ENGINEERING EXPLORED

FILLED WITH TOP TIPS AND INSIGHTS
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Are you creative yet practical? Do you enjoy using maths and science to solve problems? Would you like to have a huge impact on the world we live in?

If the answer to all these questions is yes, then you could definitely be an engineer!

**What’s an engineer?**

Engineers are people who design, create and improve the places and things in our everyday lives. From the food we eat and trainers on your feet, to the planes in the sky and cutting-edge gadgets in your hand, almost everything we touch and experience has been engineered in some shape or form.

Remember the last time you got on a train? Well an engineer helped design that train. And all the tunnels it went through along the way.

Or how about your last visit to the cinema? An engineer designed the acoustics so you could hear every word. And another engineer designed the lighting within the film so you could see every actor’s face.

There are so many different engineers doing so many different things. They make cities greener and Formula 1 cars faster. They protect people from landslides and volcanic eruptions. They even build machines that smash high-speed particles into each other so that we can unravel the mysteries of the universe!

In short, an engineer is someone who can:

**DO ANYTHING.**

**MAKE ANYTHING.**

**BE ANYTHING.**
INDUSTRIES YOU COULD WORK IN

Become an engineer and you could work in almost any industry imaginable. Here’s just a small sample.

**ENERGY**

If you were a **mechanical engineer** you could build pipelines that pump oil across entire countries. If you were an **electrical engineer** you could help power tankers that bring energy to people around the world. And if you were a **civil engineer** you could do your part for the environment by erecting giant wind turbines.

**IT**

Behind every video game is the **software engineer** who developed it. Inside every smartphone is the microprocessor a **hardware engineer** built. And connecting every computer is the **network engineer** who allows us to message people thousands of miles away.

Engineers in this area could join **BCS, The Chartered Institute for IT**.

**FASHION**

Work as a **chemical engineer** and you could develop cosmetics, or as a **textile engineer** and you could research smart fabrics that help athletes perform better. You could also become an **industrial engineer** and calculate things like how many jackets a brand should manufacture and where they should ship them.

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AEROSPACE

Like the idea of designing an aeroplane that can cross the Atlantic in only a few hours? How about satellites that can track climate change? Or a spacecraft that can take people to Mars? If you were an aerospace engineer, you could potentially design all of these things and more.

As an aerospace engineer, you could join the Royal Aeronautical Society (RAeS).

AUTOMOTIVE

We all want more fuel-efficient cars. We want smoother rides and reliable braking systems. We want engines that purr, parts that never corrode and seats that heat up when it’s cold. As an automotive engineer, these are just some of the things you could do.

Automotive engineers may wish to join the Chartered Institute of Highways and Transportation (CIHT).

HEALTHCARE

Want to develop a pharmaceutical drug that saves millions of lives? How about a medical device, such as a pacemaker, that allows people to live longer? Or what about creating artificial organs for patients in need of a transplant? Then maybe you should become a biomedical engineer.

As a biomedical engineer, you could join the Institute of Physics & Engineering in Medicine (IPEM).

Professional engineering institutions

To prove you have what it takes to do your job, it’s a good idea to join a professional engineering institution that’s closely related to your role. These include the Institution of Mechanical Engineers (IMechE), the Institution of Engineering and Technology (IET), the Institution of Civil Engineers (ICE), the Institution of Chemical Engineers (IChemE) and the Royal Aeronautical Society (RAeS).

For a full list of professional engineering institutions, visit www.engc.org.uk

Once there, click on the ‘About Us’ tab at the top of the page and then select ‘Our Partners’ from the drop-down menu.
To get the job you want in the future, you need to think carefully about which subjects you study now. For an engineering role, the best place to start is STEM: **Science, Technology, Engineering and Maths**.

STEM subjects should form an important part of your GCSEs and A levels. Everyone needs to do maths and science, but if you can pick separate sciences then physics, biology and chemistry are really useful too. Other subjects that can give your career a boost include design & technology, ICT, computing – even art and geography. It all depends on what you want to do.
HOW TO BECOME AN ENGINEER

SCHOOL
Science (Physics and Chemistry), Maths, D&T and Computing

6TH FORM / FE COLLEGE
A levels / IB / Highers (or equivalent)
BTEC
HNC & HND
Foundation Degree

UNIVERSITY DEGREE
Bachelor’s (BEng)
Master’s (MEng)

APPRENTICESHIPS
Intermediate / Advanced / Higher
Sponsored Degree
Earn while you learn
e.g. NVQ / SVQ / BTEC / degree

ON-THE-JOB TRAINING

WORK
WHERE DO I BEGIN?

**LEVEL 1**

**School / College / Workplace**

- **GCSE D-G**
- **BTEC Level 1 / NVQ 1**
- **Traineeships:** For 16-23 year olds qualified below Level 3

**LEVEL 2**

**School / College / On-the-job training**

- **Apprenticeship (Intermediate):** Engineering, IT, Construction, Built Environment, Manufacturing
- **GCSE / IGCSE A*-C:** Maths, Science
  - (ideally triple science)
  - (Useful subjects: D&T, ICT, Computing, Engineering)
- **BTEC Level 2 / NVQ 2:**
  - Engineering, Construction & Built Environment, Science, ICT

**LEVEL 3**

**6th Form / College / On-the-job training**

- **Advanced Apprenticeship:** Engineering, IT, Construction, Built Environment, Manufacturing
- **A level:** Maths, Physics
  - (Useful subjects: Chemistry, Computing, D&T, Further Maths)
- **IB Diploma:** Higher Level Maths, Physics
  - Chemistry – for chemical and biomedical engineering
- **Tech Level Qualifications:**
  - **BTEC Level 3 / NVQ 3:** Engineering, Construction & Built Environment, Science, ICT

WHAT COMES NEXT?

**Advanced / Higher Apprenticeship**

- Available in a variety of industries including: Manufacturing, Aerospace, Automotive, Power, IT, Construction, Sustainable Technologies
- Combine workplace training with study
- Typically 3 to 4 years
- Can include vocational qualifications or a degree
- Approved by the Engineering Council

**Higher National Certificate / Diploma**

- Vocational higher education qualifications, taken whilst in employment
- Can be taken at FE colleges and universities
- Typically 1 to 2 years

**Foundation Degree**

- Usually undertaken as a part-time qualification whilst in employment
- Typically 2 years
  - Further learning to Bachelor’s level required for IEng registration

**University Degrees**

- In general engineering, a specific field of engineering, computer science, manufacturing or technology
- Accredited by the Engineering Council

**Bachelor’s Degrees**

- 3 to 4 years
- Can include a year working in industry / a year abroad
- Can be followed by a 1-year MSc to register as a Chartered Engineer

**Master’s Degree (MEng)**

- 4 to 5 years
- Can include a year working in industry / a year abroad
WHERE WILL IT LEAD?

PROFESSIONAL REGISTRATION

- Engineering Technician (EngTech)
  or ICT Technician (ICTTech)
- Incorporated Engineer (IEng)
- Chartered Engineer (CEng)

CHECK IT OUT!
WHERE DO I BEGIN?

SCHOOL/COLLEGE STUDY

LEVEL 3
SCQF
- National 3
- Standard Grades Foundation
- National Progression Awards
- National Certificates
- Skills for Work
- Awards

LEVEL 4 & 5
SCQF
- Nationals 4 and 5
- Intermediates 1 and 2
- Standard Grades (General and Credit)
- National Progression Awards
- National Certificates
- Skills for Work
- Awards

LEVEL 6 & 7
SCQF
- Scottish Baccalaureate
- Advanced Highers
- Highers
- National Progression Awards
- National Certificates
- Skills for Work
- Awards

WHAT COMES NEXT?

FURTHER EDUCATION / LEARNING WHILST WORKING

LEVEL 5-7
SCQF
- Modern Apprenticeship SVQ 3

LEVEL 6-7
SCQF
- Scottish Vocational Qualifications SVQ 1 to 3
- National Progression Awards
- Professional Development Awards
- National Certificates
- Awards

LEVEL 8-12
SCQF
- Scottish Vocational Qualifications SVQ 4 & 5
- Professional Development Awards
- Technical Apprenticeships SCQF 8 & 9
- Professional Apprenticeships SCQF 10 to 12
- Awards
WHERE WILL IT LEAD?

Professional Qualifications

- Engineering Technician (EngTech) or ICT Technician (ICTTech)
- Incorporated Engineer (IEng)
- Chartered Engineer (CEng)

WHAT COMES NEXT?

Further & Higher Education

- SCQF
  - Level 7-8: HNC, HND
  - Level 9: Bachelor of Engineering (BEng)
  - Level 10: Accredited Bachelor of Engineering BEng (Hons)
  - Level 11: Accredited Integrated Master's Degree (MEng)
    - Accredited Postgraduate Master's Degree (MSc)
GETTING STARTED: APPRENTICESHIPS

There are three main routes into engineering. The first is via an apprenticeship.

An apprenticeship is a role that combines on-the-job training with classroom learning. Its main purpose is to give you a broad base of skills so that you can do a variety of roles in the future.

There are four levels of apprenticeship: Intermediate, Advanced, Higher and Sponsored Degree. Depending on the level you choose, apprenticeships can take anywhere between one and five years to complete.

Each level of apprenticeship has an equivalent education level:
- Intermediate – equivalent to five GCSE passes
- Advanced – equivalent to two A level passes
- Higher – can lead to NVQ Level 4
- Sponsored Degree – results in a degree

Why should you do an apprenticeship?
There are many reasons. Here are five of the best.

1. You can apply at 16.
2. You get to earn while you learn.
3. You’ll constantly gain new skills.
4. You can work towards your professional registration.
5. Once your training is complete, your employer will often give you a full-time job.
The second route into engineering is via vocational qualifications.

Vocational qualifications, or work-related qualifications, give you a chance to gain the skills and knowledge required by the National Occupational Standards to do a particular role.

How do you begin? By taking a vocational course at a further education or technical college. Examples of vocational qualifications you can earn include BTECs, EAL, NVQs, SVQs and City & Guilds.

Why should you study vocational qualifications?

1. There are loads of subjects you can explore.
2. You’ll learn something new every day.
3. It’ll help you decide which sector is right for you.
4. You’ll gain the skills employers value most.
5. Once complete, you’ll be fully prepared for the world of work.
The third route into engineering is also the most popular: an undergraduate degree.

Attend university and you’ll enjoy a lively academic environment, filled with all sorts of lectures and seminars, and made up of various modules that add up to a full degree. The teaching style and assessment methods vary from course to course, as do the topics covered, though you’ll usually get to pick some of the modules you take.

Along with being able to study lots of different subjects, you’ll also be able to choose from a wide range of degrees that will prepare you for becoming an engineer. In general, each degree takes three or four years to complete.

If your university offers work experience, you could also do a sandwich course. This allows you to work in a relevant industry for a year before returning to your studies.

Why should you study engineering at university?

1. You’ll have access to lots of different courses.
2. You’ll get to network with professors and learn from industry professionals.
3. You could become eligible for professional registration as an Incorporated Engineer or Chartered Engineer.
4. If your degree allows, you could work abroad for a year.
5. Once you graduate you’ll have tons of career options available to you, both in terms of jobs and postgraduate study.
What’s your favourite thing about engineering and technology?
The way we can create extremely complex machines that can do the most amazing things, yet all they consist of is lots and lots of small, simple things working in harmony.

What’s the benefit of doing an apprenticeship?
An apprenticeship is the best by far. A company pays for your education, you get to earn while you learn, you develop at your own pace and, by the time you finish, you’ve gained a wealth of industrial experience and become a much bigger asset to the company.

What’s the most exciting thing you’ve done since joining Thales?
I got to work on the Type 45 military ships in Portsmouth. We would climb up the masts and swap over radar systems. It was incredible to see the systems on board the ships and to hear how much they meant to the guys who operate them. It gave me a real sense of pride in our company and what we do.

What kind of training have you received?
I’ve had all kinds of training, particularly on different systems and processes within the company, but also to gain practical skills and knowledge such as IPC certification and radiation detection. I also went to the Lake District for a week-long team-building and leadership course with other apprentices. It helped me develop my personal skills and understand how the company works.

What advice would you give to young people who are interested in the world of engineering?
Follow your passion. If you’re meant to be an engineer, you will be. It’s a way of life, not a job description.
Kellie Barton
Test Methods Engineer, Test Methods & Design

What first attracted you to engineering?
As a child I was always curious about how things worked. I’d take things apart which were broken in the house and do my best to fix them. I’d build bridges over streams and tree houses out of anything I could find. I enjoyed the challenge of working with limited resources to create a solution to my problem. I was a creative child and so solving problems to bring my ideas to fruition was truly rewarding. I wanted a career where I could do the same. Engineering is that career.

What’s your favourite thing about engineering and technology?
Problem solving. Using the rules of nature to create something that didn’t exist before. Or to make things that already exist, better. There are so many ways to solve the same problem. It’s down to engineers to decide which one is best.

What was it like to go to university?
University was a brilliant experience. It was challenging and took lots of dedication, but studying a subject I was passionate about, with people who shared my passion, was incredibly rewarding.

What advice would you give to someone who is interested in engineering when picking their GCSEs or A levels?
The first choice on your list should be mathematics. It’s a requirement for all engineering-based university courses, as well as a prerequisite for many engineering internships. I made the mistake of thinking I wasn’t good enough at mathematics to take it for A levels, which meant that later on I had to take a year out and complete AS and A-level mathematics at a night class at college. Only then could I be accepted into university on the course of my choice. It worked out in the end, but not taking mathematics from the start definitely delayed my career. So take maths! You can do it!
The field of engineering is one big opportunity right now. In fact, it’s been estimated that between 2012 and 2022 the UK will need an additional 1.82 million people with engineering skills. That’s huge. It means doubling the number of engineering apprentices and graduates entering the industry.

If your son or daughter is thinking about becoming an engineer, here’s how you can help.

1. Encourage them to study STEM subjects at GCSE and A level.
2. Learn about all the different roles engineers do.
3. Look for local apprenticeship opportunities.
4. Help them get involved in extracurricular STEM activities.
5. If they want to go to university, research any courses related to STEM and what the entry requirements are. The GCSE and A level subjects they choose may affect their eligibility.
What Thales do

Our job is to build the most imaginative, mind-bending engineering and technology solutions the world has ever seen. Here’s a look at some of the incredible things we’ve done – and all because of people who’ve studied STEM.

400+

Every year we register over 400 new inventions.

1,000s

We employ thousands of engineers and technicians across the UK.

2 out of every 3 aircraft in the world use our equipment.

We’re leading Iridium Next, the world’s largest constellation of satellites.

19/20

We protect private data for 19 of the world’s 20 biggest banks.

We’ve built over 110 helicopter simulators for customers in 25 countries.

We’ve helped over 25 countries make 300 million identity documents.

Every day over 130,000 people enjoy our in-flight entertainment systems.

Our fare collection systems handle over 50 million transactions daily.

Our satellites are #1 worldwide for studying oceans.

We helped create the National Rail Enquiries Online Journey Planner and the Rail Planner Live app.

For more information, visit: www.thalesgroup.com/uk/education
Want further insights into the world of engineering?
These links are a great place to start.

**Becoming an engineer**
www.tomorrowsengineers.org.uk

**Apprenticeship opportunities**
England: www.apprenticeships.gov.uk
N. Ireland: www.nidirect.gov.uk/apprenticeships
Scotland: www.myworldofwork.co.uk/modernapprenticeships
Wales: www.careerswales.com/en

**University advice**
www.ucas.com
www.university.which.co.uk

**Further education / Technical colleges**
www.utcolleges.org
www.hotcourses.com

**Careers support**
www.plotr.co.uk

**Careers at Thales**
www.ukearlycareers.thalesgroup.com