12 academic staff and over 50 PhD students, research associates and visitors, it is one of the largest groups in the UK specialising in microwave and millimetre components, mobile wireless networks, antennas and propagation, RF and microwave sensors and tomographic systems, radar, coding, signal analysis and processing.

The group hosts the Electromagnetics Centre for Microwave and Millimetre-wave Circuit Design and Applications, a centre of excellence for microwave and millimetre-wave engineering funded by the Joint Infrastructure Funding (JIF) award. The Group has an integrated Agilent Technologies Laboratory with proven capability in electromagnetic modelling, microwave component and circuit design, fabrication and measurement up to 110 GHz.

The group's research

This is directed towards advanced technologies applicable to communications, radar, and industrial and medical sensing and imaging systems, including: wireless sensor networks, cooperative communications, cognitive radio, green communications, communication theory and performance analysis, interference and coexistence, miniature antennas, MIMO antenna systems, radio astronomy, ultra-low noise amplifier design and characterisation, meta materials, high-performance compact multilayer MMICs, microwave sensors and tomography.

The outcome of research has been published in international journals and conferences, as well as being documented as reports for research funding bodies. The group has both applied and fundamental research with research funding from the Research Councils, industry, government and institutions in the UK, and EU.

Research highlights

The group has leading research in many aspects of communications and microwave engineering. Recent research projects include:

- The Actuated Acoustic Sensor Networks for Industrial Processes project for the development of the technology to monitor and control aqueous processes and mapping of nuclear storage ponds (funded by EPSRC)
- The Square Kilometer Array for the next generation of radio astronomy telescope (funded by STFC and EU)
- Impact of Wind Farms on Radar for the investigation of radar performance in the presence of large wind turbines and means of mitigating their effect (funded by EPSRC)
- Wireless-Friendly Buildings for modelling and developing frequency sensitive surfaces that could be integrated into complex buildings for wireless signal propagation control in a realistic, multi user environment (funded by EPSRC)
- Microwave Wet-Gas Sensors and Tomography for multiphase flow metering and quantifying accurately the produced water in wet gas in wet-gas wells and mature oil wells (funded by TSB)
- Ultra-Low Noise Amplifiers for the European Space Agency's Deep Space Network (funded ESA)
- High-electron Mobility Transistor Characterisation from 300 – 15 Kelvin (funded by EU)
- Compact Multifunctional MMICs for high-performance microwave circuits at reduced cost (funded by DTC)
- Reconfigurable Miniaturised Metamaterials for RF/microwave multilayered integrated circuit applications (funded by EPSRC, DTC)
- Device for Powering Remote Sensors: Rolls-Royce funded research into electrical technologies for greener aircraft was recently presented at the House of Commons as part of the SET for Britain Exhibition.

research groups

Microelectronics and Nanostructures (M&N) Group

Established by Professor EH Rhoderick in 1963, the M&N group was the first group of its kind in a UK university. It carries out fundamental research into new electronic materials and the routes towards exploiting these for new device and circuit technologies, and hosts eight academic staff and over 30 PhD students, research associates and visitors.

Our work has wide ranging collaborations with industry and with overseas laboratories. Over the past decade, we have secured major industrial and Research Council funding for the development of research infrastructure, including major EPSRC funding in the areas of ultra high speed, low noise devices, plasmonic control of quantum cascade lasers for THz generation, brain-inspired CMOS circuit architecture, ab-initio materials modelling of electronic materials, solar conversion devices and bio-sensing devices.

These areas of science and technology require extensive experimental facilities and our research is supported by MBE growth of III-V semiconductors, state-of-the-art device fabrication and materials characterisation labs, optical spectroscopy ranging from THz to UV frequencies, cryogenic STM and AFM and optically detected electron spin resonance.

Part of the group's research activity is based in the Photon Science Institute of the University.

The group's research

Our work covers a complete spectrum of activity in the field of electronic materials and device research. At the atom scale, the group works on the electronic structure theory of solids and on optical and electronic functionality, with system ranging from two atom defect clusters in Si solar devices to atomic motion in Graphene. Our MBE facility grows device structures for ultra high-speed transistors and circuits, quantum optical devices, mid IR and THz devices and solar energy conversion devices.

The group also synthesises organic materials and logic devices, which are key to the emerging plastic electronics technologies.

The novelty and functionality of this wide range of materials device structures are measured in our advanced experimental labs, which host UHV scanning tunnelling microscopy and atomic force microscopy, cryogenic transport measurement, luminescence spectroscopy and Raman spectroscopy.

The integration of devices into circuits and systems is an important part of our work. Currently, the group is developing systems based on ultra-high-speed, low-noise III-V materials, room temperature nanoelectronic device based circuits and brain-inspired CMOS chip architecture.

The group currently holds a research portfolio worth more than £6 million, from industry, research council and the EU, including a major EPSRC Platform Grant. Group members publish widely in major international journals and contribute to the work of research councils and government advisory bodies.

Research highlights

- The group is closely involved with the optical spectroscopy of Graphene
- Development of novel materials for photonic sensing of x-ray dose for radiotherapy applications (with the Christie Hospital, Manchester)
- Silicon wafer based photonic devices for remote molecular sensing
- The first photonicallly tuned quantum cascade lasers using the concept of plasmonic distributed feedback.

Power Conversion (PC) Group

The PC group researches electromagnetic and power electronic techniques for the conversion and control of electrical energy, especially for applications in more-electric aircraft and ships, electric vehicles, and renewable power generation, such as photovoltaic and wind. The group consists of eight academics and a team of almost 40 research staff and students.

The Rolls-Royce University Technology Centre (UTC) in Electrical Systems is accommodated within the Group and includes a 100 kW laboratory facility for examining the performance of future aircraft power generation and distribution systems.

The group's research

Activities range from fundamental to applied research and include: high-performance electrical machines and actuators, superconducting fault current limiters, power-dense and fault-tolerant power electronics, super-capacitor and battery energy storage, condition monitoring techniques, system modelling and control. Activities are funded by a £3 million portfolio of grants and contracts and many of the group's research programmes are undertaken in collaboration with industry.

We place high importance on the practical testing and demonstration of new techniques and therefore maintain an extensive suite of modern laboratories, which includes: cryogenic rigs for super-conducting applications and low temperature power electronics; a fuel cell characterisation facility; an electric vehicle power train, including advanced battery and super-capacitor energy storage; a reconfigurable multi-phase induction machine rig for marine propulsion studies; a doubly-fed induction machine generator for wind power applications; and a calorimeter for high precision loss measurements in machines and drives.



Research highlights

Recent research projects have demonstrated:

- A 600 A, 30 K superconducting fault current limiter
- 50kW power-dense DC-DC converters for electric vehicles, including custom-designed magnetic components
- Control methods for fault-tolerant aircraft generation systems
- A power converter for an LED-based street lighting
- An energy harvesting device for powering remote sensors
- 30kW rim drive for marine thruster applications

research groups

Control Systems (CS) Group

The CS group has a long established reputation. Founded in 1966 as a research centre for multidisciplinary research in control systems, it has grown substantially over the years. Our researchers are among the pioneers in control systems research and have made a range of important contributions to the subject.

Particular areas where the CS group has played a groundbreaking role include multivariable control, adaptive control, system modelling and identification, and fault detection – and the application of many of these techniques to industry.

Although we are proud of our research contributions, the most important output of the CS group is people. The MSc course in Advanced Control and Systems Engineering began in 1968 and graduates from this, and our PhD programme, now occupy important academic and industrial positions throughout the world.

The group's research

The group has an international reputation for its pioneering research in both applied and theoretical control. In particular, an array of frequency domain design tools have been developed for multivariable systems, self-tuning and adaptive controllers have been proposed and applied to a variety of engineering systems, and methods for applying symbolic algebra in the development of control systems have been proposed.

In recent years, we have made new developments in robust control, robotics, stochastic distribution control, nonlinear and adaptive control, fault detection and diagnosis, system identification, multi-objective optimisation and modelling of complex systems.

The group attracts substantial research funding from both industry and research councils and publishes approximately 40 papers each year in leading international journals and conferences.

Research highlights

- Evidence of the group's focus on leading-edge research is highlighted by the fact that it regularly attracts substantial EPSRC projects
- We have a strong track record of transferring technology to industry, and many of the multivariable control and fault detection techniques that we have developed in the group are now applied to industrial processes around the world through the spinout company Perceptive Engineering
- The group has filed several patents and has licensing agreements in place to commercialise its work on pipeline monitoring systems.
- Strong involvement in the Dalton Nuclear Institute that has just been announced as a winner of the Queen's Anniversary Prize for Further and Higher Education for "World-leading applied research and skills training for the varied needs of the nuclear industry"

Electrical Energy and Power Systems (EEPS) Group

Established in 1958, the EEPS group is one of the largest continuously active research groups of its kind in the world, with 12 academic staff and more than 60 PhD students, research associates and visitors. Several prominent academics and industrialists from the UK and Europe hold visiting appointments.

The group hosts the National Grid Power System Research Laboratories, including the largest HV laboratory in the UK (2MV impulse generator; 800kVAC resonant AC set; 600V DC test set; 300kV AC test set; 500 m² of floor space).

The MSc course in Electrical Power System Engineering was first delivered in 1963 and has been running continuously ever since. It has produced more than 1,000 masters graduates, who have taken leading positions in industry and universities around the world.

The group's research

The group's research is directed towards ensuring future electrical energy systems are more sustainable and robust. We consider the ageing of infrastructure, liberalisation of the energy markets, development of renewable energy sources and alleviation of poverty through rural electrification in the developing world. New research includes contributions to electrical systems in transportation and the use of environmentally friendly transformer oils.

The group undertakes fundamental and applied research and currently holds a research portfolio worth more than £10 million. Two-thirds of this funding comes from industry and the research councils, with the remaining third obtained from governments and other institutions.



Research highlights

Over the last few years, the results of the group's research have been incorporated in the reports of ten international working groups convened for the development of standards or guides of best industrial practice.

Over the same period, the group has obtained two Platform grants, four Supergen grants and one EPSRC Star chair, and contributed to more than ten EU-funded collaborative projects.

research groups

Sensing, Imaging and Signal Processing (SISP) Group

SISP's interests encompass instrumentation, transducer and sensor design, signal preconditioning, and signal and information processing and interpretation in both machine and biological systems. The group has 12 staff, including seven professors and a number of research associates and research visitors.

We deal with a spread of modalities, including magnetic, electrical, acoustic, optical, photonic, biomedical, and mechanical signals, with application areas such as medical and industrial imaging (tomography), real-time image and audio-signal enhancement, transportation, neural-signal analysis, and human and machine vision.

The group's research

Industrial Process Tomography (IPT)

Established in 1989, the Tomography team enjoys multidisciplinary collaboration with the University's schools of Chemical Engineering and Analytical Science; Mathematics; and Mechanical, Aerospace and Civil Engineering. This relatively new technology is progressing from early foundations in low-frequency electrical tomography, to microwave and optoelectronic techniques, recently including THz. The team is a world leader in tomography instrumentation, which has spawned commercial instruments from Industrial Tomography Systems Ltd and Process Tomography Ltd.

Vision and Information Processing

This team's research interests include scientific imaging devices and systems instrumentation, image and video processing, as well as artificial neural networks and pattern recognition. In parallel work, it uses data-reduction techniques to analyse multiple spike trains from real biological neural systems. It also uses information theoretic and modern statistical techniques, along with psychophysical experimentation, to model the transduction of sensory signals and to analyse biological vision systems, particularly for colour and image processing.

Digital Signal Processing (DSP)

Over the last ten years, this team's research projects have involved the development of instrumentation and software for non-destructive testing of materials using a variety of sensing modalities, including inductive scan imaging and ultrasonic systems. It is also involved with the development of systems and software for the analysis of cardiovascular and autonomic function, and the design and development of real-time DSP hardware for audio bandwidth applications.

The Syngenta University Innovation Centre

Sensor science technologies have the capacity to create a paradigm shift in the future of the global agribusiness sector. To realise this potential, the Syngenta UIC has been developed to identify and nurture business opportunities for medium to longer term applied research. The ultimate objective is to deliver systems for commercial use.

The SISP group benefits from wide and efficient interaction between its subgroups, as well as with other groups in the School of Electrical and Electronic Engineering (EEE), the Faculty of Engineering and Physical Sciences, and other faculties.



Research highlights

Signal Wizard, developed in SISP, is a unique hardware and software system developed in the School of EEE, for designing, downloading and executing in real time almost any kind of digital filter or audio processing algorithm.

Signal Wizard is now a commercial venture, sold worldwide via distributors in the USA and Europe. Major customers include Disney, Otologics, Sensimetrics, Plantronics, Wayne Technologies, London Central Communications, MR Confon GMBH, Telia Sonera, The United States Government, and many universities, including Stanford and Cambridge.

Our University website holds a wealth of information on the many varied aspects of postgraduate student life. Below are some of the most popular topics – use the web links for full details...

facilities and support

As you'd expect from a world-class institution, The University of Manchester provides a wide range of comprehensive support services and facilities dedicated to your needs. Here is a brief outline – use the web links to find out more.

Accommodation

With more than 9,200 rooms, The University of Manchester has more university-owned accommodation than virtually any other university in the country, almost all of which is within two miles of campus. A number of residences are reserved exclusively for postgraduates; in others, graduate students are roomed together.

tel +44 (0)161 275 2888
fax +44 (0)161 275 3213
www.manchester.ac.uk/accommodation

In addition to the University's halls of residence, Manchester has a sizeable stock of private accommodation for rent. Further details can be obtained from the University's only approved housing bureau, Manchester Student Homes.

tel +44 (0)161 275 7680
fax +44 (0)161 275 7684
manchestersudenthomes@manchester.ac.uk
www.manchesterstudenthomes.com

Careers Service

Our award-winning Careers Service offers specialist postgraduate advice and services, including: one-to-one guidance appointments; talks, workshops and employer-led events; training and development opportunities; dedicated websites, including An Academic Career, a new site for aspiring academics; and a highly rated careers blog for postgraduates.

We are also one of the most targeted universities by graduate recruiters in the UK and our postgraduates benefit from meeting a wide range of employers on campus. We will help you to discover career options with a postgraduate degree, when to apply for jobs or further study, and how best to promote your experience.

www.manchester.ac.uk/careers
<http://manchesterpgcareers.wordpress.com>
www.manchester.ac.uk/academiccareer

Childcare

There are two nurseries close to campus for children aged six months to five years.

tel +44 (0)161 272 7121 (Dryden Street Nursery)
tel +44 (0)161 200 4979 (Echoes Nursery)
www.manchester.ac.uk/studentnet/crucial-guide/university-life/student-parents

City of Manchester

One of the great benefits of being a postgraduate student at Manchester is that all the joys of Britain's number one student city are on your doorstep. You'll be spoilt for choice for art, culture, food, drink, music, history, nightlife, sport, festivals, shopping and much more – with two beautiful national parks also within easy reach when you want to get away from it all. Find out more about our city:

www.manchester.ac.uk/aboutus/manchester

Cultural facilities

Some of the city's finest cultural venues are right here on the University campus.

Manchester Museum

www.manchester.ac.uk/museum

Whitworth Art Gallery

www.manchester.ac.uk/whitworth

Contact Theatre

www.contact-theatre.org

Jodrell Bank Observatory and Visitor Centre

www.manchester.ac.uk/jodrellbank

Disability Support Office (DSO)

If you have additional needs arising from a medical condition, a physical or sensory disability, or a specific learning difficulty, you are strongly encouraged to contact the University's Disability Support Office to discuss your needs, any arrangements that may be necessary and the extent to which appropriate support is available.

tel +44 (0)161 275 7512
fax +44 (0)161 275 7018
minicom +44 (0)161 275 2794
dso@manchester.ac.uk
www.manchester.ac.uk/dso

International postgraduates

We welcome a community of 7,900 students, from more than 150 countries, into postgraduate study at the University every year. A range of facilities and services are available to make your application and move to Manchester go smoothly, including an in-depth arrival guide, a free airport collection service and an orientation programme.

www.manchester.ac.uk/international

IT facilities

When you become a postgraduate student at Manchester, you will have an IT account that lets you access the University's main computing services. These include:

- Personal email account
- Free internet access from your room in University-managed halls of residence
- More than 3,200 computers on campus
- More than 630 WiFi access points on campus
- An online learning environment, accessible from your mobile, with course materials and interactive learning activities
- Full IT support via our IT Service Desk: online, over the phone, or face-to-face

www.manchester.ac.uk/its

Library and information services

The John Rylands University Library is widely recognised as one of the world's great research libraries. The breadth and depth of its electronic and traditional resources makes it one of the best-resourced academic libraries in the UK. If you live some distance from campus, you'll be able to access its databases, e-journals and e-books from home. Many of its services, such as document supply, are also available online via 'My Manchester'. The Library offers specialist training in research information skills and has dedicated staff to assist you in your studies.

www.manchester.ac.uk/library



Maps

Get to grips with your future home and take a closer look at our campus, the city and University accommodation by viewing our maps:

www.manchester.ac.uk/visitors/travel/maps

Prospectus

Our 2012 postgraduate prospectus offers a comprehensive overview of The University of Manchester. You can view a copy online:

www.manchester.ac.uk/postgraduate/prospectus

Religious support

There are two chaplaincy centres for the major Christian churches. St Peter's House provides chaplains for the Anglican, Baptist, Methodist and United Reformed Churches, while the Roman Catholic Chaplaincy is at Avila House. Hillel House provides facilities for Jewish worship. There are prayer facilities on campus for Muslim students and student societies for many religions.

Sport

We have an active Athletic Union, a diverse 'Campus Sport' programme and a huge variety of health, fitness and wellbeing classes, as well as volunteering and scholarship opportunities.

www.manchester.ac.uk/sport

Student support

Whatever the issue – financial, academic, personal, or administrative – we have experienced and sympathetic

people, support groups and advice centres to help you. Find out about counselling, academic advice and various other student support services online:

www.manchester.ac.uk/studentnet/crucial-guide

Students' Union

The University of Manchester Students' Union (UMSU) is the largest Students' Union in Europe, offering everything from student representation to live bands. UMSU has some of the largest and most active student societies in the country and complements the University's overall provision of support and welfare services.

www.umsu.manchester.ac.uk

Video library

Watch and listen to our students and staff introducing various aspects of student life and The University of Manchester with our selection of online videos:

www.manchester.ac.uk/aboutus/video

How to apply

Our preferred method of application for all postgraduate programmes is via our online application form:

www.manchester.ac.uk/pgapplication

If you are unable to apply online and require a printed application form, contact the Postgraduate Admissions Office:

tel +44 (0)161 275 4740
 pg-admissions@manchester.ac.uk
 (remember to include your postal address)



For further information about the courses, or about qualifications, please contact:

address

Postgraduate Admissions
 B29, Sackville Street Building
 School of Electrical and Electronic Engineering
 The University of Manchester
 Sackville Street
 Manchester
 M13 9PL
 United Kingdom

tel +44 (0)161 306 4701 (Taught courses)
 +44 (0)161 306 4800 (Research programmes)

email pgt-eee@manchester.ac.uk (taught courses)
pgr-eee@manchester.ac.uk (research programmes)

For the most up-to-date course information, please visit our website:

www.manchester.ac.uk/eee

Disclaimer

This brochure is prepared well in advance of the academic year to which it relates. Consequently, details of courses may vary with staff changes. The University therefore reserves the right to make such alterations to courses as are found to be necessary. If the University makes an offer of a place, it is essential that you are aware of the current terms on which the offer is based. If you are in any doubt, please feel free to ask for confirmation of the precise position for the year in question, before you accept the offer.

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