

RGS CAREERS
**ROUTE TO STUDYING
ENGINEERING**
2016-2017



REIGATE GRAMMAR SCHOOL

RGS

GUIDE TO ENGINEERING

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There are, of course, many types of Engineering, so perhaps it is helpful to give a very brief overview of what some of these are. I have used the COA Careers Directory, which 5th form students who take the Preview careers profiling test receive, as my main source for this. This is not an exhaustive list:

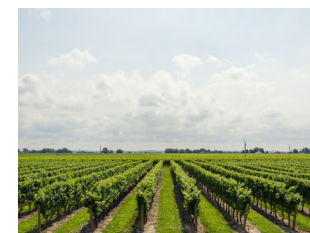
AERONAUTICAL/AEROSPACE ENGINEERING

You could be involved with almost any aspect of making things fly or keeping them flying, from missiles through to passenger or military aeroplanes, or even rockets. You could be developing new technology or be part of a team that plans, designs or tests aircraft. You might end up specialising in specific areas such as the design of the wings of an aircraft or in onboard computer systems.



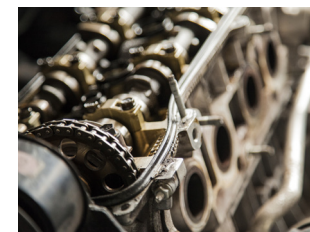
AGRICULTURAL/LAND-BASED ENGINEER

You would be working as a specialist in technology related to the land; e.g. agriculture, forestry, food engineering, renewable energy or other environmental areas. You would be involved in the design, maintenance and development of machinery and equipment such as that required for animal welfare, irrigation and drainage schemes or fish farming, as well as tractors, harvesting equipment and horticultural machines. As an industry that is heavily linked to the ever changing environment, this is an area that is going through considerable change at the moment.



AUTOMOTIVE ENGINEER

This is an area of Mechanical Engineering, which deals with all aspects of the design, development and maintenance of motor vehicles and their components. You could be involved with designing new cars, or with developing specific parts of vehicles; e.g. the transmission system.



BIOMEDICAL ENGINEER

This involves helping with the treatment and rehabilitation of patients with serious diseases or disabilities. For example, you might be involved with the design of new equipment for use in keyhole surgery or for joint replacement or in the development of instruments for use in diagnosing or monitoring patients.





BUILDING SERVICES ENGINEER

This involves the development and design of all aspects related to the requirements for modern buildings. For example, you could be involved in the design of energy efficient buildings, with renewable energy or in areas such as ventilation, lighting, acoustics or in environmental pollution control.



CHEMICAL ENGINEER

You could be involved in the production and control of the chemical plant and machinery needed to manufacture e.g. chemicals, plastics, pharmaceuticals, petrol, as well as some food and drink products. It is a highly skilled job, and your role could include turning small-scale laboratory work into large-scale, safe, economically sound industrial processes.



CIVIL ENGINEER

This involves designing and managing the construction of e.g. bridges, roads, pipelines, sewage plants, railways, power stations and major buildings. You could be involved with major areas of national infrastructure, such as transport systems, as well as energy and water supply systems.



ELECTRICAL ENGINEER

This area of engineering is largely involved with the generation and supply of electrical power. You might spend your time researching more efficient power generation, developing alternative energy sources or planning the future development of the electricity supply network.

ELECTRONIC(S) ENGINEER

This involves designing or making equipment that uses low power electric current. The fields that you might work in could range from communications satellites through to the digital cameras. You could be involved in exploring new possibilities in robotics or artificial intelligence, or you could specialise in areas such as communications, computing, software or manufacturing.



MANUFACTURING ENGINEER

A manufacturing engineer is concerned with all stages of the conversion of raw materials into usable products for the general public or for industry. There is a lot of overlap with mechanical engineering. You may work in any aspect of the production processes and systems involved in any sort of manufactured goods. Your job might involve designing and maintaining complex machinery or the design and layout of the plant in a factory.



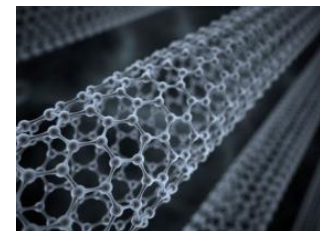
MARINE ENGINEER

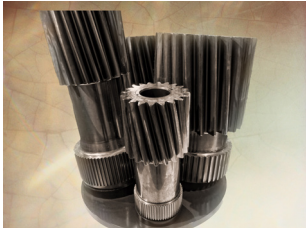
This might involve the design, management and maintenance of systems and equipment used in Ocean Engineering, Offshore Engineering or Seagoing Engineering. Ocean Engineering involves the exploration and extraction of oil, gas and minerals found under the seabed and the development of new energy sources. Offshore Engineering concerns the design, construction and commissioning of offshore platforms, and looking to overcome the problems presented by winds, waves and currents. Seagoing Engineering involves ensuring the safe and efficient operation of seagoing vessels.



MATERIALS ENGINEER

A materials engineer specialises in the physical and chemical properties of materials used to manufacture products. You would be trying to ensure the highest possible standards of performance and reliability. E.g. You might be involved with finding the best combination of materials for a mobile phone or in a replacements hip joint, or you might be looking into developing high temperature alloys for airframes.





MECHANICAL ENGINEER

This is largely concerned with machines and their components, right from the largest manufacturing equipment to the smallest pieces used in construction.



MINING ENGINEER

Broadly speaking, their role is to ensure the safe and financially viable development of mines, as well as other surface and underground operations. The key role is to find the best ways to extract raw materials from the ground.



PETROLEUM ENGINEER

This is a specialism within mining engineering, which is concerned with finding reservoirs of oil and gas in the earth.

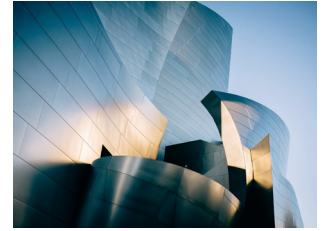


SOFTWARE ENGINEER

This involves creating the original programs that are required to enable computers to carry out the functions that are required of them. You could be engaged in fields ranging from robotics to the creation of packages for accounting. Your role might involve writing software, ensuring that it works, overseeing its installation and testing it.

STRUCTURAL ENGINEER

This is a specialist discipline within civil engineering. Essentially the structural engineer has the job of ensuring that the architect's design does not fall down! You would work on building projects, ensuring that the buildings are structurally sound.



Clearly there are considerable over-laps between some of these types of engineer, and they also often work alongside each other as well as architects.

A LEVEL CHOICES

- For most courses you will need to take Maths and Physics to A2 Level
- For Chemical Engineering you will need to take Chemistry and Maths, but Physics is also recommended and will maximize your options. Feedback from former students certainly confirms that a strong aptitude for Physics is necessary for success on this course.
- Further Maths is recommended at a small number of universities (check individual university web-sites for detail), but you can certainly get into very good Engineering courses without it. For example, Cambridge University do state that, if your school offers Further Maths, and you do not take it, you will be disadvantaged, while Imperial say that it is desirable to have Further Maths.

n.b. As always, my advice is that you should pick the A Levels that you enjoy most and think that you will do best in. This course of action is likely to give you the best options, because it is likely to yield the best grades. Remember that you have to spend an enormous amount of time studying these subjects, so you **MUST** want to take them. It is likely that, if you do not want to take Maths and Physics, Engineering is not the right choice for you.

ROUTES INTO ENGINEERING

In order to be an engineer, most people do a Masters Engineering degree. You can either do a degree in one of the specific areas (start of booklet) or you could do a **General Engineering** degree and specialise later. It is also possible to do a Degree Apprenticeship in Engineering, and I have produced a booklet on these too (<https://www.reigategrammar.org/school-life/academic/careers-university-entry/>). One only seems to be able to gain a BEng through the Degree Apprenticeship route, so further qualification will be necessary for Chartered Status.

The best web-site to help you to be completely clear about the various routes into Engineering is www.engc.org.uk

The usual way to qualify as an Engineer is to take an Engineering degree that is accredited by the Engineering Council. This means that it satisfies the education requirement to allow you to register as an Incorporated (IEng) or Chartered (CEng) Engineer. All honours degrees that meet the requirements for CEng registration should now meet the requirements for IEng. To check that the course that you are interested in is accredited, go to <http://www.engc.org.uk/courses>

The individual university web-sites should tell you this information as well.

Advice: Go for courses that meet the education requirements for CEng registration. It is very hard to meet the requirements to become a Chartered Engineer without a Masters in Engineering. This does not necessarily mean that you have to apply for a Masters degree; you could switch onto one at the end of your first degree.

Further detail on how to register as a Chartered Engineer is available on <http://www.engc.org.uk/professional-registration/how-to-register/>

Ten of the top universities for Engineering in the Complete Universities Guide 2017 and their requirements for MEng courses (n.b. It is quite hard to state categorically which the top ten are, as they all offer different kinds of Engineering):

n.b. Always check on the UCAS web-site or individual university web-sites for the most up to date requirements. If there has been a choice I have gone for the one including a year in industry, so do check all of the options and their requirements.

TIP: Sometimes if you move away from the obvious courses such as Chemical, Mechanical or Civil Engineering, you may find slightly more favourable offers. Some courses are quite similar to these but with different names.

Cambridge: (different colleges will offer different courses and the grade/subject requirements may vary): **Courses offered: General Engineering** (**A including Maths and Physics. Some colleges may require Further Maths or another science subject), **Chemical Engineering** (**A including Maths and Chemistry. Some Colleges may require Further Maths or Physics. It is also possible to get on this course after starting on Natural Sciences). Other areas of speciality including Aerospace and Aerothermal Engineering are available after a year of General Engineering.

Imperial College London: Aeronautical Engineering (**A-*** including Maths and Physics. Further Maths is highly desirable but not required), **Biomaterials Engineering** (*AA Physics, Chemistry and Maths), **Chemical Engineering** (**A-*** including * Maths, at least A in Chemistry and one of Further Maths, Physics, Biology or Economics), **Civil Engineering** (**A including * in Maths with A in all A2 modules, and at least A in Physics. Further Maths is not required but is an advantage), **Software Engineering** (*AAA-*** including * in Maths), **Design Engineering** (*AA including A in Maths), **Electrical and Electronic Engineering** (*AA including * in Maths and A in Physics. Further Maths is strongly recommended as the third A Level), **Mechanical Engineering** (**A including Physics and Maths at *. 3rd A Level from Chemistry, DT, Biology, Economics, Computing OR *** with * in Maths, A in Physics and two others), **Molecular Bioengineering** (*AA including * in Maths, A in Chemistry and another science. **N.b.** there are also many combined engineering degrees, **Materials Science and Engineering** (*AA including Maths, Physics and Chemistry), **Materials with Nuclear Engineering** (*AA including Maths, Physics and Chemistry)

Bath: There are 46 different Engineering courses at Bath. Please see their web-site for details. I will give details of the most popular with our students. Courses at Bath nearly always give the option of a placement year. **Aerospace Engineering** (*AA including *A in Maths and Physics. AAA acceptable with A in EPQ), **Chemical Engineering** (*AA including *A in Maths and Chemistry. AAA acceptable with A in EPQ), **Civil Engineering** (*AA including Maths. AAA + A in EPQ acceptable), **Mechanical Engineering** (*AA including Maths and Physics or AAA + A in EPQ)

Loughborough: There are 85 courses in Engineering at Loughborough, most offering industrial placement years, including **Aeronautical Engineering** (AAB including Maths and Physics with A in Maths), **Chemical Engineering** (AAA including Maths and Chemistry or Physics), **Civil Engineering** (AAA including Maths and preferably another science), **Mechanical Engineering** (*AA including Maths and Physics. One of Maths or Physics must be at *).

Bristol: 25 courses including **Aeronautical Engineering** (*AA including Maths and Physics. One of Maths or Physics must be *), **Civil Engineering** (*AA including Maths and a science subject. The * must be in Maths or the science), **Mechanical Engineering** (*AA including Maths and Physics)

Warwick: 34 courses including **Civil Engineering** (AAA including Maths and Physics), **Mechanical Engineering** (AAA including Maths and Physics)

Durham: General Engineering (*AA including Maths and Physics)

Aberdeen: 25 courses including **Chemical Engineering** (ABB including A in Maths, B in Physics or DT, B in Chemistry), **Civil Engineering** (ABB including A in Maths, B in Physics or DT), **Mechanical Engineering** (ABB including A in Maths, B in Physics or DT). It seems that with all of these, if the candidate has an A in Physics a B in Maths may be acceptable.

Lancaster: 19 courses including: **Chemical Engineering** (AAA including Maths and Chemistry), **Mechanical Engineering** (AAA including Maths and a Physical Science)

Oxford: n.b. Requirements are likely to vary slightly between colleges. **Biomedical Engineering** (**A including Maths and Physics. ** must come in two of Maths, Physics or Further Maths), **Chemical Engineering** (**A including Maths and Physics. ** must come in two of Maths, Physics or Further Maths), **Civil Engineering, Electrical Engineering, General Engineering, Information Engineering and Mechanical Engineering** (all have the same requirements as Biomedical Engineering),

CHARTERED STATUS

Routes post-degree to gain the full Chartered Engineering status vary slightly between areas of Engineering, but, by way of example, to become a full member of the Institution of Civil Engineers (ICE) after gaining a Masters degree, the normal route is to be put onto a 'training agreement' by your employer for a minimum three year period. There you will have an assigned training advisor who signs off attainment of prescribed training objectives. Following successful completion of this you would prepare for the Member Professional Review, which requires the preparation of reports that set out how you have achieved your training objectives (1500 words) and another (3000 words), which puts the case for why you should be considered to be a Chartered Engineer. You would also give a short presentation and have an interview with two reviewers, then write an essay on a chosen subject from the reviewers under exam conditions. This is all set out in the 'Routes to Membership' which is readily available on the ICE website. It generally takes 4-7 years post-graduation to gain Chartered status, but don't worry; this does not mean that you are not earning a living during this period! <http://www.ice.org.uk/What-is-civil-engineering/Teaching-resources/Civil-engineer-qualifications>

PERSON SPECIFICATION

Different strands of Engineering will require different characteristics, but, in general, an Engineer needs to have the following skills and personality traits:

- You need to be practical and good at problem-solving
- You need to be creative (although the extent of this does vary between types of Engineering)
- You need to be a good team player
- You may well lead teams, so leadership and team-working skills are important
- Good communication skills are important, as you are likely to need to explain technical issues to people who do not have your level of expertise
- You need to be very interested in science and in how things work
- Business skills can also be very useful, as you are often involved in cost management

IMPORTANT REQUIREMENTS FOR A SUCCESSFUL ENGINEERING APPLICATION AND ADVICE FROM RGS



1. As you have not studied Engineering at A Level, it is crucial that you show the admissions department that you are well aware of what an engineer does, that you are fully informed about what is involved in an Engineering degree (whether it is a General Engineering degree or in a specific area of Engineering) and that you have the enthusiasm and capability to take up the challenge. You will also need to be able to say what sparked your interest in Engineering. Consequently:
 - Try to find some work experience. This can help you to understand the role of an engineer, and to be clearer about whether this is what you want to do and whether there are any particular areas of Engineering that appeal to you. Reflect upon this work experience in your personal statement, and make sure that you refer to anything specific that you achieved while on work experience.
 - You will need to do some wider reading. The following link provides useful books that you might try: <http://www3.eng.cam.ac.uk/admissions/information/reading.html>
 - Make sure that you have been on at least one course. There are many free one day courses at London Universities. These are open for booking from 11 a.m. on 8th January. Lower Sixth students can book themselves onto these through the web-site www.london.ac.uk/tasters. Be aware that these will book up fast. Students should seek permission from Mr. Jones if they need to miss a day of school. Headstart Courses are longer and more expensive, but I have consistently received good feedback from students about how they have clarified their thinking and helped them to make strong applications. These can be booked via <http://www.etrust.org.uk/headstart>. Again, they book up fast from the start of the year, so do not hang around! Finally, the Careers Department put any information about any courses that we hear about on the 'Taster Course' link on www.rgsinfo.net
 - Go to any Engineering talks that are put on
 - Talk to any engineers that you know. Find out what they enjoy about the job, and what they consider the main challenges to be.
2. Any evidence of scientific or mathematical interest is useful:
 - Include detail of any scientific or Mathematical projects that you have undertaken, especially if they have any slant towards Engineering
 - Go to TSI Friday and other science talks or discussion groups
 - Success in Maths or Science competitions can be useful; e.g. Maths Challenge
 - Read science journals such as 'New Scientist' and refer to specific articles that have interested you in your personal statement
3. It is important to show that you have a realistic understanding of what Engineering entails. Some TV shows can make it seem a little too immediate and exciting. You probably won't be building rockets from day one! There will be quite a lot of theory and principles to learn, so show that you are ready for this.

- Engineers often work in teams and they need to be good communicators. Try to provide evidence of your effective communication, such as feedback received or an outcome that resulted from your communication.

Evidence of teamwork is also very important. Examples must be given and it is a good idea to stress what effect your contribution to the team had.

Examples to support these areas could come from sport, Drama, Music, Duke of Edinburgh, lessons or from anything else that you can think of. They do not have to come from work experience in Engineering.

- Most admissions tutors want to see that you are well-rounded, so do refer to extra-curricular activities, but make sure that you don't just give a list. State what you have learnt from them.
- Make sure that you show that you realise that Engineering is a challenging career, but that you are equipped and motivated to take up that challenge.
- Research the web-sites of the individual universities that you are applying to to see what they are looking for in an applicant. By all means ring up admissions tutors to find out what they are looking for. You need to make sure that you are the font of all knowledge on Engineering courses!
- If you plan to take a Gap Year, this is no problem. Indeed some universities are very encouraging of this for engineers, as long as a large part of the year is taken up with relevant industrial placements. One useful company for getting industrial placements is Year in Industry (YINI), which you can find out more about via <http://www.etrust.org.uk/the-year-in-industry>. There is also useful information on the Cambridge University web-site on the subject of industrial placements: <http://to.eng.cam.ac.uk/teaching/index/ProspectiveStudents11.html>

CHARTERED STATUS

- Mr. Saunders is the Engineering contact, so do contact him or the Careers Department with any concerns about Engineering applications
- This year we are running an Engineering evening for Second to Seventh form students and their parents in PMH. This will be an opportunity to hear from, and talk to, Engineering students, recent graduates and Career Engineers in a variety of fields.
- The Higher Education Evening and The Careers Convention are run on alternate years in February; these provide an opportunity for students and their parents to talk to engineers or to representatives from universities on a 1-1 basis

- TSI Friday, which is held every other Friday in S3, offers a wealth of enriching science presentations on a wide range of topics
- Through Network R we can put you in touch with former students, who are studying Engineering, so that you can find out from them first-hand about their course. Contact Mr. Hylton on jdh@reigategrammar.org for information on this.
- After Summer exams, we put on UCAS Days to help students to prepare their UCAS applications. As part of this we will invite some former students in to take your questions about university life.
- We are gathering a database of work experience offers, so we will help with placements if we can. Contact Mr. Buzzacott or Mr. Nicholson about this.

USEFUL WEBSITES

www.ucas.ac.uk for details on all Engineering courses and links to individual university web-sites

www.unistats.com to help you to compare courses based on data such as student satisfaction, cost of living, contact time and employability prospects

<http://www.theguardian.com/education/universityguide> for league tables and comparisons between courses

www.engc.org.uk Engineering Council UK provides help with routes into Engineering

www.engineeringuk.com Engineering UK

www.icheme.org Institution of Chemical Engineers

www.whynotchemeng.com for lots of useful help for those considering Chemical Engineering

www.ice.org.uk Institution of Civil Engineers

www.imeche.org Institution of Mechanical Engineers (Most strands of Engineering have something similar)

<http://www.imeche.org/careers-education/scholarships-and-awards> for details of possible scholarships and awards for Mechanical Engineers

<http://conferences.theiet.org/achievement/scholarships/diamond/index.cfm?origin=/diamond> for information on scholarships for students undertaking engineering courses at university

www.rgsinfo.net Use the Taster Course to find courses to help you to find out more about Engineering



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