Getting into engineering courses at university

What is engineering?

Engineering is the application of science and mathematics to solve problems.

Engineers figure out how things work and find practical uses for scientific discoveries. Scientists and inventors often get the credit for innovations that advance the human condition, but it is engineers who are instrumental in making those innovations available to the world. The history of engineering is part and parcel of the history of human civilization. The Pyramids of Giza, Stonehenge, the Parthenon, and the Eiffel Tower stand today as monuments to the heritage of engineering. Today's engineers not only build huge structures, such as the International Space Station (ISS), but they are also building maps to the human genome and better, smaller computer chips.

Engineering is one of the cornerstones of STEM education to learn about science, technology, engineering, and mathematics.

Mechanical Engineering involves the design, manufacturing, inspection and maintenance of machinery, equipment, and components as well as control systems and instruments for monitoring their status and performance. This includes vehicles, construction and farm machinery, industrial installations and a wide variety of tools and devices.
Electrical Engineering involves the design, testing, manufacturing, construction, control monitoring and inspection of electrical and electronic devices, machinery, and systems.
Have a look at this YouTube video on a day in the life of a mechanical engineer - (254) Day at Work: Mechanical Engineer - YouTube

Civil Engineering involves the design, construction, maintenance, and inspection of large infrastructure projects such as highways, railroads, bridges, tunnels, dams and airports. Take a look at the realities of learning civil structural engineering (254) Civil Structural Engineering – Reality vs Expectations - YouTube

Aerospace Engineering involves the design, manufacturing and testing of aircraft and spacecraft as well as parts and components such as airframes, power plants, control and guidance systems, electrical and electronic systems, and communication and navigation systems. Have a look at this YouTube video on Sagar's advice on the UK's top aerospace engineering universities (254) AEROSPACE UNI RANKINGS 2022 - YouTube

Nuclear Engineering involves the design, manufacturing, construction, operation and testing of equipment, systems and processes involving the production, control and detection of nuclear radiation. These systems include particle accelerators and nuclear reactors for electric power plants and ships, radioisotope production and research. Nuclear engineering also includes monitoring and protecting humans from the potentially harmful effects of radiation. This video talks about careers in nuclear engineering as done at Purdue University (254) Engineering Career Exploration: Nuclear Engineering - YouTube

Structural Engineering involves the design, construction and inspection of load-bearing structures such as large commercial buildings, bridges, and industrial infrastructure. Have a look at "Do structural engineers get paid well" (254) Do Structural Engineers get Paid Well (in AUS, US, UK) - YouTube

Biomedical Engineering is the practice of designing systems, equipment, and devices for use in the practice of medicine. It also involves working closely with medical practitioners, including doctors, nurses, technicians, therapists, and researchers, in order to determine, understand and meet their requirements for systems, equipment and devices. Look at (254) Day in the Life of a Biomedical Engineer | Working on Medical Devices - YouTube

Chemical Engineering is the practice of designing equipment, systems, and processes for refining raw materials and for mixing, compounding and processing chemicals to make valuable products. See (254) What Does a Chemical Engineer Do? - Careers in Science and Engineering - YouTube

Computer Engineering is the practice of designing computer hardware components, computer systems, networks and computer software. See (254) A Day in the Life of a Computer Engineering Student - YouTube

Industrial Engineering is the practice of designing and optimizing facilities, equipment, systems and processes for manufacturing, material processing, and any number of other work environments. See (254) What Is Industrial Engineering? | What Do Industrial Engineers Do? - YouTube

Environmental Engineering is the practice of preventing, reducing and eliminating sources of pollution that affect air, water and land. It also involves detecting and measuring pollution levels, determining sources of pollution, cleaning up and national regulations. See (254) What does an environmental engineer do? - Careers in Science and Engineering - YouTube

Is it essential to go to University to Study Engineering?

Maths and Physics form the basis of all Engineering courses, and you will need good grades in A Level subjects or the IB DP. There are alternative routes such as BTECS, T Levels and Foundation Programmes, but currently these are not accepted as entry standard by the elite UK universities, and you may have to adjust your aims to lower graded unis or courses.

Most uni courses end in specializing in one of the fields already described, but many courses also delay the choice of specialism till after the first year.

Do you need to go to university at all – well yes if you are serious. The engineering profession now governs professional registration such that degrees are the typical route to register as a professional engineer. Most courses now offer BEng or MEng degrees which is the minimum training to obtain Chartered Engineer or Incorporated Engineer status.

BEng courses are generally 3 years whereas MEng are generally 4 years because they incorporate a Masters degree into the Bachelors.

Many courses start off on general engineering themes before the student starts to specialize in year 2. There are combined honours degrees coupling with other subjects, but they are less popular because students will usually end up doing engineering.

With up to 18 categories of engineering you need to do a lot of research on the wide range of uni engineering courses before making your choices for the maximum 5 UCAS applications.

There are numerous league tables, mostly run by the National Press, like the Guardian and the Sunday Times, but they all use different criteria which can dramatically vary a university's ranking which is why we average them all for our top 50s.

The UK Top Research Universities in Engineering are Cambridge, Oxford, London (King's), Cardiff, Sheffield, Imperial, Liverpool, UCL and Glasgow. Entry grades range from ABB (Liverpool) up to A*A*A (Cambridge) or 33 IB points to 38 IB points. However lower grade unis go down to DDE

The highest-grade unis are generally requiring A* grades in Maths and Physics plus an interview. As you will see from the UCAS list there are numerous engineering degree courses and universities. At the lower end, grades could be as low as CCC and an interview is not required.

UK Work Experience

As with medicine, work experience is highly rated by universities. It helps a student with their Personal Statement and interview. It also helps to let the student discover which branch of engineering is most suitable for both study and career.

It is not usually that difficult for a student to obtain a work placement. There may be local engineering firms. Their school may have connections. There are many schemes run by engineering institutes or universities.

Keep a record of your experiences at your placement which are relevant to engineering – they will come in useful later.

Remember also, a work experience interview is often quite similar to a university interview.

Elite unis such as Oxbridge, Imperial and Kings will have a huge application rate and will need to trim down the number of applicants to manageable levels. The predicted A Level grades and Personal Statements are the first culling of numbers, but then the interview process does the real selection.

Examples of UK Engineering Courses

Aeronautics at Imperial College London

Aeronautics is all about the science of flight and vehicles that fly, from hot air balloons to spacecraft.

From drones that can help monitor the health of forests to advanced computer modelling of fluid flows that could lead to more efficient engines and turbines – the Department of Aeronautics is at the forefront of aeronautical teaching and research.

You will have access to state-of-the-art facilities including:

- A Mach 9 hypersonic gun tunnel
- A large flight-test arena which develops next generation aerial robots
- A flight simulator where you can test your own aircraft designs.

Imperial also work closely with the aerospace industry, and you'll have talks and seminars by visiting experts.

Imperial offer undergraduate degrees that are professionally accredited by the Royal Aeronautical Society (RAeS) and the Institute of Mechanical Engineers (IMechE). This dual accreditation demonstrates the broad base of engineering, computational and analytical skills that they deliver, as well as the specific knowledge and experience required for careers in the aeronautical industry.

Many employers value the critical and analytical skills gained from Imperial Aeronautical Engineering courses which is why the industry areas Imperial graduates go on to work in are incredibly broad. There's a high demand for Imperial graduates from the aerospace industry, manufacturing, consultancy, research and development, and other fields including teaching and finance.

Recent graduates have become...

- Aerodynamics Engineer, Red Bull Racing
- Future Space Programs Engineer, Airbus
- Actuarial Consultant, EY
- Aerospace Engineer, Rolls Royce
- Technology Risk Analyst, KPMG

Electronic Engineering Courses at Kings College London

The Electronic Engineering BEng course at Kings focuses on four key areas in electronics: circuits and systems, signal processing, computing, and communication. You will develop in-depth knowledge of and practical expertise in circuit analysis and design, communication systems, computation and programming for engineers, and hardware design, which will provide a foundation for senior roles in electronics, signal processing, and communication industries.

Key benefits

- Unique combination of electronic engineering, general engineering, and robotics modules.
- Benefit from longstanding links with various companies, including Orange, Vodafone, Nokia, NEC, BT, and Texas Instruments.
- Modules are designed to enhance your employability.

The course will provide you with broad knowledge and an in-depth understanding of electronic engineering and design techniques. The diverse nature of the Kings course will give you a strong foundation in electronic engineering along with general communication, control, and computer systems. There is also a strong focus on developing mathematical skills, which you will use to analyse the performance of communication and control systems. You will study modules across electronic circuits, communication systems, introduction to robotics, foundations of computing, and hardware design with optional modules in the final year to specialise in artificial intelligence planning, robotic systems, telecommunication networks and other advanced topics. This course will challenge you to think more broadly, translating electronic engineering into everyday life through cryptography, and computer vision and wireless networks.

Chemical Engineering and Biotechnology (BA/MEng) at Cambridge

From sustainable water to food, energy, and healthcare solutions, chemical engineers and biotechnologists help solve the challenges facing the world today and tomorrow.

You'll study the scientific principles that are used to develop processes and products and be able to apply them to real world systems, with environmentally and economically sustainable methods.

Applications are now open for 2023 entry. The course integrates chemical engineering and biotechnology and has a particular focus on the scientific principles that underpin the disciplines.

You'll learn how to take an idea from concept to a practical process that can manufacture products sustainably and on an industrial scale.

You'll cover:

- Introduction to pure and applied sciences
- Fundamentals in chemical engineering and biotechnology
- Industrial process design and applications
- Energy technology, sustainability, and advanced design

The course is supported by a Teaching Consortium of industrial companies.

The Consortium supports the design project and professional practice course elements. Many of the companies offer vacation internships to Cambridge students.

Qualification

You can study for three years to graduate with a BA(Hons) degree. However, most students complete the course in four years and graduate with an MEng qualification.

Both current BA (Hons) and MEng courses are accredited at the appropriate level by the Institution of Chemical Engineers. This means that after graduation and 4 years of relevant experience, students can apply for Chartered Engineer status.

Engineering Science at Oxford University

Engineering Science encompasses a vast range of subjects, from microelectronics to offshore oil platforms, and involves the application of creative reasoning, science, mathematics (and, of course, experience and common sense) to real problems.

The Department of Engineering Science at Oxford has a top-level quality assessment rating for teaching and a world-class reputation for research. Because Oxford believes that future engineering innovation will benefit from broad foundations as well as specialised knowledge, undergraduate teaching is based on a unified course in Engineering Science, which integrates study of the subject across the traditional boundaries of engineering disciplines. Links between topics in apparently diverse fields of engineering provide well-structured fundamental understanding and can be exploited to give efficient teaching.

The Engineering Science programme is a four-year course, leading to the degree of Master of Engineering. The first two years are devoted to topics which Oxford believes all Engineering undergraduates should study. In the third and fourth years there is scope for specialisation into one of six branches of engineering: Biomedical, Chemical, Civil, Electrical, Information and Mechanical. Decisions about which of these will be your specialisation can be deferred until the third year.

The course is accredited every four years by the major engineering institutions in respect of the initial requirements for the designation of chartered engineer.

Industrial experience is an extremely important adjunct to an academic engineering education, and undergraduates are strongly encouraged to obtain it. One way to do so is by being sponsored. Further information is generally available through your careers teacher, or from the engineering institutions. If your sponsoring company wants you to spend a year with them before university, you will be asked to declare this at your interview and in your UCAS application.

Please note: For the first time, for entry in October 2023 Oxford will be offering a different route to access Engineering Science at Oxford. So, if you're interested in studying Engineering Science but your personal or educational circumstances have meant you are unlikely to achieve the grades typically required for Oxford courses, then choosing to apply for Engineering Science with a Foundation Year might be the course for you. Please see course pages for more details.

UK Summer Courses

Imperial Global Space Design Programme

Each year Imperial runs a 2-week summer course on several different aerospace engineering themes before culminating in a 2-day competition to build a space community. The winning team has the opportunity to attend the NASA finals the following year.

Apart from being the most exciting summer course in the UK, participants get a certificate of attendance which is a great help in applying for an undergraduate course.

Approach us (les.webb@educationadvisers.co.uk) for details

Going to the USA to study engineering

91 of the world's best engineering schools are in the USA and no wonder, America is a magnet for budding engineers.

The top 10 USA engineering universities are reckoned to be

1. MIT in Massachusetts
2. Stanford University
3. Harvard
4. Berkeley (UCB)
5. Georgia Tech
6. Cal Tech
7. UCLA
8. Carnegie Mellon
9. Texas @ Austin
10. Urbana Champaign (Illinois)

MIT is an absolute monster with 1000+ faculty and 11,000 undergrads and graduates. There are 5 schools one of which is the school of engineering. MIT openly and proudly calls itself "nerd heaven".

Admissions procedure follows the USA model with ACT and SAT tests. Foreign qualifications are also assessed but not by converting them to USA scores. MIT has a fascinating process of requesting applicants to write several short essays of no more than 250 words on subjects such as:

1. Describe the world / family you live in.

2. What field of study appeals to you most at MIT?

3. Describe a way you have contributed to your community.

Interviews are very unusual by UK standards. They are conducted by 5000 MIT graduates around the world.

Cal Tech is a small but intensive university in California

Here is what they say about their bioengineering course:

Aims and Scope of the Undergraduate Program

The undergraduate curriculum at Caltech focuses on two key goals: 1) Engineering new biological systems and functions, and 2) Applying engineering principles to learn principles of biological design. The curriculum provides students with a firm grounding in engineering principles, biotechnology, and fundamentals from the biological sciences through coursework on physical cell biology, systems biology, biomolecular engineering, biodevice design, and synthetic biology. Bioengineering undergraduates are strongly encouraged to perform research in campus laboratories. Students graduate with a strong experimental and computational foundation for careers or further study in bioengineering, biotechnology, biomedicine, biological data analysis, and the expanding universe of biology-related disciplines and industries.

Students will also have learned quantitative and analytic skills vital to experiments and system designs. Graduating students are expected to be able to critically evaluate and understand bioengineering literature and be able to work in a team and communicate effectively. To accomplish these goals, students are expected to complete a series of required courses designed to introduce them to a representative range of bioengineering sub-disciplines, provide them with a solid quantitative analysis foundation, and provide them with opportunities to work in teams through a number of project-oriented courses. Students will receive instruction in scientific communications through Bi/BE 24.

Undergraduate research is encouraged both during the academic year and through participation in summer research programs. Students should present a plan for satisfying all degree requirements to their academic adviser by the end of the third term of the second year. Students with a grade-point average lower than 1.9 will not be allowed to continue in the option except with special permission from the option representative.

Yale University

This is what Yale says about their undergraduate engineering courses

Engineering is a challenging and rewarding field for young people of talent and creativity. It calls for the art and expertise of designing technological systems that benefit society, and involves problem-solving strategies that are readily transferable, and in high demand, in a variety of professions, including medicine, law and business.

Yale students get an excellent engineering preparation, and graduate with several additional dimensions. Unlike those at tech schools, Yale students take their non-engineering subjects in classes taught by the renowned faculty and together with liberal arts majors whose focus is on social, political, economic, and other humanities areas. Yale engineering students grow in the understanding of the complex social, political, economic and environmental implications of new technological products and processes. They also learn to communicate effectively. Not surprisingly, many of Yale graduates go on to establish outstanding records

of achievement not only in technical fields but also in academia, business, government, and as leaders in their community.

Like any other outstanding college engineering program, Yale teaches students the principles of math and science, modern software tools, and how to design devices and systems. With most of Yale faculty being involved in cutting-edge research, many opportunities exist for students to participate. A student may begin research at any time, depending on the preparation and nature of the research. Many students begin as early as the summer after the freshman year.

Yale Engineering students receive ample individual attention from their professors. Yale's School of Engineering & Applied Science has approximately 100 professors and approximately 200 students graduate each year. It's a nice ratio of graduates to faculty. Yale students have the opportunity to work alongside their faculty mentors on the cutting-edge of contemporary research. Many faculty members involve undergraduates in their research. Many students make innovative contributions, and become first authors on publications.

In addition to visiting online, do visit Yale's beautiful campus in person. As for admission to engineering at Yale, application to Yale is made only through the Office of Undergraduate Admissions. Thus, any questions about admission to Yale should be directed to Undergraduate Admissions.

Guidance on Engineering

There are literally hundreds of different engineering courses available in the UK or the USA with something available for anyone no matter their grades.

For help in choosing the right course and university contact us at Education Advisers Ltd at

New Barn

Home Farm

Red Hill

Wateringbury

Kent ME10 5NN Tel 01622 813870