



The University of
Nottingham

Innovating Inspiring
Engineering



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Professor Hai-Sui Yu

Engineering the future

The UK's capacity to deliver on, and benefit economically from, national strategic priorities such as the redevelopment and modernisation of the national infrastructure and low-carbon energy solutions will depend fundamentally on enhancing the supply of graduate engineers, architects and researchers.

Here at Nottingham we aim to recruit, inspire and deliver, highly-skilled graduates to the labour market who will enable the transition towards a more sustainable, low carbon society that will bring with it improved economic benefits.

We also recognise our role in the development of the higher level skills needed not only to develop products and manufacturing systems that are sustainable and economical, but also to create those key technologies that will facilitate the more efficient use of our natural resources.

We have adopted a clear, long term vision of investment in our people, research and teaching, and are keen to support activities which will provide economic and social benefits, for example the development of effective disaster mitigation technologies, novel medical devices, high-value manufacturing and efficient future transport networks.

Engineers and architects in the Faculty of Engineering are at the forefront of these new developments. They are working on new, sustainable technologies that will change the way we build our homes, travel to work and communicate around the globe. They are playing a pivotal role in harvesting and conserving our natural resources: for example water treatment technologies being developed here at Nottingham could save millions of lives by making waste/contaminated water and sea water drinkable.

We are working alongside global energy producers, distributors and users, to develop urgently needed technologies to reduce carbon emissions, and capture and store carbon.

As we celebrate 100 years of engineering at Nottingham, now seems a good time to take stock, and to look ahead at these global challenges to ensure Nottingham is well positioned to take the lead in the development of innovative and sustainable technologies.

We will continue to invest in the world-class infrastructure that supports the Faculty and position ourselves in a considered way so that we can deliver real value from our interactions with key stakeholders, and exploit opportunities for greater collaboration through strategic partnerships.

We plan to play an important role in creating the next generation of elite engineers and architects.

Professor Hai-Sui Yu
Dean, Faculty of Engineering

www.nottingham.ac.uk/engineering



Teaching and Learning

Engineering is one of the strongest faculties at Nottingham with all departments recognised as being amongst the best in higher education. The commitment is to give students the “Nottingham Edge” – an unrivalled combination of quality and excellence, strength and pragmatism, enabled learning, boldness and innovation, respect and tolerance.

A degree from Nottingham is a statement of skill, innovation and quality. A key part of this is the value we place on research-led teaching that enables students to engage creatively with new and exciting ideas. Our students are taught by academics who are leaders in their fields of research, a unique advantage for our students who are respected and valued by employers. With excellent local and international links, Nottingham graduates receive the best education and are amongst the most sought-after in the world.



Teaching and Learning

Undergraduate Teaching



The outstanding learning experience of undergraduate study in the Faculty is built on the expertise of our staff, typically leading researchers in their field, using modern teaching technologies and set in an international context.

At undergraduate level, the aim of our teaching strategy is to develop graduates who have a thorough grounding in their subject of study, are aware of research, have a critical approach to knowledge, can study independently, and have the skills and attributes to be successful in employment. We are particularly keen to ensure our students have a well balanced programme of lectures, tutorials and seminars. Laboratory/studio work is an intrinsic part of our undergraduate degrees and is highly valued and enjoyed by our students. They are encouraged to explore the creative, applied side of architecture/engineering and often work on live projects set by industry or on projects which benefit society, particularly for developing countries.

In 2009, the Faculty of Engineering welcomed Architecture and Built Environment to become the Faculty's fifth Department, along with the Departments of Chemical and Environmental Engineering, Civil Engineering, Electrical and Electronic Engineering, and Mechanical, Materials and Manufacturing Engineering.

The majority of our courses are offered as three-year BEng and four-year MEng with BArch, BA and DipArch being offered by our Department of Architecture and Built Environment. All our courses are modular and students can select from a range of modules to tailor their degree to suit their interests.

Nottingham's Foundation Programme is designed for both UK and international students whose school leaving qualifications do not immediately allow them admission to undergraduate engineering and computer science degree programmes. Students who successfully complete the Foundation Year at Nottingham are able to progress into year one of their chosen degree subject.

Undergraduate Teaching

Innovative learning

Staff in the Faculty of Engineering have pioneered many of the latest teaching methods used across the University such as e-assessments and virtual learning environments. Students are able to take advantage of a number of technology enhanced learning tools via the internet which are designed to support different learning styles and to provide self-directed learning with self-test opportunities, accessible anytime, anyplace.

Course development

All our undergraduate courses are regularly reviewed and accredited by professional bodies ensuring that quality is independently measured and that teaching material is up-to-date and relevant to today's industrial needs.

The Faculty places great value on the student voice, and student committees play an important role in communicating to us their views on the learning experience, course modules and laboratory sessions. Students are also encouraged to complete the National Student Survey, a census of final year students across the UK. The data is published on Unistats.com and can be viewed by prospective students and by the University so that we can facilitate best practice and enhance the student learning experience.

Working with industry

From the very early years of the Faculty we have sought opportunities to work closely with industry, it is a feature that has remained constant throughout our growth and of which we are justifiably proud. These partnerships ensure our teaching is relevant and valuable to today's employers and for the workforce of the future. We have long-standing relationships with global and international organisations such as BAE Systems, BP, the Ford Motor Company, Network Rail, Rolls-Royce, and Shell. Support from these organisations varies from providing sponsorship and scholarships to providing third/final year undergraduate projects, vacation placements or a full year internship, where students can work towards an Industrial Diploma in addition to their final degree.

Because our courses are accredited by professional bodies they provide recognised routes for students to attain chartered status. Accreditation is seen as an indicator of professional competence and ethics and so is seen to enhance our students' employability.

All our students are able to take a year out in industry and the Faculty has close links with the organisation 'Year in Industry' who have their regional office here in the engineering building. Architectural students on the BArch and MEng programmes have the opportunity to register on a Year Out in Practice following their initial undergraduate course before continuing their studies through the Diploma in Architecture.

Our excellent relationship with industry is further borne out by Nottingham's national reputation for the employability of our graduates; we have one of the best records for successful graduate employment in the country. Nottingham graduates are consistently among the most popular to employers. Nationally, eight out of ten engineering undergraduate students are employed within six months of graduating—15 per cent above the average for graduates of all other disciplines, according to the Higher Education Statistics Agency.

Investment in infrastructure

Continued investment in our laboratories ensures students learn in modern, high-quality facilities. A new £10 million Engineering and Science Learning Centre will open in 2011 enhancing the student experience even further. It will offer additional lecture theatres and seminar space and will focus on the latest technologies to support student self-learning with flexible work space and touch-down terminals for short-stay internet access. A central social hub will connect to cafeterias, with seating clusters for group work, ensuring that the learning experience of our students continues to be amongst the best in the UK.

Study abroad

International employers are increasingly seeking students with a 'global awareness', particularly those who can demonstrate their ability to work in another country by studying abroad during their degree. The Faculty recognises this and supports its students to find universities where they can continue their chosen field of study without extending the length of their degree programme. Agreements with top universities across the globe, including with the Universitas 21 group of highly prestigious research-led universities, and inter-campus exchanges with our Malaysian campus provide exciting study abroad placements from one semester to one year.



Architects' drawing of the new Engineering and Science Learning Centre to open in 2011

Encouraging and rewarding excellence

The Faculty of Engineering has developed an innovative rewards programme, *High Fliers*, for its top performing students. The programme recognises and rewards undergraduate and taught masters students by providing tailored social and academic events and workshops throughout the year. The programme encourages continued high achievement, stimulates enthusiasm for postgraduate research and offers scholarships for postgraduate study at Nottingham.

The Engineering Research Placements scheme provides a unique opportunity for high performing undergraduate engineers and architects to sample, firsthand, the life of a researcher. Students work in a supportive environment, under the tutelage of an academic supervisor, on a current exciting research project over the summer holidays. They have access to a wide range of technical facilities and laboratories, normally only used by postgraduate researchers. The programme also provides an excellent opportunity for post-doctoral researchers to obtain supervisory experience and for academics to employ a student to 'test an idea' for a future proposal.

In 2009 the Vice-Chancellor, Professor David Greenaway, presented awards to summer placement students at an exhibition which showcased the best of the *High Fliers'* project work. He recommended *High Fliers'* to others across the University as an innovative programme for recognising and encouraging excellence.

A summer placement has been proven to encourage more students into research careers, and is popular with both students and researchers.

Further Information

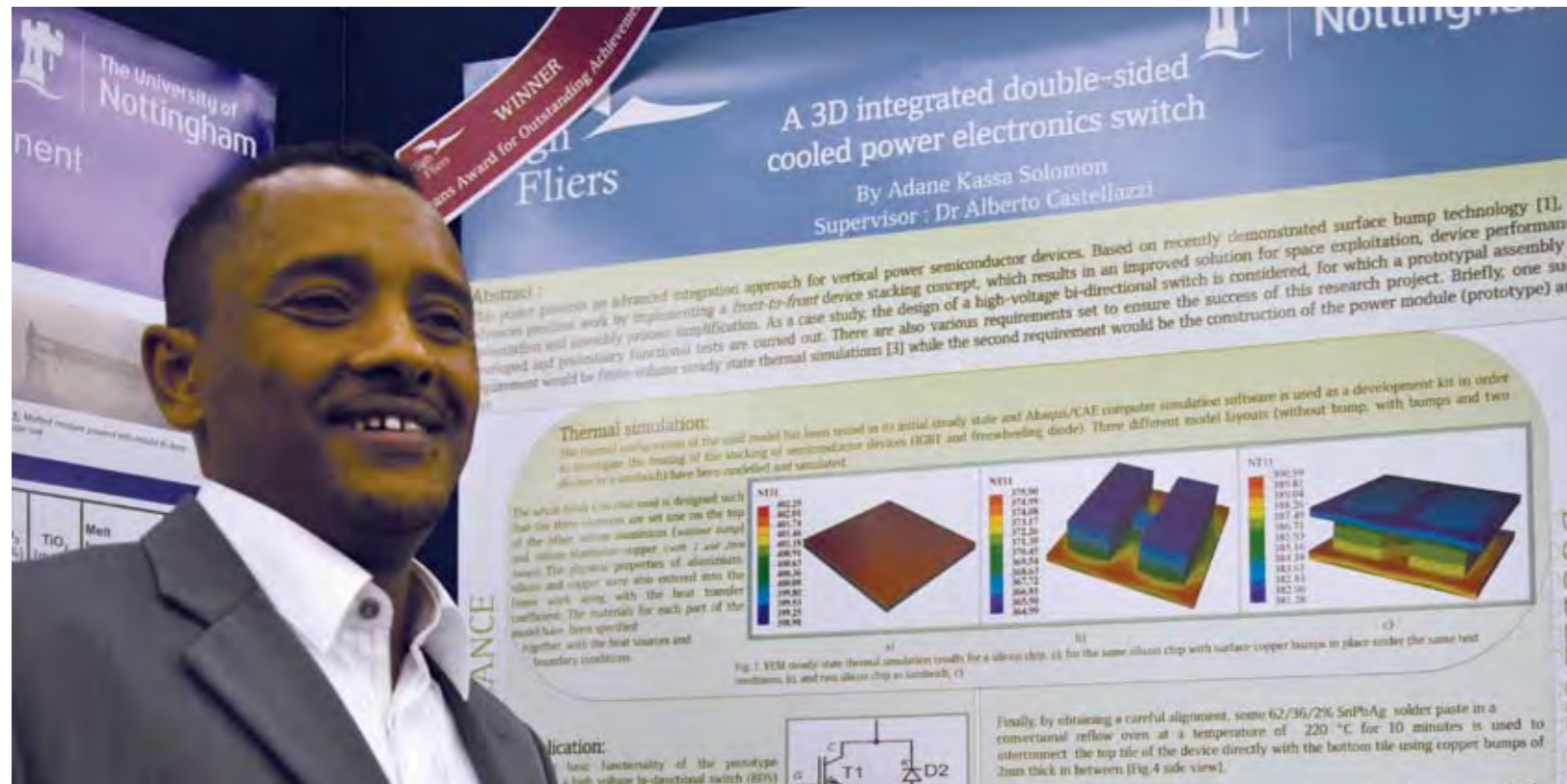
- Architecture and Built Environment: www.nottingham.ac.uk/abe
- Chemical and Environmental Engineering: www.nottingham.ac.uk/chemenv
- Civil Engineering: www.nottingham.ac.uk/civeng
- Electrical and Electronic Engineering: www.nottingham.ac.uk/eee
- Mechanical, Materials and Manufacturing Engineering: www.nottingham.ac.uk/m3
- Foundation Year: www.nottingham.ac.uk/foundationyear

Fact File

No of undergraduate students:	2892*
No of international students	938*
Annual intake:	974
No of courses:	48
Entry levels:	varies from AAA to BBC

Foundation entry route available
*as at 1.12.09





Case Study



"It was a fantastic opportunity to get this placement and I am very grateful to the University. It was challenging work but I had a very helpful supervisor. Taking what I learned in the lecture theatre into a practical environment has seriously made me consider doing my PhD."

Adane Kassa Solomon, 4th year
Electrical and Electronic Engineering
Winner of the 'Dean's Award for Outstanding Achievement' (pictured above).

"I enjoyed being able to experience what life as an academic researcher was like and being given a greater degree of independence was also a very good experience."

Richard Charles Lawrence, 4th year
Chemical Engineering

"For the first time I experienced what it's really like at the cutting edge of research, using equipment and doing things I'd never done before. I'm doing mechanical engineering and I spent time during the summer carrying out research with a chemical engineer. Until the summer research placement I'd never really spent much time in other fields of work."

Simon Woolhead, 4th year
Mechanical Engineering
Winner of the best designed poster award

Postgraduate Teaching



The Faculty of Engineering offers around 50 taught masters courses spanning a range of disciplines. These courses equip students with a deep understanding of their subject and provide key transferable skills relevant to their future careers. They are particularly sought-after by international students wishing to add value to their undergraduate degrees with a UK masters qualification.

Our range of taught masters programmes is continually evolving in response to changes in society and the need to integrate the latest research findings. They are also developed in response to the views of employers so ensuring that we deliver highly-skilled people relevant to the labour market. Our most recent development includes a range of computational engineering courses and a sustainable energy engineering course, which combine a diverse range of expertise from across the Faculty.

We are pro-active in our search for new market opportunities to develop courses which meet the needs of industry. For example, the Lloyd's Register Educational Trust have funded a major programme on risk and reliability which includes the development of distance learning MSc programmes.

Postgraduate pathways

Students in the Faculty of Engineering are offered a range of postgraduate pathways including Master of Science (MSc), Master of Research (MRes), PhD (Doctor of Philosophy), New Route PhD programme (or Integrated PhD), Master of Philosophy (MPhil). Taught masters programmes are offered across the five engineering departments. Research programmes are managed by the seven research divisions.

Engineering Graduate Centre

The Engineering Graduate Centre (EGC) offers an exclusive space for postgraduate engineers, architects and researchers to relax, take refreshments or to find a quiet corner in which to work. The EGC manager works on a one-to-one basis with postgraduates to improve their employability; providing training sessions on CV writing and interview techniques, arranging in-company training placements, and also organising a range of educational and social events and employer presentations.

Fact File

No of taught masters students:	507*
No of postgraduate research students:	480*
No of international students:	502*

*as at 1.12.09



Architects' drawing of the new Energy Technologies Building. This proposed development will be sited on the Innovation Park adjacent to Jubilee Campus. The project will provide a range of laboratories, workshops and offices for research in to energy technologies, to be completed by the end of 2011. The scheme is being designed to BREEAM (BRE Environmental Assessment Method) excellent standards. (Image courtesy of Maber Architects)

Engineering Research

According to the 2008 Research Assessment Exercise (RAE), engineering research at The University of Nottingham is recognised as being world class with more than 75 per cent graded as 'world leading' or 'internationally excellent'.

This result places the Faculty firmly in the UK's top five universities for engineering research. We want to build on these strengths to ensure that our internationally excellent research not only leads the field, but remains flexible to respond to new and emerging worldwide challenges. Our aim is to be a global leader in our areas of expertise and we will achieve this through targeted strategic investment.

We plan to maximise our impact and visibility and deliver the next generation of world-leading research. We will continue to support talented people and develop partnerships with industry, funding bodies and government agencies, to create an exemplary environment where discovery, scholarship, innovation, commercial exploitation and public engagement thrive.

The Faculty of Engineering has taken a considered and informed look at the way in which it manages its human and capital assets in the pursuit of research excellence and in 2008 made a fundamental change to its operations with the implementation of an integrated structure.

This formalised, supported and built on the excellent interdisciplinary research which already existed and helped to break down the potential barriers of 'traditional' disciplines. We are now well positioned and better focussed to identify and attract new investment opportunities and to react quickly and efficiently to emerging global and multidisciplinary challenges.

The Faculty has seven research divisions each of which host a number of world-leading research centres, groups and institutes.

They are:

- Architecture and Urbanism
- Electrical Systems and Optics
- Energy and Sustainability
- Infrastructure and Geomatics
- Manufacturing
- Materials, Mechanics and Structures
- Process and Environmental

Details of each of these research divisions can be found on the following pages.

Engineering Research

Architecture and Urbanism Research Division

www.nottingham.ac.uk/auresearch

Nottingham's research in architecture and urbanism has an international reputation, falling within the broad groupings of Architectural History & Theory, Urban Design, Environmental Design, and Architecture & Tectonics. The Division is particularly noted for its innovative work in green issues and sustainability and attracts leading experts from practice and industry.

The Division has four research groups:

Architectural Humanities Research Group

The Group supports research in architectural history, theory, culture and design. Combining individual scholarly work with collaborative and often practice-led research, group members are active in pursuing a range of research topics including: the history of architectural theory and criticism; the philosophy of technology, materiality and sustainability; museums and architectural exhibitions; the history and theory of modern and contemporary architecture. The Group has important international links and also works with other schools and departments around the University including: Modern Languages and Cultures; Computer Sciences; Geography; History and Art History.

Architecture and Tectonics Research Group

The Group's research addresses the core of architecture including design as research, and research that supports and stimulates design. The making of architecture is researched by reflective practitioners in: zero carbon architecture, materials, new tectonic opportunities, digital fabrication, 1:1 prototyping, high-rise architecture and the social science of sustainability. Research is undertaken collaboratively, on a multi-national basis with industry, engineers and other architecture and urbanism research groups. It is a founder member of the Digital Fabricators Research and Practice Association and member of Council for Tall Buildings and Urban Habitat. The Architecture and Tectonics Group encompasses the Division's Project Office, which undertakes live projects as a mode of research.

Environmental Design in Architecture Research Group

The Group aims to inform the practice of architecture and enhance the quality of the built environment through research and consultancy in environmental design. The main research focus is on the ways that buildings form, material, and use impacts on the relationship between the external and internal thermal, visual and aural environment. Much of the work is related to mitigating the impacts of climate change and reducing carbon emissions through both the education of built environment professionals and innovative building design.



Members of the Group are involved in leading-edge research, informing education, practice and industry, and collaborating with academic and commercial partners and architects around the world including: Mario Cucinella in Italy; Architecture Project, Malta; Abhikram Architects, India; Ingeniatrics Tecnologias, Spain; Microlide, France; SRIBS, China.

Urban Design

Research into Urban Design has been a strength of The University of Nottingham for the past two decades. The Urban Design Research Group focuses on the study of urban regeneration, conservation, public realm, waterfront regeneration, public consultation and cultural tourism. The Group has strong academic and professional links nationally and internationally. Collaborations with partner universities, urban design and town planning bodies and local governments, focus on live projects as a mode of research. Live projects are pursued through student projects and professional consultancy, drawing together research and teaching. For example, last year's Master in Urban Design studio project explored an Enabling Development Framework surrounding Brayford Pool in Lincoln. The best student project was taken further as a professional consultancy in collaboration with Lincoln University and the City of Lincoln planning authorities. The project will soon be undergoing public consultation and is expected to be incorporated in the City of Lincoln design guidance.

The RCUK (Research Councils UK) funded summer school in 2009 initiated practice-based collaborative research between the Urban Design Research Group and Chinese Partners. The workshop in Beijing brought together students and academics from The University of Nottingham and Tsinghua University to work on the live project of Cao Feidian Eco-town. The research of the Urban Design Group is further developed and disseminated through its 16 PhD students.



The prototype home went on display for the very first time at Ecobuild, Earl's Court in London, in March 2010.

Case Study Nottingham H.O.U.S.E.

In 2010, a 40-strong team of students from the Division prepared and built a full scale, zero carbon solar powered house ready for the world's biggest event for sustainable design, construction and the built environment.

Called the Nottingham H.O.U.S.E. (a family home optimising the use of solar energy), it will be Britain's only entry in the international house building competition – the Solar Decathlon Europe 2010 to be held in Madrid. The international competition showcases the powerful combination of solar energy, energy efficiency, and the best in home design. Built in partnership with the construction materials company Saint-Gobain, the house demonstrates how low energy architecture can lend itself to the mass market.

Engineering Research

Electrical Systems and Optics Research Division

www.nottingham.ac.uk/esoresearch



A new £1.5m Aerospace Research Centre extension to the existing Tower Workshop will incorporate workshop and office spaces. To be completed by September 2010.

This Division researches innovative methods to use and develop electrical, electronic, optical and materials technologies to solve a wide range of technical problems across industry and the biological sciences, over a range of length scales from kilometres to nanometres. Underpinning much of the work is expertise in electromagnetic modelling. Key strengths include: photonic and optical communications engineering; power electronics; ultrasonics, electrical technology for sustainable & renewable systems.

The Research Division comprises five groups/institutes:

Applied Optics Group

As an optics group working in an electronics department, the team developed an understanding of the limitations of current scientific camera technologies - which are effective at detecting tiny signals but poor at getting dynamic signals on a large static background. The Group has developed a new generation of light detector arrays that overcome these limitations,

allowing them to take a whole picture where hitherto it was necessary to image single points. This technology is now funded by EPSRC Follow-on Funding with a view to commercial exploitation. There are currently research collaborators at other universities applying these ideas for their research. Examples in the UK include the universities of Southampton and Oxford as well as collaborators in Europe and the Far East. One exciting area of research is the Doppler Cameras which have been used to image blood flow in the skin in real time. When laser light illuminates the body, the light that returns consists of a small rapidly fluctuating signal on a large static background. The size of the rapidly fluctuating signal is proportional to the amount of blood flow. This is important for many applications such as assessing burns and wounds, viewing veins for taking blood samples and understanding allergic reactions.

Institute of Biophysics, Imaging and Optical Science

IBIOS provides an environment in which researchers from a range of disciplines can work in a close-knit community, with integrated facilities, in physical proximity and with a shared research agenda.



The fundamental approach of the Institute is to combine state-of-the-art developments in optical imaging technology with curiosity driven research into cellular biology. This nationally unique combination of disciplines is entirely natural because the key problems facing researchers in the investigation of the cell arise from the need to pose intelligent questions and extract more information from the systems of interest. As the technology required to obtain this information is simply not available its development and application provides one of the major scientific and technological challenges of the next decades.

George Green Institute for Electromagnetics Research

The George Green Institute for Electromagnetics Research was established in 2004, as a result of many years of electromagnetics research at the University. GGIEMR is principally a research and postgraduate teaching centre covering all areas of electromagnetics and its applications.

Named after the Nottingham scientist George Green (1793-1841), the main theme of the work of the Institute is the development of predictive techniques for electromagnetic design which take full advantage of systematic analytical work going back two centuries, and more recent developments in numerical modelling and simulation using computational platforms. The Institute maintains a varied portfolio of research work and collaborates with many different agencies to support its work.

Its core activities cover:

- the development of numerical and analytical techniques in electromagnetics
- applications including, electromagnetic compatibility (EMC), opto-electronics and photonics, signal integrity (SI), transients in large systems, interaction of EM waves with materials
- experimental techniques for system characterisation and model validation

Photonic and Radio Frequency Engineering Group

The Group pursues cutting-edge research in photonics and microwaves, with a focus on device technologies. It brings together a dynamic team of academics from around the globe, and has impressively equipped research laboratories to support its work. Its innovative activity in communications, high-speed electronics and high-power laser diodes is organised along three strands:

- high-power optoelectronics
- photonic communications technology
- RF devices, circuits and materials

The Group also conducts novel research through well-established collaborations with leading research laboratories and industrial partners across Europe.

Power, Electronics, Machines and Control Group

One of the largest research groups in its field worldwide, the Power Electronics, Machines and Control Group has world-leading research activities across a range of fields including:

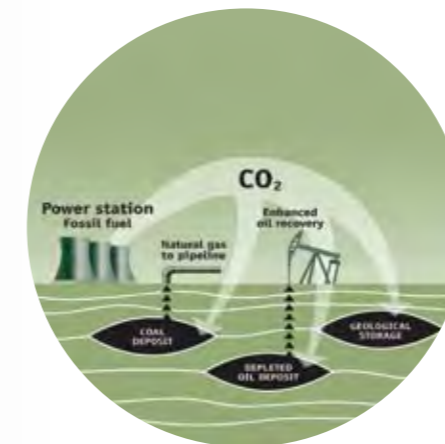
- power electronic energy conversion, conditioning and control
- power electronics integration, packaging and thermal management
- motor drives and motor control
- electrical machines

The Group works extensively with industrial partners applying the core technologies and expertise in areas such as aerospace electrical systems and equipment, renewable and sustainable energy, marine systems, industrial drive systems and pulsed power converters. Research in the Group ranges from basic technology investigation to fully engineered advanced concept demonstrators and is underpinned by world-class experimental and workshop facilities allowing realistic practical validation of novel components and systems. The Group has been recognised as an EU Marie Curie Training Centre.

Engineering Research

Energy and Sustainability Research Division

www.nottingham.ac.uk/esresearch



“The Faculty of Engineering has a reputation for excellence across a broad range of technologies.”

The University is a leading authority on energy research and enjoys a reputation for excellence in a broad range of technology-based activities.

Research undertaken in this Division addresses issues of global importance in the area of sustainable, affordable energy technologies. Work is cross-disciplinary and multiagency with outstanding facilities for applied work as well as computational studies. The Division comprises inter-related groups and institutes offering a range of research expertise.

Cleaner Fossil Energy and CO₂ Mitigation

The Faculty of Engineering has a reputation for excellence across a broad range of technologies encompassing bioenergy, fossil energy, energy storage, the built environment and grids. The strategic priority given to energy and to coordinate research across the range of disciplines led to the **Energy Technologies Research Institute** being founded in 2006. Indeed since then, the portfolio value of energy grants has more than doubled, including a number of notable successes including the **BBSRC Sustainable Bioenergy Centre** and the **EngD Centre in Efficient Fossil Energy Technologies**. As part of the strategy to further grow our internationally leading research programme, the University is investing £7M in new energy technologies and bioenergy buildings. The funding comes from the Higher Education Funding Council for England (HEFCE) as part of the Capital Investment Fund (CIF). Nottingham is one of three universities (with Birmingham and Loughborough) comprising the Midlands Energy Consortium (MEC) which hosts the Energy Technologies Institute and where we have established the Midlands Energy Graduate School with £3M HEFCE funding to provide a unique shared platform to improve the quality of postgraduate research training in energy research.

The Centre for Innovation in Carbon Capture and Storage

The Centre, funded by the Engineering and Physical Sciences Research Council (EPSRC), conducts pioneering research into carbon capture, transport, storage and utilisation, based on a number of groundbreaking projects to reduce CO₂ atmospheric levels and mitigate global warming.

Research has focused on some of the most critical problems in energy science, working at the interface between energy and the environment, developing novel solutions to meet the demand for cost-effective and environmentally-friendly energy.

The Centre has secured international recognition for research in carbon capture and storage (CCS), which has been pivotal for the development of new CCS technologies. Research is cross-disciplinary and multi-agency, uniting the expertise of academia, industry and government organisations across the globe. Some examples of our research programmes include decentralised CCS options, with a focus on

mineralisation processes for above ground; development of compression technologies; novel sorbents for more efficient capture; modelling and experimental studies of geological carbon storage; influence of contaminants during CO₂ transport and storage; and public acceptance of CCS. More recent research has been in the field of ecosystem responses to releases of CO₂, including remote sensing technology and conversion of CO₂ into a sustainable energy carrier.

The Centre's creative collaborations with industries have led to the development of the first UK short-course training postgraduate programme in CCS for professionals in private and public organisations. The team has special relationships with many international companies and research centres and has plans to participate in major CCS demonstration projects in the UK and worldwide.

Thermo fluids

The Group is recognised internationally for fundamental and applied research on the performance of machines including reciprocating internal combustion engines, turbomachinery and motors; techniques of flow visualisation, flow control and drag reduction; and CFD models, applications and mathematical techniques. The Group enjoys close links with industry; sponsors and collaborators include many international companies such as Airbus, Ford and Rolls-Royce. The Group has extensive and modern facilities for applied work on engines and machine performance and on generic problems such as the fundamentals of turbulence. The Group is also a prime user of the University's high performance computing facility for its CFD activity, and maintains expertise in the use of several proprietary codes including Fluent, CFX and KIVA.

Recent research themes include the reduction of inefficiency in engines - windage losses in transmissions, rubbing friction in reciprocating engines, cooling of electric motors; the understanding and improvement of combustion in engines, cookers, and power stations; and biomedical diagnostic improvements. New themes continue to be developed: environmental and climate change concerns are increasingly influencing directions, and driving initiatives in areas such as wind energy.

Work is also being undertaken in this area by the Internal Combustion Engine Research Group (ERG), one of the largest university research groups working on spark ignition and diesel engines for the automotive industry. For over 30 years the ERG has worked closely with the Ford Motor Company in a collaboration which is one of the most successful between industry and a university. The ERG interacts directly with Ford to advance powertrain development and introduce new technology, and pursues complementary lines of fundamental studies which support this.

The Faculty has a long history of working with Rolls-Royce on a wide range of aeroengine-related projects, including projects on the transmission systems. As a result of this successful collaborative research, the University was chosen to set up a **Rolls-Royce University Technology Centre (UTC)** in Gas Turbine Transmission Systems in 1997.



Advanced Materials Research Group

The Group undertakes world-leading research on a range of novel materials for energy technologies, including hydrogen storage materials, nano-tubes for PV applications and nano-structured membranes, and catalysts for fuel cells. Research is supported by excellent characterisation facilities and the Group's wide network of international collaborations. The Group's mission is to control the synthesis and processing conditions of advanced materials to design in functionality, shape and smartness at the macroscopic and microscopic scales, and increasingly at the nano-scale. Strategic research themes each combine fundamental, curiosity-driven research with application-driven research, driving the development of advanced new materials. These new materials have excellent potential to catalyse engineering progress and ultimately to provide benefit to society. The Group attracts funding from industry, the defence agencies, the national Research Councils and European agencies and enjoys stimulating and rewarding collaborations of the highest calibre which cut across the international academic, and industrial, materials' communities.

Institute of Building Technology (IBT) and Institute of Sustainable Energy Technology (ISET)

The **IBT** undertakes high-quality, strategic and applied research related to building services and energy conservation (e.g., CHP systems, heat pumps, lighting, acoustics, ventilation and indoor air quality). The Institute has developed into a leading centre for research and teaching in building services engineering/building technology. The **ISET** carries out research and teaching into renewable/sustainable technologies in the built environment, attracts external funding, runs training programmes and short courses and participates in network and public awareness activities. The Institutes offer excellent and extensive research facilities including the Marmont Centre for Renewable Energy, the Sustainable Research Building, the Eco-Experimental House, and Creative Energy Homes project.

The Marmont Centre for Renewable Energy contains research laboratories which are equipped with a variety of technologies and state-of-the-art facilities for research into passive cooling, heat recovery, solar/wind/ground energy systems, absorption technology, ejector refrigeration, heat pump systems, ventilation systems, indoor air quality and thermal comfort. **The Sustainable Research Building (SRB)** is designed to serve as an exemplar building, demonstrating state-

of-the-art techniques for environmentally responsible, sustainable construction. The SRB incorporates a flexible envelope to permit field-testing and integration of new and sustainable technologies.

The flagship **Creative Energy Homes Project** is a showcase of innovative state-of-the-art energy efficient homes of the future. Six homes constructed on University Park have been designed to various degrees of innovation and flexibility to allow the testing of different aspects of modern methods of construction. The project aims to stimulate sustainable design ideas and promote new ways of providing affordable, environmentally sustainable housing that are innovative in their design. Several companies including Stoneguard, Roger Bullivant Ltd, EON and BASF have funded the project.

Engineering Research

Infrastructure and Geomatics Research Division

www.nottingham.ac.uk/igresearch

The Division conducts world-leading research in transportation infrastructure, positioning, navigation, mapping and monitoring of the built and natural environments. It enjoys state-of-the-art facilities as well as rewarding relationships with industry partners and other well-regarded research institutions around the world.

The following groups offer a range of research opportunities in the Division:

Institute of Engineering Surveying and Space Geodesy (IESSG)

The Institute of Engineering Surveying and Space Geodesy has been closely involved in the rapid technological revolution in this field. It has earned global renown for its cutting-edge research in satellite navigation and positioning systems, photogrammetry, remote sensing, sensor integration and geographical information systems. The diversity of its work, spanning engineering surveying to unmanned aerial vehicles, has led to exciting and innovative collaborations across departments and with other institutions.

Our postgraduate programmes generate interest worldwide, and current research themes include:

- geospatial engineering
- GPS geodesy
- integrated sensors
- photogrammetry and remote sensing
- ubiquitous positioning and autonomous systems



During autumn 2009, IESSG and the Centre for Geospatial Science (CGS) moved to the purpose-built Nottingham Geospatial Building, giving researchers access to advanced geospatial laboratories and state-of-the-art facilities and offering incubation units to like-minded industry partners. Among the companies quick to take up the offer of a commercial unit housed in the new centre, was the Midlands office of the Ordnance Survey.

Centre for Geospatial Science (CGS)

A major multidisciplinary research centre, CGS conducts pioneering studies across a considerable range of areas related to geospatial science and technology including:

- geoinformatics and data modelling
- geospatial intelligence
- interoperability and standards
- location based services
- semantics, reasoning and cognition
- spatial data infrastructure (SDI)

Key projects include: Sensor web technology for the

integration and control of complex environmental data gathering activities with QinetiQ, funded by the TSB (Technology Strategy Board) and the £5.1m 'Location Aware Ubiquitous Computing' DTC (Doctoral Training Centre) funded by the Research Councils UK.

The Nottingham Transportation Engineering Centre (NTEC)

The Centre is located in the Pavement Research Building on University Park and provides internationally leading research, education and laboratory facilities for transportation infrastructure and related applications in the road, rail and air sectors. The Centre has state-of-the-art research and development laboratories and current research themes include:

- design and performance
- sustainability and the environment
- operational risk and reliability
- sustainable construction
- materials
- asset management

NTEC have held a prestigious EPSRC Platform Grant in Pavement and Rail Track Engineering since 2000 which has recently been renewed until 2013. NTEC has recently expanded its research portfolio with the appointment of Professor John Andrews who is working on a major new multi-million pound research programme on Infrastructure Asset Management, jointly sponsored by Network Rail and the Royal Academy of Engineering. A major new programme of work on Risk and Reliability Engineering, including research and the development of a distance learning MSc in Risk and Reliability Methods, is also about to commence, sponsored by Lloyds Register Educational Trust.

Manufacturing Research Division

The University of Nottingham is renowned internationally for the excellence of its manufacturing and human factors research and significant contributions to manufacturing science, technology development and industrial applications across a range of sectors including aerospace, automotive, consumer products, medical and power engineering.

It has world-class facilities for design, manufacturing, assembly, measurement, testing and modelling as well as a proven track record in delivering high quality research, leading to numerous patents and high impact peer reviewed publications.

The Division also has a number of centres which work alongside industry partners in a range of sectors to research and develop technologies, processes and systems that give UK and international manufacturing businesses a competitive advantage in the global marketplace. More details of these can be found on page 22.

The following groups/centres offer a range of research opportunities in the field of manufacturing:

Advanced Manufacturing Technology (AMT)

The AMT Group conducts research at the forefront of manufacturing science and technology working in close cooperation with a number of strategic industrial partners and research centres worldwide. Research is supported by excellent manufacturing, assembly and metrology facilities, the latest technologies and equipment.

Current areas of research include:

- intelligent automation and assembly
- laser processing
- machining and condition monitoring
- metal forming
- micro- and nano-manufacturing
- precision manufacturing
- responsive manufacturing
- robotics

The Group have collaborations with a number of manufacturing organisations including gas turbine and aero-engine manufacturers, looking at things like: On-line machining monitoring system based on PXI and LabView platform; reconfigurable tooling technologies; a lean manufacturing disturbance diagnostics tool to aid understanding and response to major causes of performance loss.

The Group has excellent facilities and is itself home to leading research centres including:

The Precision Manufacturing Group which delivers high-quality technology solutions to industry in areas such as precision machining, adaptive fixturing, micro fabrication & assembly and system design & integration, and incorporates the **Centre of Excellence for Customised Assembly (CECA)** which focuses on micro and meso-scale products, bringing together the latest precision manufacturing technologies in micro-moulding, laser processing, micro-machining and metrology that companies can use to test the commercial potential of new micro products and processes.

The £1.1million **Waterjet Machining Technology Centre** houses equipment that uses a six-axis computer controlled waterjet machine. The machine, which is one of the most advanced of its type in the world, produces a waterjet at pressures that are so high it can carve cavities and cut almost anything. The water comes out of the nozzle at 55,000 psi and speeds of up to 2,000 mph. The waterjet, which can cut blocks of metal into three dimensional components, is an important resource for engineering and manufacturing businesses.

Human Factors Research Group

The Human Factors Research Group conducts truly multidisciplinary research into human behaviours at work, home, travel and leisure to drive user-centred design for the products and systems that we use every day.

Research is wide-ranging and includes, for example: Ergonomics assessments such as manual handling, upper limb disorder risk, workplace design and the development of tools to increase understanding human performance in the workplace in order to minimise risks; healthcare ergonomics, including medical device design, GP surgery and community hospital design, and infection resistant keyboards; the design of novel technologies to support transport operations, ranging from air traffic control to road information signage design, and all aspects of rail human factors.

The human factors simulation laboratory comprises three dedicated transport simulators, car, motorbike and rail.

Members of the Group have worked with a range of industrial and research partners, including Network Rail, Eurocontrol, Peugeot PS, Volvo, Fiat, Alenia Spazio, Highways Agency, Kings College Hospital, National Patient Safety Agency and BAe Systems.

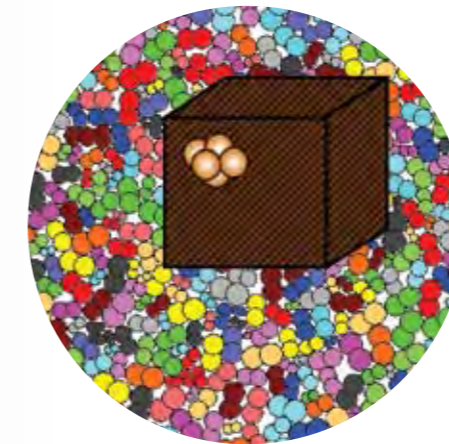
www.nottingham.ac.uk/mresearch



“Research is supported by excellent manufacturing, assembly and metrology facilities, the latest technologies and equipment.”

Materials, Mechanics and Structures Research Division

www.nottingham.ac.uk/mmsresearch



Discrete element modelling of granular materials

The Division conducts multidisciplinary research across a wide range of fields, serving industries as diverse as medicine, aerospace and automotive engineering and the construction industry. Expertise within the Division spans bioengineering, geomechanics, materials science, and structural engineering.

Research comprises a wide range of experimental investigations and predictive numerical modelling studies which are supported by the latest in computing and laboratory facilities.

The Research Division comprises:

The Nottingham Centre for Geomechanics (NCG)

NCG is a multi-disciplinary research centre that brings together expertise in mathematics, and civil and mining engineering to address issues across the full range of geotechnical engineering areas, including:

- centrifuge modelling
- constitutive and numerical modelling
- laboratory and in-situ testing

- soil and rock structure interaction
- transportation geotechnics
- underground excavation and tunnelling

The Centre is home to two major research facilities – the Soil Mechanics and Rock Mechanics laboratories – both of which are equipped with the best in modern experimental geomechanics apparatus.

The Centre for Structural Engineering and Construction

The Centre has an excellent reputation for quality research that cuts across disciplines, and has expertise in a number of areas including computational engineering, concrete structures, construction management, structural mechanics, and wind mechanics. Academics from the Centre work alongside leading industry partners to address applied and fundamental issues.

Research activities are supported by the latest in computing and laboratory facilities. The Structures Laboratory offers a range of resources for large-scale structural testing, static and dynamic testing, as well as facilities for producing a range of traditional and specialised concretes.



Advanced Materials Research Group

Housed in the recently refurbished Wolfson building, the Group enjoys an international reputation for research excellence at the forefront of materials processing and characterisation, spanning:

- hydrogen storage materials
- laser processing
- nano-materials engineering
- nano-tubes
- novel photonic glasses
- surface engineering

The Group has extensive resources to support its work, and researchers have access to materials-orientated equipment and expertise across the University.

Bioengineering Research Group

The Group undertakes high quality research in the areas of biomaterials and biomechanics. Its impressive and diverse research portfolio reflects its strong multidisciplinary expertise and links with key industry and academic partners around the world.

Current research areas include:

- cardiac medical devices
- cell surface interactions and biocompatibility
- integrated systems biology
- spinal mechanics
- tissue engineering

Researchers have access to refurbished research space including new laboratories and offices as well as a very impressive range of state-of-the-art research equipment.

Polymer Composites Research Group

A leading international organisation in this area, the Group conducts applied and fundamental research on manufacture and performance of advanced fibre reinforced composites in a number of sectors spanning automotive, aerospace, wind energy and medicine.

The Group has a number of partners in industry and other leading research groups and conducts cutting-edge experimental and modelling studies in the development of novel manufacturing processes, materials characterisation, end-of-life and recycling, mechanical performance, textile composites and process simulation.

Structural Integrity and Dynamics Research Group

The Group undertakes work in a wide variety of areas to resolve fundamental engineering problems. Activities span development and application of advanced boundary element and non-linear finite element, including damage mechanics, software, fatigue, creep and creep-fatigue of aeroengine and powerplant materials and structures; contact mechanics; crack propagation; micro-electro-mechanical sensors and actuators; modelling, balancing and control of machines, stochastic mechanics in structural dynamics and energy losses in heavy vehicle tyres and suspension; and experimental and computational (FE and CFD) investigations of aeroengine shafts, support structures, bearings and oil systems.

Engineering Research

Process and Environmental Research Division

www.nottingham.ac.uk/peresearch

This Research Division is focused on the development of the science and technology which underpins chemical and physical processes. Particular emphasis is placed on the development of innovative and environmentally sustainable technologies which offer industry a step-change in overall efficiency.

Research is delivered through the following four centres/groups:

The National Centre for Industrial Microwave Processing

Our research is focused on developing a fundamental understanding of the interaction of microwave and RF energy with materials, and then the utilisation of this knowledge for process scale-up.

Microwave heating technologies can significantly reduce energy requirements and process times and can lead to the development of smaller more compact process plant. Microwave technologies not only improve process efficiency and operability, but can also improve the sustainability of the whole process. Applications include:

- Reducing landfill: processing wastes to give value-added products
- High efficiency microwave treatment systems for use on contaminated soils from brown-field sites; enabling land to be re-used with minimal environmental impact.

Fluid and Particle Processes

Research in this area covers almost every aspect of chemical and environmental engineering, from the energy and mining industries to pharmaceutical processing, and product design to recycling. Current studies span the full range of scales, from the microscopic to the practical design of large-scale industrial processes. Systems and materials studied include suspensions of nano-particles, multiphase mixtures of liquids and gases, minerals and product waste.

Researchers have access to high performance computer systems as well as cutting-edge experimental laboratories. They have the opportunity to undertake challenging projects with colleagues from other leading research groups and industry partners and have world-leading activities in large-scale multi-phase flow.



Green Chemical and Water Technologies Group

The Group focuses on the crucial task of alleviating the global water crisis by developing water purification techniques for decontaminating freshwater and desalinating seawater.

Research combines chemistry and engineering expertise in clean technologies and water processing, fluid mechanics and process modelling. A number of ventures are conducted in association with industry partners world-wide as well as other research groups, such as the Engineering and Physical Sciences Research Council funded DICE (Driving Innovation in Chemistry and Engineering) project which brings together experts from chemistry and chemical engineering to the interface of their disciplines.

Current projects to develop potable and waste water treatments include advanced oxidation, colloid, desalination, and membrane technologies.

Environmental Fluid Mechanics Research Centre

Researchers in the Centre have expertise in computational fluid dynamics, experimental fluid mechanics and theoretical modelling. Their extensive research interests cover a diverse range of topics including:

- coastal engineering and sediment erosion
- geophysical fluid dynamics
- pollution
- wind engineering
- natural hazards

The crucial factor unifying the work is the focus on problems and issues relating to the motion of fluids in the natural and built environments. Research in the Centre has led to industrial funding of over £100,000 in the fields of coastal engineering (sediment erosion at beaches: HR Wallingford Ltd), and wind engineering (wind-structure interaction: Buro-Happold).



Commercialisation and Knowledge Transfer

www.nottingham.ac.uk/servicesforbusiness

As one of the UK's top ten universities for collaboration with industry, The University of Nottingham has an impressive record of working with blue-chip, global multinational businesses. Nowhere is that better exemplified within the University than in the Faculty of Engineering which has enjoyed strong industrial involvement and close relationships with companies, for more than 100 years.

The pursuit of knowledge and its dissemination for the benefits of society and the economy are fundamental pillars of the University's mission. We are increasingly collaborating with the business world in ways that benefit everyone involved - helping companies to move forward and helping the University to bring skills and ideas to the market. The Faculty is well placed to support organisations to grow, evolve and to become more competitive and we work with a wide range of businesses, from large international firms to small local companies, on a truly varied array of projects.

Knowledge Transfer

Knowledge transfer - the process of turning academic research and expertise into a product, service or technique that has commercial value - is becoming increasingly important in helping UK plc to compete on the global stage. Knowledge Transfer Partnerships (KTP) is Europe's leading programme to help businesses improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside with researchers. Each KTP employs researchers to work on specific projects, which are core to the strategic development of the business. The University has worked with large multinational organisations like Airbus and GlaxoSmithKline to small, local engineering companies like Caunton Engineering. KTPs are proving very popular and effective, especially with engineering companies; out of 21 KTPs currently active across the University, 12 are engineering, bringing in around £834,000 worth of government funding.

The Faculty has a number of centres through which it actively engages with businesses in order to support economic growth both regionally and in the UK. The centres can provide the people and facilities to undertake short or long-term research projects, technical expertise for new product or process development, testing facilities and equipment or the development of solutions to comply with changing legislation.

The Environmental Technology Centre (ETC) is based in the Sir Colin Campbell Building on The University of Nottingham Innovation Park. It works specifically to help small and medium sized businesses make improvements through the adoption of more efficient use of resources, environmentally friendly working practices and the use of cleaner and more sustainable technologies.

GRACE (GNSS Research and Applications Centre of Excellence) housed in the new £4.5million state-of-the-art Nottingham Geospatial Building on The University of Nottingham Innovation Park, is creating a world-class centre of excellence in Global Navigation Satellite Systems. Informed by world-leading research, it aims to train and support small and medium-sized enterprises and start-ups in the region. The new building incorporates business incubation units for the exclusive use of collaborative industrial partners.

Nottingham Innovative Manufacturing Research Centre has received £16 million core funding from EPSRC since 2001. The Centre works extensively with industry to research and develop technologies, processes and systems that give UK and international manufacturing businesses a competitive advantage in the global marketplace. Researchers work with innovative companies of all sizes from a wide range of sectors, including aerospace, automotive, medical

devices, consumer products and power engineering to respond with resources and know-how to match industrial needs. Projects are supported by over 70 industrial partners and institutions, ranging from global companies like Siemens, Ford, Corus, Bombardier and BAE Systems to local businesses, supply chain companies, engineering institutions and universities across the world.

University Technology Centres (UTC). Rolls-Royce and the Faculty of Engineering have two well established UTCs: One concentrating on research into gas turbine transmission systems (opened in 1997), the other in manufacturing technology (opened in 2000). The UTCs offer Rolls-Royce the long-term strategic research that it is unable to do in the commercial environment. They provide cost-effective, world-leading research which aims to solve current challenges and proactively identify areas for future research.

Technology Demonstrator

The University of Nottingham Technology Demonstrator is a unique new facility that is home to working prototypes of some of the latest University inventions, all of which are available for commercial development.

Managed by the Technology Transfer Office, current technologies on show include: super-capacitors; medical devices, a virtually open plan conferencing system and a number of inventions arising from the industrial microwave processing research group. These new technologies sit side by side with the fascinating stories and products behind recent spin-out companies and licensing deals.

The Technology Demonstrator is located in the Sir Colin Campbell Building at the University of Nottingham Innovation Park. The facility is always open for prearranged visits. Email: george.rice@nottingham.ac.uk.

Spin outs

Spin out companies are often created to drive the development of University research forward into a commercial product or service.

The University's experience in creating spin out companies is excellent with a current portfolio of 22 firms which have benefited from seed funds and investment from private individuals. One such example is the success of Monica Healthcare Ltd, a company focused on the manufacture and marketing of innovative fetal monitors. The company spun out of the University in 2005 following 15 years of research conducted by the then School of Electrical and Electronic Engineering and the Department of Human Development (Obstetrics, Midwifery and Gynaecology).

"We have been working with a spraying company on developing a machine which will allow us to spray chocolate as a decoration. The difficulty we experienced was when we tried to make stencils for our Easter eggs. Trying to cut 1.5mm polycarbonate over the curvature of an Easter egg was causing the development team a real headache. We had tried pretty much every method of cutting available and found water jet cutting to be the most successful. The problem was getting the cut to follow a curve of the egg. Luckily for us our local university had a state-of-the-art 6 axis cutter and initial trials proved very successful. Without the technology and support of the University the potential of the spraying system would have been very limited."

David Brealey, Chocolatier Thorntons

"It is only through the support of organisations like the ETC and EMDA that small businesses can even contemplate these new technologies. I would urge any business sharing similar pressures to invite the ETC to help them overcome their issues. The ETC's approach is non-judgmental and totally confidential, so there is nothing at all to worry about by welcoming them to your business."

Joseph Clayton & Sons Ltd





An International Perspective

Malaysia Campus:
www.nottingham.edu.my
 China Campus:
www.nottingham.edu.cn

The University of Nottingham is ranked in the UK's top 10 and the world's top 100 universities by the Shanghai Jiao Tong (SJTU) and the Times Higher Education-QS and was described by The Times as Britain's "only truly global university".

The University is helping to define what it means to be an international university.

We seek to embed an international dimension across the full range of our activities and, in doing so, help to maintain The University of Nottingham's position as a leading global university with the competitive advantage over leading universities. We believe that being truly international will be a key to success in the 21st century, so we are investing in this area with greater depth and imagination than most universities worldwide.

This is most visible in the large numbers of international students here at Nottingham and our two international campuses in Malaysia and China; more than a third of our thirty-six thousand students are from outside the United Kingdom.

We are justifiably proud of the international campuses, which have established a new model for the globalisation of university education.

By recruiting permanent and visiting international academic staff and incorporating globally relevant content and skills into our curriculum, we will ensure that students receive a genuinely international education that gives them a unique opportunity for success within the global employment market. All undergraduate and postgraduate study programmes at Malaysia and China are delivered entirely in English with the same teaching and evaluation standards as at Nottingham UK.

Our involvement in networks such as Universitas 21 allows us to work with the world's best scholars across all areas of activity, and we intend to develop and enhance such teaching and research partnerships.

University of Nottingham Malaysia Campus (UNMC)

The UNMC opened in September 2000 to become the first campus of a British University in Malaysia and one of the first anywhere in the world - earning the distinction of the Queen's Award for Enterprise 2001 and the Queen's Award for Industry (International Trade) 2006. In September 2005, the Malaysia Campus moved to its new purpose-built campus at Semenyih, 30km south of Kuala Lumpur city centre. Engineering was one of the founding disciplines at UNMC and has its own dedicated engineering research building.



The campus is a self-contained and self-sufficient neighbourhood village in a garden environment with over 3,500 students. It combines a high-quality living environment with state-of-the-art learning, teaching and research facilities, including a range of high-spec engineering laboratories and workshops.

There are approximately 1,700 students studying engineering at UNMC, making it the largest Faculty at the Malaysia campus. Engineering provision at UNMC mirrors the programmes in Nottingham UK in all major respects. Programmes offered include: foundation year, BEng, MEng, MSc and MPhil and PhD.

Research activity at UNMC continues to grow; there are currently more than 100 registered research students, mostly studying for PhDs, some jointly with the Faculty of Engineering in Nottingham. Consistent with the UK Campus, research is organised in research divisions. In UNMC there are five engineering research divisions, namely Electrical and information systems; Energy, Fuel and Power Technology; Environment; Manufacturing and Industrial Processes; and Materials, Mechanics and Structures. There are also currently 30 externally funded projects with funding of about RM7,500,000. As the research portfolio develops there will be more joint research projects between UNMC and Nottingham UK.

University of Nottingham Ningbo, China (UNNC)

The 140 acre campus was opened in 2005 at Ningbo, a historic city on China's eastern coast close to Shanghai. Like the Malaysia Campus, UNNC builds on the physical attributes of University Park in the UK and includes a lake and its own version of Nottingham's iconic Trent Building plus purpose-built facilities for its 4,000 students.

UNNC is looking to match The University of Nottingham, UK's strengths in teaching and research with China's interests and needs and plans to grow its student population to over 6,000 students in the next few years. The Faculty of Engineering and Science is home to the Divisions of Engineering, Sustainable Development and Computer Science.

BEng students currently spend the first two years at UNNC followed by two years at the University of Nottingham UK. In 2009/10 a total of 337 students were studying in the Faculty at Ningbo. In 2010, a four-year BEng programme, based full-time at Ningbo will commence and there are plans to introduce a new degree programme in Architecture, all of which will make engineering a major presence at UNNC.

The Faculty of Engineering and Science has exciting plans for expansion including:

- a new Science and Engineering Building
- an Integrated Energy Storage Technologies (IEST) research laboratory to support the growing building industry in Ningbo and China
- a centre in sustainable manufacturing which will investigate innovative manufacturing technologies and systems, which address worldwide resources shortages, and the development of energy and resource efficient technologies for improving efficiency and reducing the carbon footprint in energy utilisation for manufacturing and operational processes
- a Zero Carbon Centre for Environmental Architecture and Design
- the delivery of new research programmes eg Carbon Abatement and Renewable Energy – biofuels, in collaboration with Nottingham's Energy Technologies Research Institute (ETRI)



100 Years of Engineering at Nottingham

In the early 1900's, a flourishing Nottinghamshire coal industry led to a demand for quality part and full-time training and education provision and so, in 1910, the first, fully independent engineering department, the Department of Mining Engineering, was established in Shakespeare Street in the centre of Nottingham. A Department of Mechanical Engineering was also established around the same time, charging a termly fee of approximately £6.

Britain's industrial revolutions and world wars have each, in their turn, ushered in new ages where the demand for greater technological advances has gone hand-in-hand with an ever-increasing thirst for knowledge and hunger for innovation. A century later and these traits continue to drive engineering at Nottingham into new and uncharted territory. From Global Positioning Systems to clean energy generation, solar-powered homes, advanced material development, our engineers lead the world's thinking.

Over the last 100 years several names have become synonymous with engineering at Nottingham – names like Bulleid, Cotton, Hinsley and, of course, Pope and Coates. The last two great academics are commemorated in the names of two Faculty buildings on University Park.

During World War One, men and women were trained in the University College workshops on munitions work and Professor Bulleid of the Engineering Department was released to become Chief Engineer of the Admiralty School of Mines at Portsmouth. After the First World War it was widely recognised that well endowed and equipped universities could give a lead to their local industries in the discovery of new methods and processes. A big influx of day and evening students followed (by 1922 there were 100 engineering students) leading to the creation of the Faculty of Applied Science and later a School of Architecture and Department of Electrical Engineering in 1931.

The move to the University College's new home at Highfields was delayed due to space problems and it was not until after the electrical engineering laboratories were opened in 1932 followed quickly by blocks to house civil and mechanical engineering, that engineering was embedded into the full life of the college and its relatively new surroundings.

Engineers found themselves in the front line of the war effort again from 1940-45 and it was members of the engineering and mining department who ran courses and instructed army personnel in fitting, turning, carpentry, joinery and blacksmith work. They also carried out valuable scientific military research to help the nation's war effort. Post-war engineering students, many of them ex-servicemen, found themselves at the forefront of innovation as their country demanded more graduates in science and technology subjects to spearhead the reconstruction of British industry.

Engineering and technology were given a new sense of direction through a new Professor of Engineering at Nottingham, J A Pope, who was appointed (as Professor of Engineering) in 1949. This was shortly after the University College Nottingham was awarded its royal charter and became The University of Nottingham, enabling the University to confer degrees in its own name. The Faculty of Applied Science at the time consisted of: the Departments of Mechanical and Civil Engineering (both under the direction of Prof Bulleid), the Department of Electrical Engineering, and the Department of Mining and Fuels. It was Professor Sir Joseph Pope, who laid the foundations for the success of the modern Faculty that we know today. Pope believed that all engineering students should be brought together and taught the fundamental principles which applied to all branches of engineering. He also believed that the credibility of academic engineers hinged on their participation in the real industrial world. He established night classes and summer schools for local engineers to update their knowledge of relevant engineering processes.

Under Pope new areas of engineering opened up including metallurgy, and chemical engineering and the study of aeronautics and atomic energy. By the time he left in 1960 there were 352 full-time students in the Faculty of Applied Science including 60 postgraduates and he had overseen a major building expansion programme which included T1 and T2 (which later became the Pope and Coates buildings) and the Tower Block. T1 was to be a common first year teaching building and T2, a common second and third year teaching building.

By 1965 the number of undergraduates in the Faculty of Applied Science had doubled as engineering had branched into new areas. (The Faculty of Applied Science eventually becoming the Faculty of Engineering in 1980). The Production Engineering Department was created a year later – its undergraduate course was the first of its kind in the country – and a new Department of Theoretical Mechanics welcomed its first students in 1964. Rex Coates became the first Professor of Civil Engineering at Nottingham in 1958 and developed it into one of the most dynamic and successful departments in the UK, noted for its entrepreneurial activities in successfully winning financial support from industry and commerce. It was Coates' initial interest in surveying which led to Nottingham developing a specialism in space geodesy and ultimately to the

Institute of Engineering Surveying and Space Geodesy (IESSG) in 1988, now a globally renowned research centre housed in the new Nottingham Geospatial Building which was formally opened on the University Innovation Park opposite Jubilee Campus in 2009.

By the 1970s and 80s the Department of Mining Engineering had developed an international reputation and, with the continued support of the National Coal Board, it developed into a world-class centre of mining research, establishing itself as one of the most popular department's of mining engineering in Britain. But traditional industry at home was suffering and this was an era dominated by new technologies in aerospace, microelectronics, computers, telecommunications. This led to an explosion in engineering research at Nottingham in the 1970s and 80s as new research centres developed expertise to match modern industrial needs. Engineering education came of age and departments took on new activities and foci. Joint Honours degree programmes with other engineering departments began to be offered and the number of postgraduates increased year on year.

Long-standing research collaborations with international industry have characterised engineering at the University throughout its history – whether it be collaborations with the Ford Motor Co or Rolls-Royce or the Pavement Research Group's 50-year plus relationship with the energy and petrochemical giant Shell. During the 1970s Ford sponsored several research projects at Nottingham, a collaboration which led to the design and development of a range of engines that powered Ford cars and trucks for the next 30 years. Indeed, an increasingly entrepreneurial approach was adopted by departments such as Civil Engineering during the 1970s as the government of the day encouraged greater commercial exploitation of scientific and technological research.

The pace of change continued into the 21st century. In 2006 the University became the home of two Doctoral Training Centres (DTC) to support the training and research of the next generation of elite engineers. Today's engineers and architects are leading the fields in a range of innovations including carbon capture and storage, low-energy buildings, geospatial science and polymer composite developments.

One can only guess at what engineers of the early 1900s would have thought of today's Faculty and its work. However, whatever the challenges of the next 100 years Nottingham's teams of inspired engineers and architects will continue to be global leaders in the field, expanding the frontiers of knowledge, just as their forefathers did.

Selected key dates in the Faculty's history

- 1882 – First mining classes introduced at the University College
- 1910 – First independent engineering department (Mining) opened at the University College
- 1920 – Applied Science Faculty created
- 1920's – School of Architecture established at the College of Art
- 1931 – An independent Department for Electrical Engineering established
- 1948 – University College Nottingham awarded royal charter and became The University of Nottingham
Move of engineering studies from Shakespeare Street to Highfields completed
- 1949 – J A Pope became Professor of Engineering
- 1958 – Creation of independent Department of Civil Engineering with Rex Coates becoming the first Professor of Civil Engineering and the Head of Department
- 1960 – An independent Department of Chemical Engineering established
- 1961 – Creation of a new Head for the Department of Mechanical Engineering
- 1961 – T1 building opened, later to be renamed the Pope Building
- 1962 – T2 building opened, later to be named the Coates Building
- 1964 – Tower building completed and the College of Art became the Department of Architecture
- 1967 – MSc courses offered for the first time
- 1970 – Sports centre opened by Roger Bannister
- 1972 – A more powerful computer on campus created the need for a new building to house it in and so the Cripps Computer Centre was opened
- 1980 – The Faculty of Applied Science became the Faculty of Engineering
- 1981 – First year of the new four-year BEng degrees offered (in 1985 these were to become known as MEng)
- 1997 – Announcement of Nottingham's first eco-energy house to be built on campus in partnership with David Wilson Homes
- 2000 – University of Nottingham, Malaysia opened
- 2005 – University of Nottingham, Ningbo opened
- 2009 – University Innovation Park on Jubilee Campus opened
- 2010 – Official opening of the Nottingham Geospatial Building
- 2011 – Engineering and Science Learning Centre due to open
- 2011 – Energy Technologies Building due to open



The University of
Nottingham

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