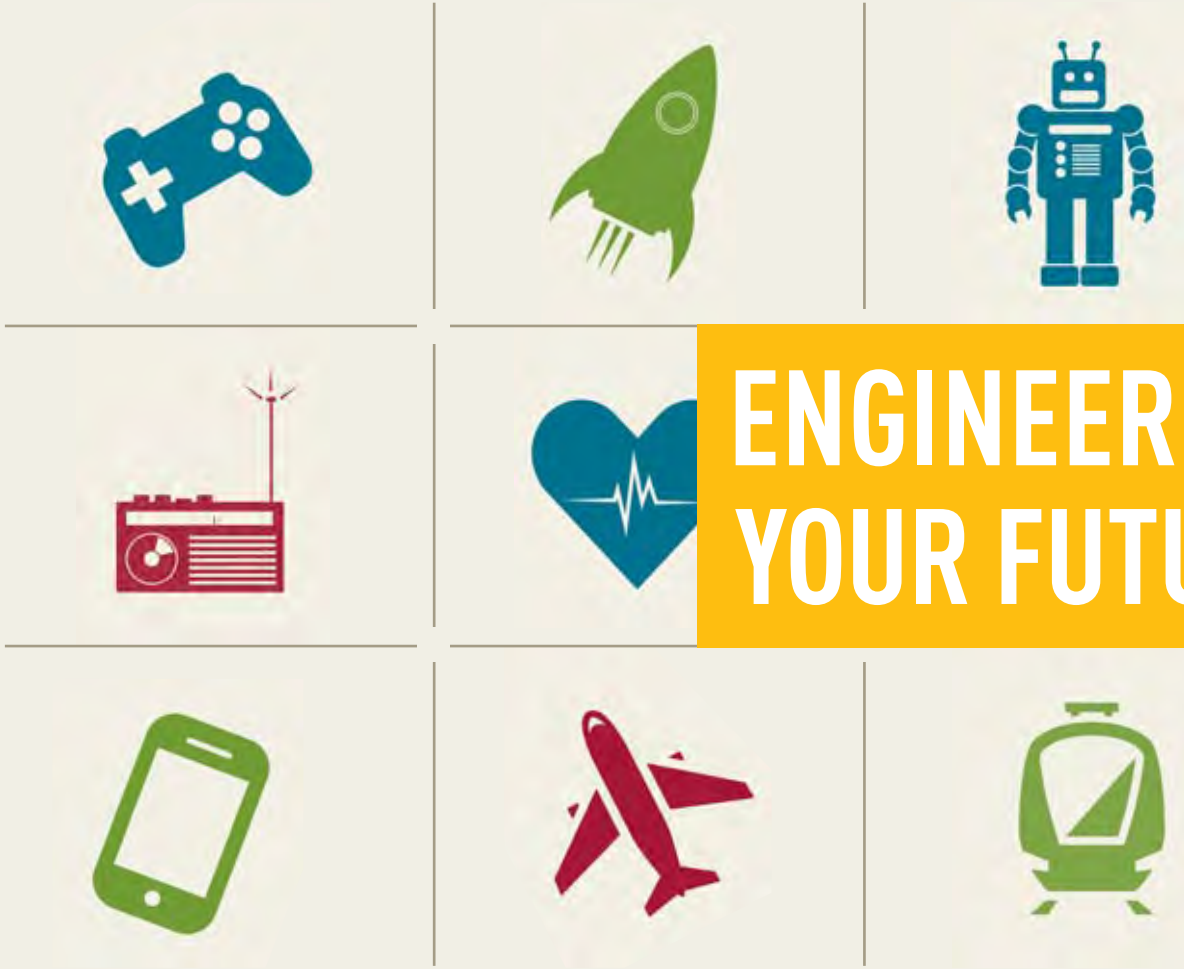
STEPS
ENGINEERS IRELAND



ENGINEERING YOUR FUTURE

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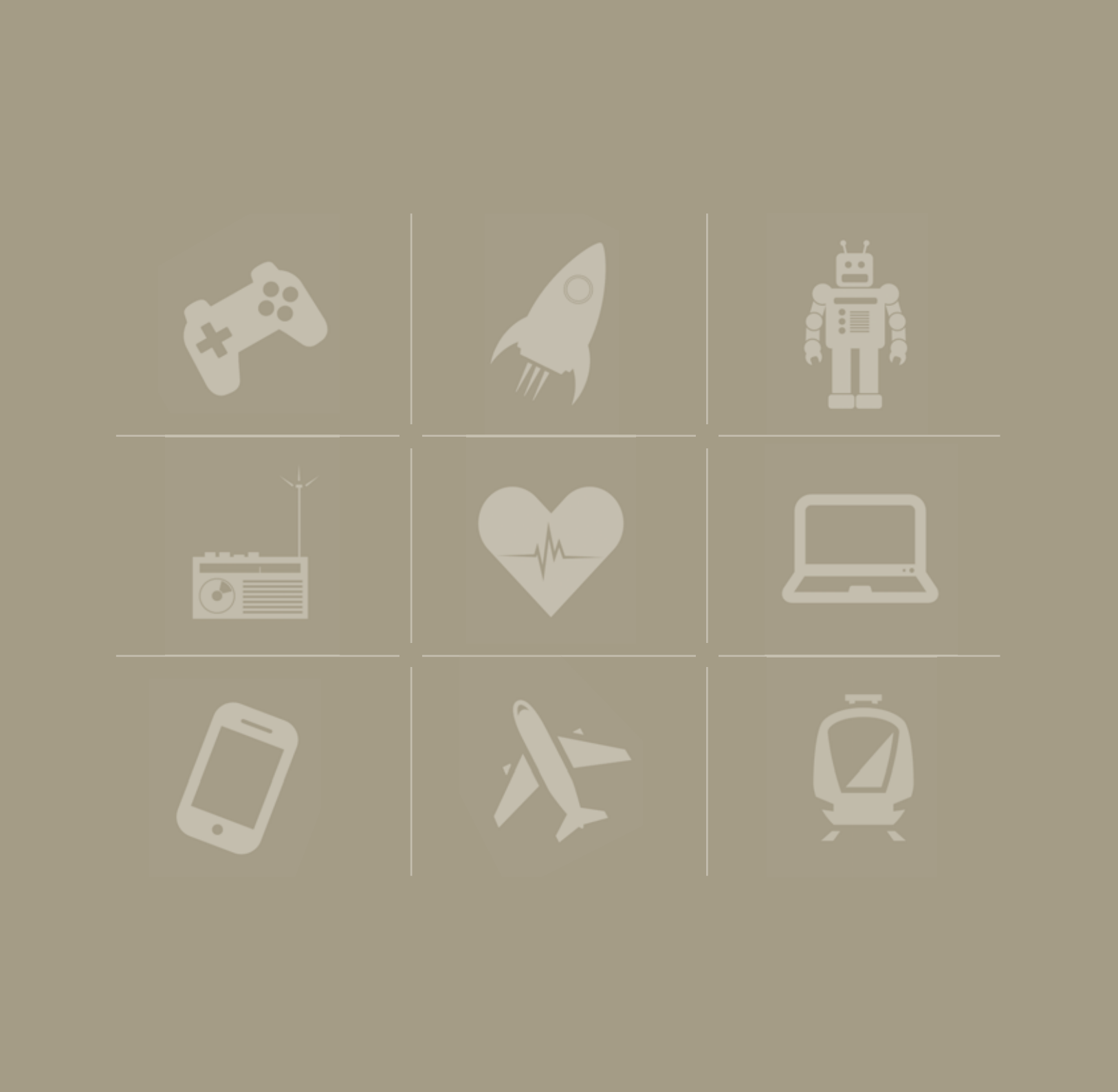


ENGINEERING YOUR FUTURE

YOUR GUIDE TO ENGINEERING AT THIRD LEVEL AND AS A CAREER

CONTENTS

WHAT IS ENGINEERING?

ENGINEERS BRING DREAMS TO LIFE

ENGINEERS TAKE IDEAS AND TURN THEM INTO REALITY, USING SCIENCE, MATHS AND IMAGINATION. ENGINEERS ARE MASTERS OF PROBLEM-SOLVING AND CREATIVE DESIGN.

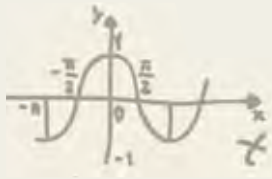
As a career, engineering offers a chance to make a difference to people's lives, while you enjoy a dynamic and varied working life.

Engineers are in demand worldwide because they are essential to the growth and development of every country.

The progress of civilisation has largely depended on the work of engineers, who have harnessed and controlled our environment to provide us with essentials for living like water, shelter and power. In the past few decades, engineers have changed the world by helping to send astronauts into space, mapping the human genome, and creating the internet.

Right now, engineers are working on innovative projects from solar energy to synthetic organs, driverless cars to virtual reality headsets. Students of engineering develop a valuable set of

This guide, brought to you by the Engineers Ireland STEPS programme, aims to answer the most commonly asked questions about engineering. See the back of this book for details of the services offered by the STEPS programme.



skills that serve as a strong career foundation. Engineers are problem-solvers; they have a flexible, creative approach to work; and they work well in teams.

These skills are highly useful in every role from technician to chief executive, and in every industry from aerospace to healthcare to software. An engineering qualification offers a chance to do interesting work with interesting people, enhance people's lives, and explore almost unlimited career opportunities.

ARE ENGINEERS IN DEMAND?

YOU'LL FIND ENGINEERS IN ALMOST ALL INDUSTRIES, FROM AVIATION, AGRICULTURE AND SPACE TO HEALTHCARE, MANUFACTURING AND SOFTWARE – AND EVERYWHERE IN BETWEEN.

Engineers are in demand in many sectors right now, especially the software and IT industry, the medical devices sector and the pharmaceutical industry, and the energy and environmental sectors.

RIGHT NOW IN IRELAND

105,000+ PEOPLE WORKING IN THE TECHNOLOGY SECTOR

250 MEDICAL TECHNOLOGY COMPANIES, EMPLOYING 25,000 PEOPLE

160 GAMES COMPANIES ACROSS IRELAND; 3,300 PEOPLE WORKING IN GAMING

IRELAND IS HOME TO

9

OF THE TOP 10 SOFTWARE COMPANIES

9

OF THE TOP 10 GLOBAL PHARMACEUTICAL CORPORATIONS

12

OF THE TOP 20 GLOBAL INTERNET FIRMS

7

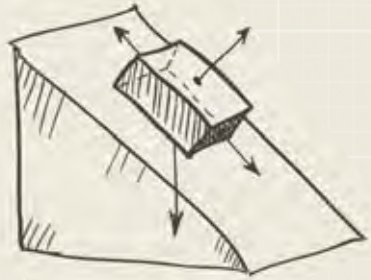
OF THE TOP 10 INDUSTRIAL AUTOMATION COMPANIES

MADE IN IRELAND

- Ireland is the second largest exporter of medical products in Europe
- 50% of ventilators in hospitals worldwide are made in Ireland
- Ireland is the largest exporter of software in the world; 60% of software sold in Europe originates in Ireland

- 80% of the global production of stents (medical devices for heart patients) takes place in Ireland
- Ireland exported EUR49 billion worth of organic chemicals and pharmaceutical products in 2010

- There are 205 wind farms on the island of Ireland. By 2020 Ireland plans to be one of the largest producers of wind energy in Europe



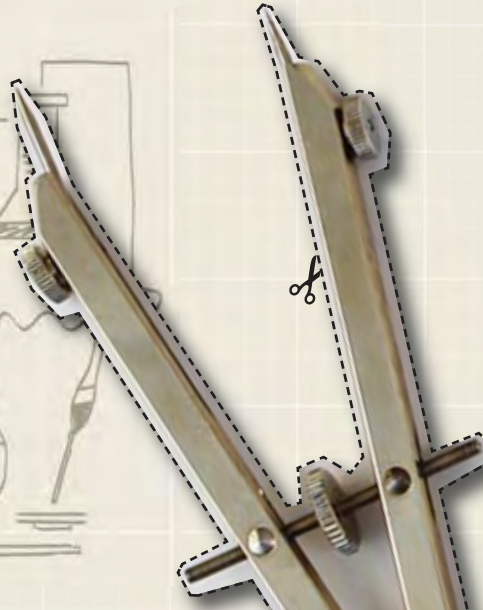
IS ENGINEERING FOR YOU?

- **Are you naturally curious about how things work?**
- **Do you love solving problems?**
- **Do you enjoy making, breaking or designing things?**
- **Do you like the idea of working as part of a team?**
- **Are you competent* in mathematics?**

If you answered yes to most of these questions, engineering might be right for you! While everyone is different, most engineers tend to exhibit these personality traits.

Many engineers say that as children, they loved taking toys and games apart to see how they worked. Others have a strong design focus. Many find themselves drawn to science subjects at school.

** While not necessarily excelling at mathematics, most engineers are comfortable with the subject. Many engineering courses offer extra maths support to students in First Year. Higher Level maths is not a requirement for every engineering course. (See the section on subjects for more.)*



FREQUENTLY ASKED QUESTIONS ABOUT ENGINEERING

WHAT DO ENGINEERS EARN?

In a 2012 salary survey by Engineers Ireland, graduate engineers reported earning EUR28,000 per year (median figure). Engineers with three to five years' experience reported earnings of EUR38,000 per year (median figure).

I CAN'T DECIDE ON AN ENGINEERING DISCIPLINE. WHAT DO YOU ADVISE?

If you are unsure which area of engineering suits you, there are plenty of general engineering courses that will help you keep your options open until graduation. You can then specialise in a particular area that interests you by doing a Masters or another course after your primary degree. Also, many courses offer general engineering for the first year or two, and then students choose a speciality for their final years. Like many professionals, engineers are expected to keep their skills up to date throughout their careers by undertaking Continuing Professional Development (CPD) training.

WHAT ELSE CAN I DO WITH AN ENGINEERING DEGREE?

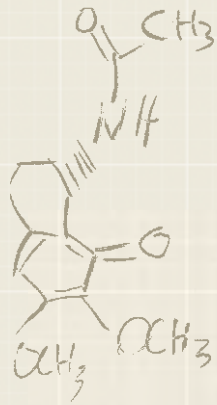
Engineering gives you the flexibility to explore many different career paths. Engineering students gain a valuable set of skills that serve as a strong career foundation. Engineers have a problem-solving mindset; a flexible, creative approach to work; and they work well in teams. These skills are valued by all employers and serve every role well, from technician to chief executive officer (CEO). In a US survey of the top 500 companies on the stock market, 33% of CEOs had an engineering degree.

DO ENGINEERS GET TO TRAVEL MUCH?

Many engineers are required to travel for work, whether to visit different sites or to meet clients in various locations. Engineers may find themselves travelling around Ireland or further afield. Many large companies have international offices; employees may be offered the opportunity to work for six months or a year in another country.

If you hope to travel as an engineer, it's important to first make sure your course is accredited by Engineers Ireland. Accredited qualifications are recognised abroad in dozens of countries, giving you mobility in the international workforce. (See the section on accreditation for more.)

WHAT SUBJECTS DO YOU NEED FOR ENGINEERING?



EACH COLLEGE HAS ITS OWN ENTRY REQUIREMENTS FOR THE ENGINEERING COURSES THEY OFFER. REVIEW THESE CAREFULLY IN THE COLLEGE PROSPECTUS OR ONLINE BEFORE APPLYING FOR A PLACE.

Students of engineering are usually competent in mathematics and feel relatively comfortable with the subject. While Higher Level maths is a requirement for many engineering courses, not every course requires it. Courses at Level 6 or Level 7 usually do not require Higher Level maths, while Levels 8 and up generally do. (See the section on Levels for more.) Many colleges offer additional maths classes in First Year for students who need extra support.

While science subjects are not usually compulsory for entry to engineering, many students do find themselves drawn to science subjects at school. Subjects such as physics, chemistry or agricultural science can provide a good foundation for students of engineering, as First Year at college usually involves the study of core scientific concepts.

Check the requirements for each engineering course before applying

GOT AN ENGINEERING COURSE IN MIND?

ENGINEERS IRELAND
ACCREDITED PROGRAMME

CHECK YOUR COURSE IS ACCREDITED BY ENGINEERS IRELAND FIRST!

Accreditation functions like a 'quality mark', giving you assurance in three important areas. Accreditation means that:

- **Your chosen course meets standards of excellence defined by the engineering profession**
- **Your final qualification will be recognised internationally**
- **You'll have a clear, smooth route to a registered title (e.g., Chartered Engineer, Associate Engineer, Engineering Technician)**

There are over 400 engineering courses at third level all across Ireland, but not all of them are accredited by Engineers Ireland. (Engineers Ireland is an internationally recognised representative body for professional engineers in Ireland, and the leading organisation for accreditation of engineering courses.

HOW DOES ACCREDITATION WORK?

A rigorous, independent evaluation of third-level engineering courses is conducted by Engineers Ireland, to see if they meet international standards of excellence. Any college that wishes to can apply for evaluation. Courses that are accredited are re-assessed at least every five years to make sure their standards of excellence are maintained. Engineers Ireland is licensed to award the EUR-ACE accreditation label.
It also accredits programmes that meet the criteria of the International Engineering Alliance. These labels mean that an engineering course meets internationally agreed standards, and that the resulting qualification will be recognised in dozens of other countries around the globe.

Why should you study an accredited course?

- Enhances your employability
- Assures international employers of the quality of your qualification
- Smooths out the process of attaining a registered title
- Ensures professional recognition of your course

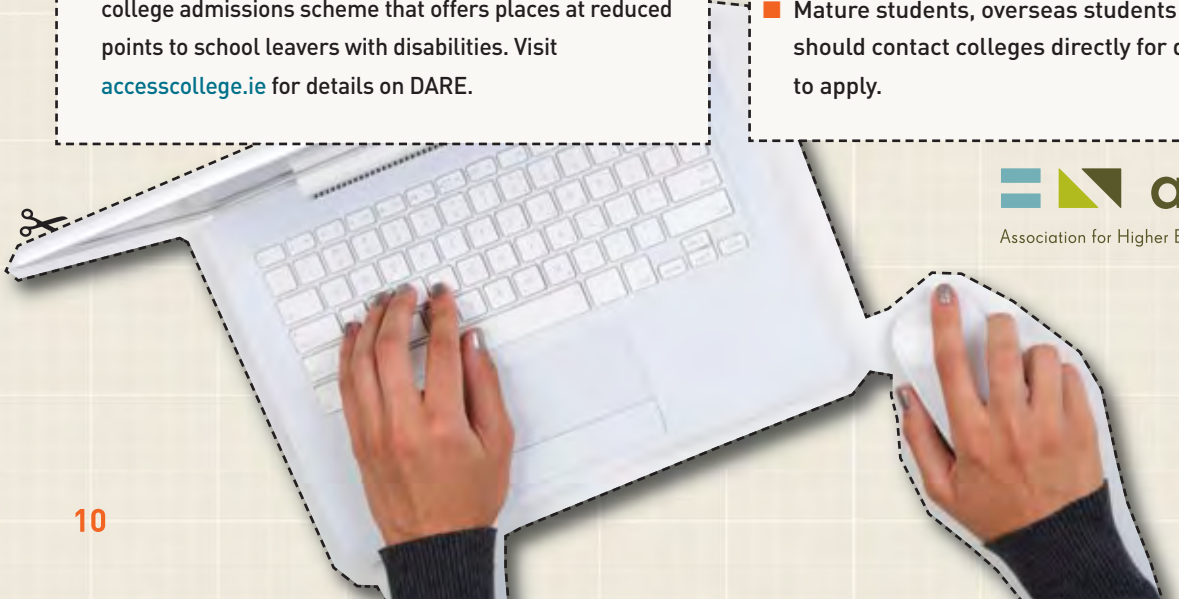
Check your chosen course is accredited before applying on engineersireland.ie/Services/Accredited-Courses.aspx

ENGINEERING IS FOR EVERYONE

ENGINEERING IS A BROAD PROFESSION AND ENGINEERING AS A CAREER IS OPEN TO EVERYONE. TAKE A LOOK AT THE PROFILES IN THIS BOOKLET TO SEE SOME OF THE DIFFERENT KINDS OF PEOPLE WHO BECAME ENGINEERS.

- Engineering is open to students with disabilities. AHEAD, the Association for Higher Education Access & Disability, has published research to show that students with disabilities are studying across all subjects in third level, including engineering. For more information visit ahead.ie.
- There are plenty of supports and services available to help students with disabilities reach their full potential. For example, DARE (Disability Access Route to Education) is a college admissions scheme that offers places at reduced points to school leavers with disabilities. Visit accesscollege.ie for details on DARE.

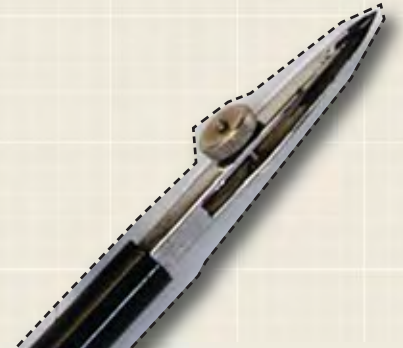
- Engineering courses are open to students from different socio-economic backgrounds. HEAR is a college admissions scheme that offers places at reduced points to school leavers from socio-economically disadvantaged backgrounds. Visit accesscollege.ie for details on HEAR.
- A range of grants, funds and scholarships are available for third-level courses. Visit studentfinance.ie for details.
- Mature students, overseas students and other students should contact colleges directly for details of how to apply.



ahead
Association for Higher Education Access & Disability

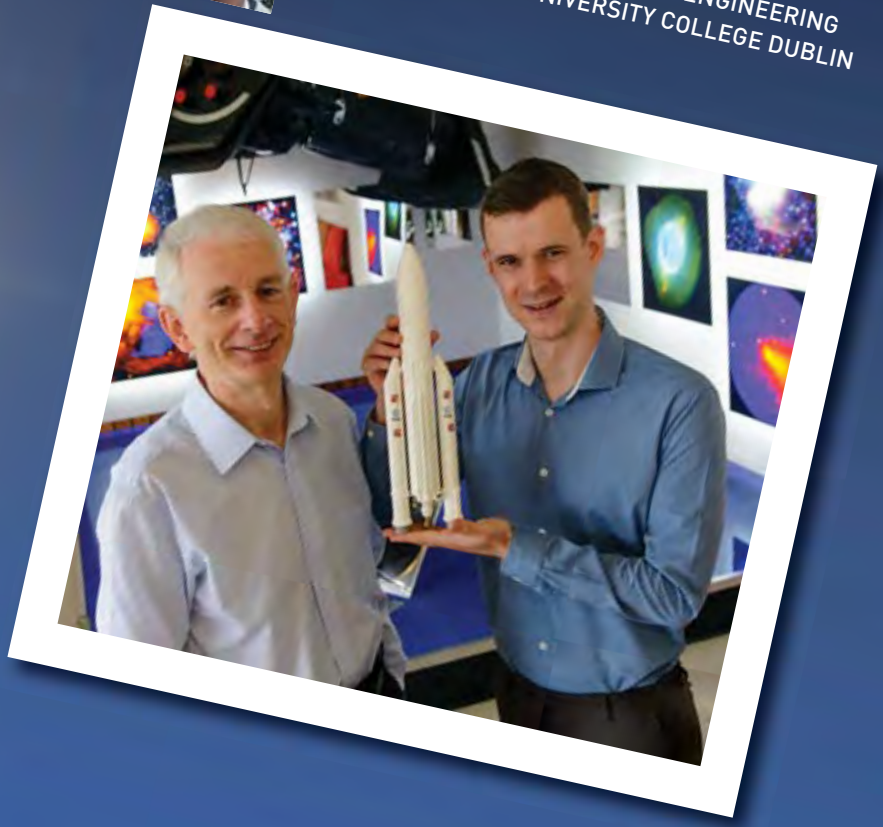
While there are currently more male students choosing engineering, girls perform as well as – and often better than - boys academically. In addition, there is an equal amount of male and female Chartered Engineers among the members of Engineers Ireland. (See the section on titles for a definition of Chartered Engineer.)
This indicates that female engineers are as committed and successful in their careers as male engineers. Many large employers of engineers have programmes to support women through their careers.

In 2014, Engineers Ireland president Regina Moran commented on a study by Engineers Ireland called 'Engineering Perspectives'. She said: "[The] Engineering Perspectives report gives us an insight into the evolving engineering profession in Ireland – on average, the ratio of men to women in engineering has been around 9:1. A fifth of all respondents in the survey were women and, of these, half were under the age of 35 years. This shows a very promising gender balance shift in the engineering landscape in Ireland. We must build on this and encourage young students, especially young women, to explore opportunities in engineering."



IN PROFILE
DAVID MCKEOWN

TITLE: ROCKET ENGINEER
DISCIPLINE: MECHANICAL ENGINEERING
WORKS AT: UNIVERSITY COLLEGE DUBLIN



WHAT DOES ENGINEERING MEAN TO YOU?

Engineering to me is problem solving. You need to be creative while also being logical – it's a nice mix.

WHAT'S THE BEST THING ABOUT BEING AN ENGINEER?

Having the skills to be able to design and make fun stuff.

WHAT ARE YOU WORKING ON RIGHT NOW?

I look at ways of reducing the vibrations as rockets take off for the European Space Agency. I lecture, research and generally mess about with cool stuff.

WHAT'S THE BEST PROJECT YOU'VE EVER WORKED ON?

I worked on controlling a new flexible robotic arm being designed for a European Mars rover. I made models of how the arm would move and worked on what is known as a 'control system', which is basically figuring out how to make the arm move about the way you want it to.

WHAT WAS COLLEGE LIFE LIKE?

College life is great; there is a much greater freedom to express yourself there than in school. I studied mechanical engineering in UCD, loved it, and the social life is as important as the academic part. I played soccer and did a lot of rock climbing during my undergrad. I still have lots of good friends from my time in college.

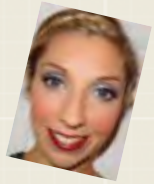
WHAT ADVICE WOULD YOU GIVE SOMEONE WHO'S THINKING OF STUDYING ENGINEERING?

Talk to people who are studying it or have studied it. Ask them lots of questions, see if it's for you.

WHAT DO YOU LIKE TO DO IN YOUR SPARE TIME?

I still play soccer for my local team and I run a lot of engineering/science outreach events, like Dublin Maker (see image) and Science Hack Day Dublin. These are events that get people making things and being creative, the fun parts of engineering.

IN PROFILE
JUSTINE BUTLER



TITLE: CHARTERED CHEMICAL ENGINEER
DISCIPLINE: CHEMICAL/PROCESS ENGINEERING
WORKS AT: DPS ENGINEERING

WHAT KIND OF PERSON MAKES A GOOD ENGINEER?

Someone who uses logical thinking to solve problems.

WHAT'S THE BEST THING ABOUT BEING AN ENGINEER?

As a process engineer, I can either design pharmaceutical equipment in the office or test equipment on site. The best thing with both is job satisfaction. I individually contribute to producing the drug that people get in the pharmacy by either producing a design that meets international standards or ensuring the equipment works as it's supposed to.

DESCRIBE YOUR CURRENT ROLE.

The best way to describe my job is that I work with equipment that directly impacts pharmaceutical products. Using a hospital injection as an example, I can produce the active pharmaceutical ingredient (API) through a number of chemical processes, fill the API into the injection vial, or produce the water that dilutes the API. All aspects of my job ensure that the same injection is produced every time and that patient safety is never jeopardised.

WHY DID YOU CHOOSE TO STUDY ENGINEERING?

Maths and chemistry were my favourite subjects in school so my dad suggested chemical engineering as a career.

Even though I liked these subjects, I still had to put in the time with them. The main difference to other subjects was that I wasn't afraid of the challenge, whereas I found languages more of a struggle.

WHAT ADVICE WOULD YOU GIVE SOMEONE WHO'S THINKING OF STUDYING ENGINEERING?

Engineering is a very diverse career, with so many opportunities. You can work in an office or travel around the world. Growing up fixing things is not what every engineer is about but an enjoyment of problem solving is key.

WHAT DO YOU LIKE TO DO IN YOUR SPARE TIME?

I work as a make-up artist/beautician in my spare time. I always had a passion for this and didn't let working full time as an engineer stop me from pursuing other interests. I love both jobs.

IN PROFILE
LOURDA CASSERLY

TITLE: CHARTERED ENVIRONMENTAL ENGINEER
DISCIPLINE: ENVIRONMENTAL ENGINEERING
WORKS AT: JENNINGS O'DONOVAN AND PARTNERS LIMITED

WHAT KIND OF PERSON MAKES A GOOD ENGINEER?
A person who has an inquisitive mind, likes solving problems and works well within a team.

WHAT'S THE BEST THING ABOUT BEING AN ENGINEER?
No two days are the same. I get the opportunity to work on many different and interesting projects.

WHAT'S THE BEST PROJECT YOU'VE EVER WORKED ON?
A wastewater treatment plant in Camp Leatherneck, Afghanistan. I used to work with CDM Smith; while I was there I transferred to their Boston office to work on this project. I was part of the mechanical design team. The plant was for the American troops based in Camp Leatherneck, which is one of the largest military bases in the region.

WHAT WAS COLLEGE LIFE LIKE?
I studied environmental engineering in NUIG. College life was busy but I always had time to go to gigs at the Róisín Dubh!

WHY DID YOU CHOOSE TO STUDY ENGINEERING?
From a young age I was always interested in the outdoors and the environment. I chose environmental engineering as I can work on projects to improve the general environment. My granny inspired me – when I was in secondary school she bought me a hydraulic engineering book!

WHAT ADVICE WOULD YOU GIVE SOMEONE WHO'S THINKING OF STUDYING ENGINEERING?
Studying engineering opens up many doors for you as a career. Friends from college are working in many diverse and interesting fields of engineering. Also, Engineers Ireland has an agreement that accredited degrees are recognised internationally – so you have the option of working almost anywhere in the world!

WHAT DO YOU LIKE TO DO IN YOUR SPARE TIME?
Any water sports. I started kayaking a few years ago with Wild Water Kayaking Club. I'm currently training for the Irish ladies' canoe polo team and plan on going to France to play in the Canoe Polo World Championships.

IN PROFILE
EDEL CASSERLY

TITLE: CHARTERED CIVIL ENGINEER
DISCIPLINE: CIVIL ENGINEERING
WORKS AT: ARUP

WHAT DOES ENGINEERING MEAN TO YOU?

Engineering for me is designing solutions to problems that can improve the quality of life for people. A good engineer is a person who is interested in problem solving or seeing how things work and likes working as part of a team.

WHAT'S THE BEST PROJECT YOU'VE EVER WORKED ON?

I worked on upgrading the N4 dual carriageway in Mullingar, Westmeath. I had two roles on the project. Initially I was based in the office, where I assisted in developing the drawings for the road scheme. I was then based on site for the duration of the constructions works, where I was responsible for monitoring the works. This project was important to me as it was the first project where I followed it through from the design to seeing the project being constructed.

WHAT WAS COLLEGE LIFE LIKE?

I went to NUIG, where in First Year I studied undenominated (general) engineering; then in Second Year I went on to study civil engineering. College life was busy but I always had time to go to gigs!

WHO OR WHAT INSPIRED YOU TO STUDY ENGINEERING?

I was always wondering how things worked. My dad inspired me to become an engineer. He's a carpenter. I used to go to sites with him, helping him fit kitchens and wardrobes.

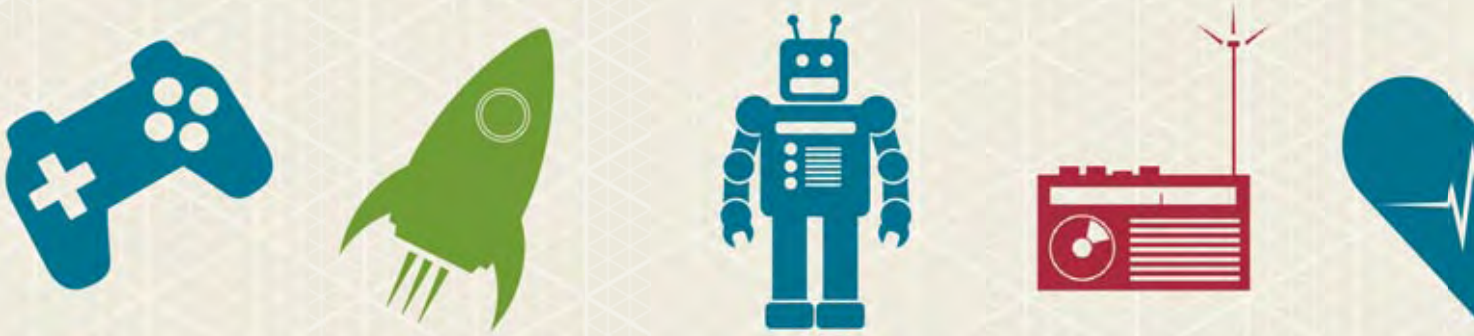
WHAT ADVICE WOULD YOU GIVE SOMEONE WHO'S THINKING OF STUDYING ENGINEERING?

If you're looking for a profession where no two days are the same, engineering is the career for you.

WHAT DO YOU LIKE TO DO IN YOUR SPARE TIME?

I love the outdoors and especially any water sports. I started kayaking with Wild Water Kayaking Club a couple of years ago and am currently training with the Irish ladies' canoe polo team, who are travelling to France to play in the Canoe Polo World Championships.

ENGINEERING DISCIPLINES



ENGINEERING IS A BROAD, DIVERSE FIELD OF STUDY THAT ENCOMPASSES VARIOUS ENGINEERING DISCIPLINES.

These disciplines evolve over time, and many of those listed here are relatively new. For example, biomedical engineering has become a specialist area where the principles of mechanical engineering are applied to the healthcare environment, for the design of new medical technologies to assist patients.

Some students choose to apply for specialised courses that reflect their interest in a particular area. Others prefer to keep their options open by choosing a general engineering degree. (Note: general engineering courses are also referred to as 'common entry', 'omnibus' or 'undenominated'.) Many of these students go on to specialise later on; for example, by doing a Masters in a particular area of interest.

Also, many courses offer a general grounding in engineering for the first year or two; then students choose from a range of specialist areas for their final years.

Review each college prospectus carefully for a complete guide to your chosen course.

On the following pages you'll find a guide to these disciplines:

- **Mechanical**
- **Civil, structural and environmental**
- **Biomedical**
- **Chemical and process**
- **Electrical**
- **Electronic**
- **Biosystems, agriculture and food**
- **Software and computer**
- **Aeronautical**
- **Building services**
- **Manufacturing and industrial**
- **Other disciplines**

MECHANICAL ENGINEERING

Mechanical engineers love a challenge!

Mechanical engineers use their problem-solving skills to...

- Design and develop new energy and alternative energy systems.
- Invent robotics for use in industry, space and healthcare.
- Design new communications and entertainment devices.
- Make engines faster and more fuel-efficient – from cars to rockets.
- Develop new materials to support new products.

WHAT IS IT?

MECHANICAL ENGINEERS USE THEIR PROBLEM-SOLVING SKILLS TO DESIGN MACHINES AND TECHNOLOGIES TO IMPROVE OUR WORLD.

THE DETAILS

Mechanical engineers are masters of problem-solving, invention and creative design. They turn ideas into reality, using their knowledge of materials, physics, energy and technology.

Mechanical engineers create all sorts of machines and devices, from jet engines to robots to medical devices to mobile phones. Mechanical engineers face the challenge of keeping up with rapid advances in technology. These engineers often work at the leading edge of innovation, on projects such as driverless cars, alternative energy sources, development of new materials and augmented reality glasses.

What's needed?

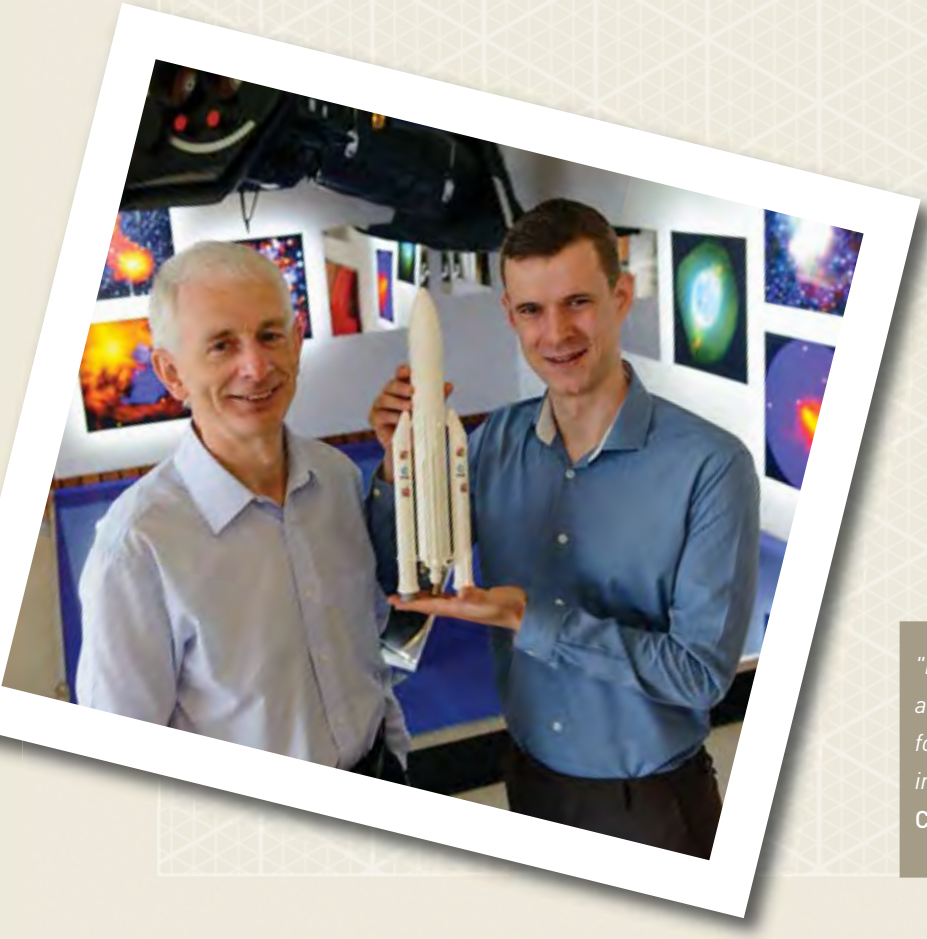
Love of problem-solving
Creative thinking
Analytical mind
Team work
Communication

Inventing the future

Where do mechanical engineers work?

Mechanical engineers can find work in many areas, including:

- industry
- consultancies
- government bodies
- research institutes



"Engineering gives me the ability to design the future. It allows me to help shape future technologies, from advanced forms of energy to cutting-edge medical products – all to improve daily life around the globe."

Colin Keogh, mechanical & energy engineer

CIVIL, STRUCTURAL AND ENVIRONMENTAL ENGINEERING

Civil engineers love a challenge!

Civil, structural and environmental engineers use their problem-solving skills to...

- Design, plan and construct new buildings and structures that meet specific requirements, budgets and timelines, and adhere to strict legislation.
- Design new transport infrastructure and improve existing systems.
- Assess the environmental impact of proposed activities or structures, and propose sustainable solutions.
- Devise innovative solutions for cleaning waste water, reducing air pollution, preventing floods and harnessing renewable energy.

WHAT IS IT?

CIVIL, STRUCTURAL AND ENVIRONMENTAL ENGINEERS DESIGN AND CONSTRUCT THE BUILDINGS AND INFRASTRUCTURE THAT ARE ESSENTIAL TO MODERN SOCIETY.

THE DETAILS

Civil engineers improve and protect the world around us, through planning, designing and building the facilities we use every day, from houses to factories to transport systems.

Structural engineering is a division of civil engineering, where the focus is on large structures such as bridges, office blocks, roads, railways, airports and canals.

Environmental engineering is another division of civil that takes on environmental challenges, such as the construction of water and wastewater treatment plants, air pollution management and sustainability issues.

What's needed?

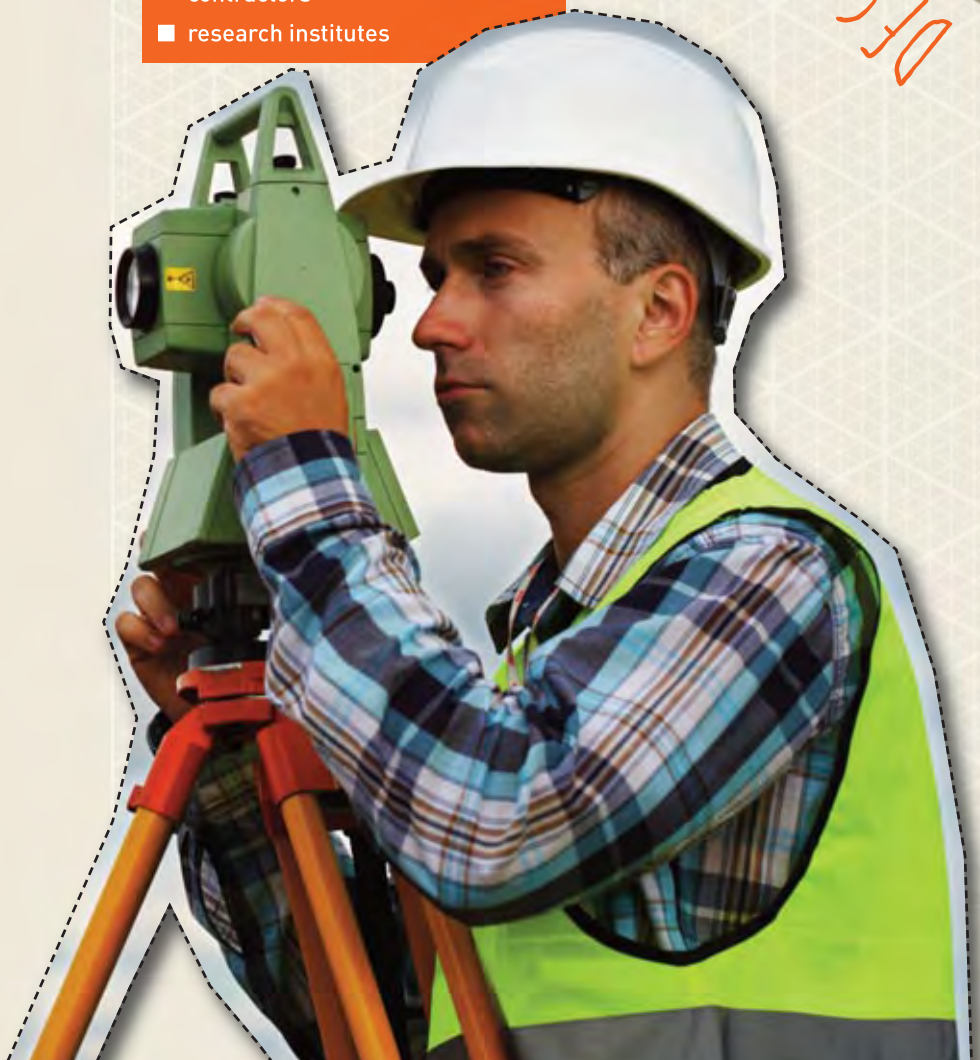
Love of problem-solving
Creative thinking
Analytical mind
Team work
Communication

DESIGNING THE WORLD AROUND US

Where do civil engineers work?

Civil, structural and environmental engineers can find work in many areas, including:

- the construction industry
- local authorities
- consultancies, architects and contractors
- research institutes



"I pride myself that every day I work, I influence the quality of people's lives. Whether it be building bridges, roads, tunnels, or a water treatment works – you influence people's lives, and invariably for the better."

Cormac Bradley, civil engineer

BIOMEDICAL ENGINEERING

Biomedical engineers love a challenge!

Biomedical engineers use their problem-solving skills to...

- Design, develop and test new medical instruments and devices.
- Research new materials for implants, prosthetics and medical products.
- Develop technologies to help people with disabilities.
- Advise and oversee the best use of medical equipment in hospitals.
- Research health problems such as disease and degeneration.

WHAT IS IT?

BIOMEDICAL ENGINEERS DEVELOP TECHNOLOGIES AND EQUIPMENT TO HELP SAVE PEOPLE'S LIVES AND IMPROVE THEIR HEALTH.

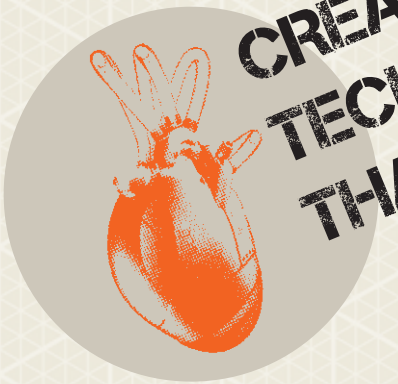
THE DETAILS

What do you get when you combine engineering with biology and medicine? Biomedical engineers apply engineering principles to healthcare systems, developing life-enhancing equipment and technologies such as artificial limbs, pacemakers, lasers for eye surgery, heart stents and contact lenses. Ireland is home to 250 medical technology companies, employing 25,000 people. Some 80% of the world's heart stents are produced here, along with 50% of ventilators and 33% of contact lenses. Biomedical engineers can specialise in research, design or development, and may work in labs, hospitals or industry.

What's needed?

Love of problem-solving
Creative thinking
Analytical mind
Team work
Communication

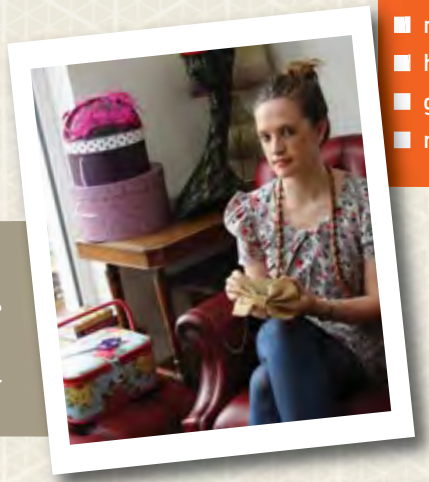
CREATING TECHNOLOGIES THAT SAVE LIVES



Where do biomedical engineers work?

Biomedical engineers are in demand in many areas, including:

- medical device companies
- hospitals and healthcare facilities
- government bodies
- research institutes



"I know when I go into work in the morning that I am helping someone's life. People are using our products all over the world."
Claire Lillis, Mechanical Design Engineer

CHEMICAL AND PROCESS ENGINEERING

Chemical and process engineers love a challenge!

Chemical and process engineers use their problem-solving skills to...

- Develop new, efficient manufacturing methods for products, from paint to food.
- Research new methods for the safe and efficient mass production of medicines.
- Design and construct chemical manufacturing plants.
- Develop new fuel supplies from renewable resources.
- Design safety procedures to be used by workers in chemical factories.

WHAT IS IT?

CHEMICAL ENGINEERS DEVELOP THE INDUSTRIAL PROCESSES USED TO MAKE EVERYDAY PRODUCTS SUCH AS FOOD, DRINK, DRUGS, COSMETICS, PLASTICS AND ELECTRONICS.

THE DETAILS

Chemical and process engineers try to keep up with modern society's growing demand for new products and processes.

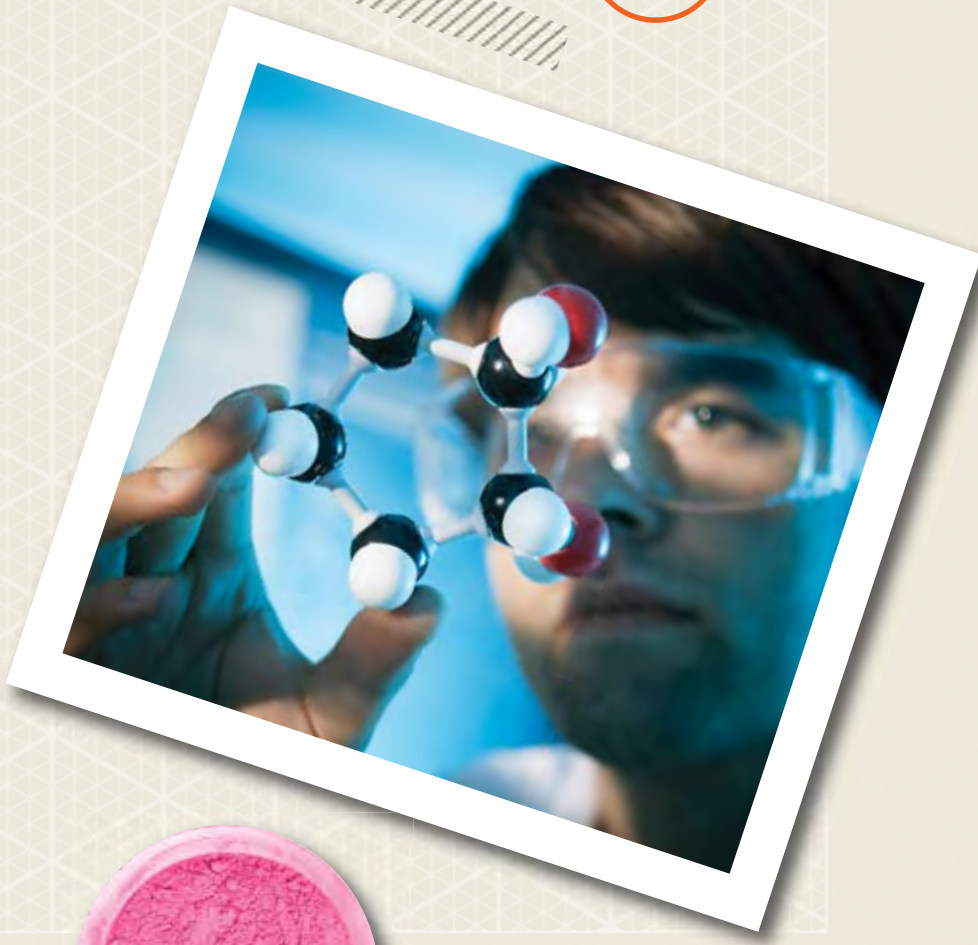
A chemical engineer can be involved in all kinds of industrial process developments, from the large-scale manufacture of medicines to the design of water treatment plants to researching new compounds for cosmetics.

Ireland is the largest exporter of pharmaceuticals in the world. Around 120 international pharmaceutical companies have bases in Ireland, including nine of the top 10 global pharma companies.

What's needed?

Love of problem-solving
Creative thinking
Analytical mind
Team work
Communication

ENGINEERING THE CHEMISTRY OF EVERYDAY LIFE

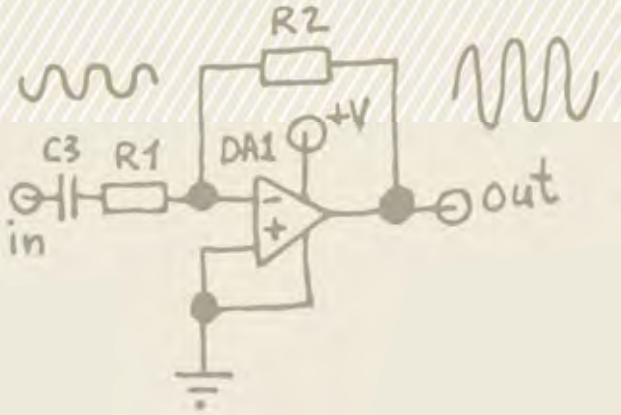


Where do chemical engineers work?

Chemical and process engineers can find work in many areas, including:

- manufacturing industry
- healthcare and food companies
- research institutes
- government agencies

ELECTRICAL ENGINEERING



Electrical engineers love a challenge!

Electrical engineers use their problem-solving skills to...

- Design electrical systems to power vehicles, aircraft and buildings.
- Find sustainable ways to generate power on a large scale.
- Create electrical systems for entertainment and communication devices such as mobile phones and games consoles.
- Develop electrical systems to operate industrial robots.

WHAT IS IT?

ELECTRICAL ENGINEERS HARNESS THE POWER OF ELECTRICITY TO MOVE THE WORLD AROUND US.

THE DETAILS

Electricity is a powerful natural force. Electrical engineers develop all kinds of systems and products that harness, distribute and use electricity, from large power plants to building wiring to household appliances.

These engineers are challenged with generating electricity in an efficient and environmentally friendly way. And once generated, the electricity has to be distributed safely and in a way we can use it.

Electrical engineers interact with electricity using many tools, from simple voltmeters to sophisticated software tools.

What's needed?

Love of problem-solving
Creative thinking
Technical mind
Team work
Communication

POWERING OUR WORLD

Where do electrical engineers work?

Electrical engineers can find work in many areas, including:

- industry
- consultancies
- government bodies
- research institutes

ELECTRONIC ENGINEERING

Electronic engineers love a challenge!

Electronic engineers use their problem-solving skills to...

- Design cutting-edge consumer gadgets such as virtual reality headsets or augmented reality glasses.
- Improve navigation control systems for aircraft, ships and trains.
- Enhance the design of medical devices such as hearing aids or pacemakers.
- Develop high-speed microchips to make mobile devices run faster and more efficiently.
- Design artificial intelligence systems for computers and devices.

WHAT IS IT?

ELECTRONIC ENGINEERS DESIGN AND DEVELOP THE ELECTRICAL AND ELECTRONIC EQUIPMENT WE USE EVERY DAY, FROM MOBILE PHONES TO MICROWAVES.

THE DETAILS

Electronic engineers try to improve our everyday lives by making innovative equipment for use in communications, healthcare, computing and entertainment. Using a combination of hardware and software skills, these engineers research, design and test new electronic products, from MP3 players to medical devices. Electronic engineers also develop high-tech information systems for use in areas like navigation control, weather forecasting and industrial robotics. They can also work on microelectronics – the design of very small electronic parts for use in circuits or chips.

What's needed?

Love of problem-solving
Creative thinking
Technical mind
Team work
Communication

ENHANCING OUR EVERYDAY LIVES

Where do electronic engineers work?

Electronic engineers can find work in many areas, including:

- industry
- consultancies
- government bodies
- research institutes

BIOSYSTEMS, AGRICULTURE & FOOD ENGINEERING

Biosystems, agriculture and food engineers love a challenge!

Biosystems, agriculture and food engineers use their problem-solving skills to...

- Improve and protect water, soil and air quality.
- Design technology to make the production and processing of food more efficient.
- Maintain and extend the shelf life of food, through enhanced packaging.
- Develop new farming and industrial machinery to harvest raw materials.
- Create renewable energy resources and new systems for sustainable development.
- Research new methods for growing food in harsh environments, including outer space.

WHAT IS IT?

BIOSYSTEMS, AGRICULTURE AND FOOD ENGINEERS DESIGN SYSTEMS TO DELIVER HIGH-QUALITY, SAFE AND ECONOMICAL FOOD TO CONSUMERS.

THE DETAILS

All aspects of the food chain are of concern to biosystems, agriculture and food engineers – from environmental protection to food production to food distribution.

These engineers face serious challenges in a world with an increasing population, shrinking resources and ever-growing demands for food and energy.

Biosystems, agriculture and food engineers tackle issues such as how to develop renewable energy resources, and how to process, package and store food efficiently.

What's needed?

Love of problem-solving
Creative thinking
Analytical mind
Team work
Communication

Engineering the food chain

Where do biosystems, agriculture and food engineers work?

Biosystems, agriculture and food engineers can find work in many areas, including:

- food and drink industry
- research institutes
- agricultural and environmental agencies
- government bodies

COMPUTER AND SOFTWARE ENGINEERING

Computer and software engineers love a challenge!

Computer and software engineers use their problem-solving skills to...

- Make the internet safer through developing enhanced security systems.
- Create new hardware for the mobile, gaming and entertainment industries.
- Design chips and microprocessors to make computer systems run faster and more efficiently.
- Design software apps for use on mobile devices and corporate networks.
- Improve healthcare systems through the design of new diagnostic tests and equipment.

WHAT IS IT?

COMPUTER AND SOFTWARE ENGINEERS DESIGN AND DEVELOP HARDWARE, SOFTWARE AND INFORMATION SYSTEMS FOR COMPUTERS AND MOBILE DEVICES.

THE DETAILS

Computer and software engineers devise the hardware and software that run the ever-evolving world around us, from communications and entertainment to transport and healthcare systems. These engineers are at the forefront of emerging technology, whether designing a new MP3 player or games console, developing new microchips and processors, or working on the latest operating systems or security software.

Software developers can work on projects ranging from smartphone apps to payroll systems, environmental monitoring systems to cloud computing. Ireland is now the biggest exporter of software in the world, and nine of the top 10 software companies have a presence here. The technology sector as a whole employs around 105,000 people across Ireland.

What's needed?

Love of problem-solving
Creative thinking
Technical mind
Team work
Communication

CREATING THE INFORMATION SYSTEMS THAT RUN THE WORLD

Where do computer and software engineers work?

Ireland currently has a shortage of software engineers, with many companies looking abroad to fill vacancies. Computer and software engineers can find work in many areas, including:

- industry
- consultancies
- government bodies
- research institutes

"We write software that gets deployed in games and played by millions of people around the world every day. I love that we get to build things that are used."

Morgan Brickley, software engineer

AERONAUTICAL ENGINEERING

Aeronautical engineers love a challenge!

Aeronautical engineers use their problem-solving skills to...

- Create new methods of transport to keep up with growing demand.
- Improve the safety, speed and efficiency of air travel, while reducing air and noise pollution.
- Develop new kinds of rockets for space exploration and travel.
- Improve the design and safety of military aircraft, while reducing fuel consumption.
- Enhance navigation, control and communications systems for pilots.

WHAT IS IT?

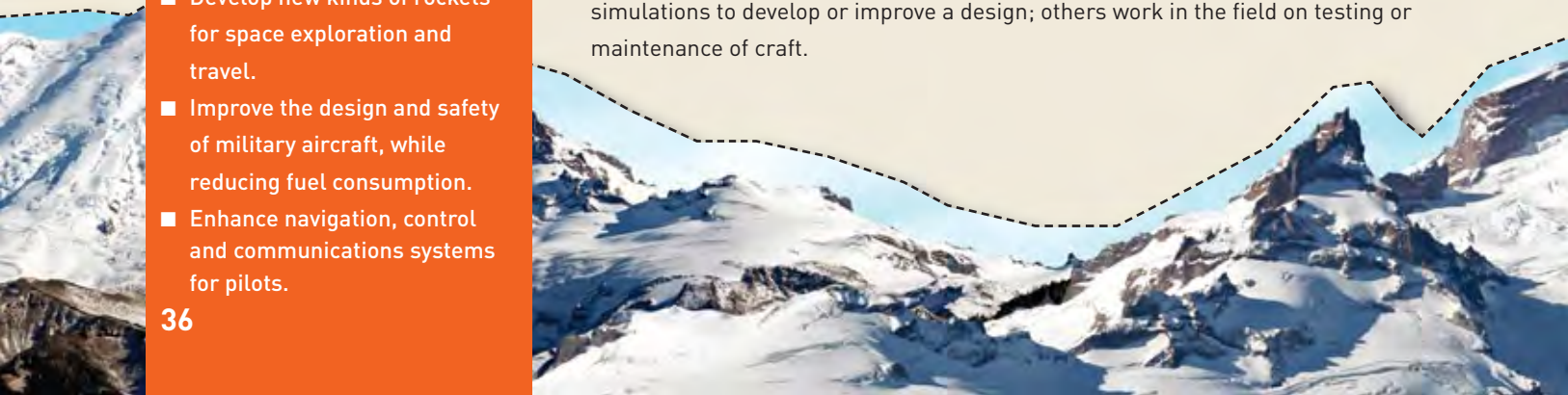
AERONAUTICAL ENGINEERS DESIGN, MAKE AND TEST ANYTHING THAT TRAVELS THROUGH THE AIR – FROM ROCKETS TO DRONES.

THE DETAILS

Aeronautical engineers, also known as aerospace engineers, apply their knowledge of physics, aerodynamics and mechanics to design and build airplanes, helicopters, missiles, satellites and spacecraft.

Team work is essential to the production of any aircraft, and each engineer works on their specialist area – from design of a new craft, to flight testing, to maintenance of navigation systems.

Some aeronautical engineers are based in the office, using maths and computer simulations to develop or improve a design; others work in the field on testing or maintenance of craft.



WHERE IDEAS TAKE FLIGHT

Where do aeronautical engineers work?

Aeronautical engineers can find work in many areas, including:

- commercial aviation industry
- government defence forces
- research institutes
- space exploration centres

What's needed?

Love of problem-solving

Creative thinking

Analytical mind

Team work

Curiosity

BUILDING SERVICES ENGINEERING

What's needed?

Love of problem-solving

Creative thinking

Technical mind

Team work

Communication

Building services engineers love a challenge!

Building services engineers use their problem-solving skills to...

- Develop new energy-saving systems for buildings.
- Design safer fire escape routes for structures.
- Enhance transport systems in large complexes, such as shopping centres.
- Roll out high-tech communications networks for industry.
- Ensure compliance with building safety laws and regulations.
- Manage the lifecycle of requirements for a building over time.

WHAT IS IT?

BUILDING SERVICES ENGINEERS BRING LIFE TO BUILDINGS, PROTECTING THE PEOPLE WHO PASS THROUGH AND ENHANCING THEIR EXPERIENCE OF THE STRUCTURE.

THE DETAILS

Building services engineers are responsible for the design, installation and maintenance of all the services required in any kind of building, from a home to an office block to a cinema.

These services include water, heating, ventilation, air conditioning, communications networks, transport and electricity, as well as safety and security systems such as fire detection, escape routes, CCTV and alarms. These services are needed for new buildings and also for retrofitting – extending the life of a building or bringing an old building back to life, e.g., when converting a warehouse into apartments.

Building services engineers are also challenged to make buildings as energy efficient as possible.

These engineers often work on large projects with other professionals such as architects, structural engineers and quantity surveyors.

IMPROVING OUR EVERYDAY ENVIRONMENT

Where do building services engineers work?

Building services engineers can find work in many areas, including:

- construction industry
- consultancies, architects and contractors
- manufacturing industry
- government agencies

MANUFACTURING AND INDUSTRIAL ENGINEERING

WHAT IS IT?

MANUFACTURING AND INDUSTRIAL ENGINEERS OVERSEE THE COMPLEX PROCESS OF MAKING THINGS ON A LARGE SCALE.

Manufacturing engineers love a challenge!

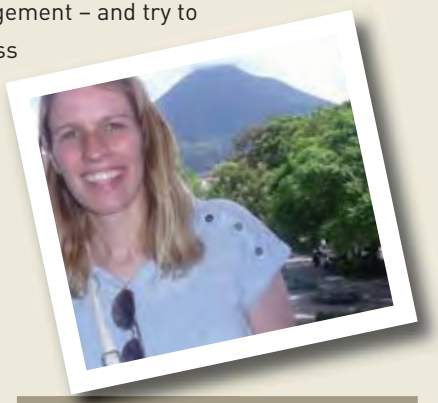
Manufacturing and industrial engineers use their problem-solving skills to...

- Analyse complex systems to gain insight into system failures, productivity blockages, quality issues or safety challenges.
- Inspire teams comprised of different people to work together toward a common goal, and understand the needs of each part of the team.
- Research the latest technological advances and work out how to implement them into existing processes.
- Design efficient, safe and productive factory layouts.
- Design and develop leading-edge machinery to produce components.

THE DETAILS

Manufacturing and industrial engineers, sometimes known as systems engineers, are masters of problem-solving. They look at the entire process involved in manufacturing and distributing a product – from the raw materials used, to budgeting, to safety, to supply chain management – and try to make the process more efficient, faster, less wasteful, and less costly.

Manufacturing and industrial engineers need to be able to work well with many different groups of people, including engineers from other disciplines.



What's needed?

Love of problem-solving
Creative thinking
Technical mind
Team work
Communication

"Engineering gives you the tools to problem-solve and allows you to work in any area from producing a simple water filter in the African desert to building a rocket to send people to Mars."

Elaine Doyle,
manufacturing engineer

MAKING ON A GRAND SCALE

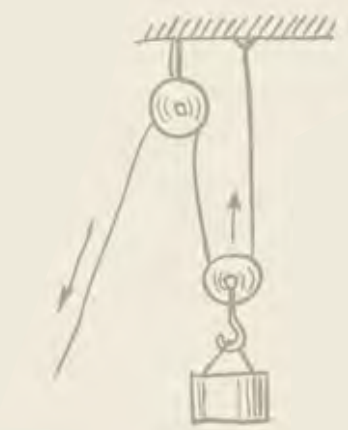
Where do manufacturing engineers work?

Manufacturing and industrial engineers can find work in many areas, including:

- manufacturing and logistics industry
- consultancies
- research institutes
- government agencies

OTHER DISCIPLINES

THERE ARE SEVERAL OTHER TYPES OF ENGINEERING DISCIPLINE. REVIEW EACH COURSE DESCRIPTION CAREFULLY ON THE COLLEGE WEBSITE OR PROSPECTUS, AND CONTACT THE COLLEGE DIRECTLY IF YOU NEED MORE INFORMATION.



MECHATRONIC OR ELECTROMECHANICAL ENGINEERING

Mechatronics combines mechanical engineering, electronic engineering and software engineering to design intelligent machines, such as robots and smart buildings.

MARINE ENGINEERING

Marine engineering involves the design, manufacture and maintenance of equipment used at sea and on board ships.

MATERIALS ENGINEERING

Materials engineers develop new materials for engineering applications and improve existing materials, such as polycarbonate and graphene.

ENERGY ENGINEERING

Energy engineers aim to increase energy efficiency and develop renewable sources of energy.

"Water impacts every aspect of our lives. It is inspiring to be working towards meeting future challenges and developing a water service that future generations can be proud of."

Róisín Bradford, civil engineer

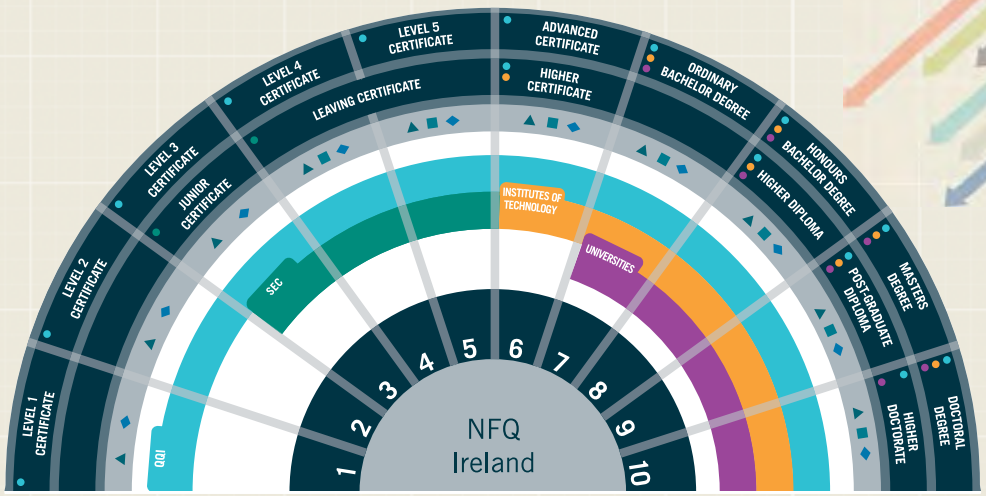
WHAT DOES LEVEL 6, 7, 8 AND 9 MEAN?

ENGINEERING COURSES ARE AVAILABLE AT A RANGE OF LEVELS, IN LINE WITH THE NATIONAL FRAMEWORK OF QUALIFICATIONS. THE NFQ PROVIDES A WAY TO COMPARE QUALIFICATIONS, AND TO ENSURE THAT THEY ARE QUALITY ASSURED AND RECOGNISED AT HOME AND ABROAD.
(VISIT NFQ.IE FOR MORE DETAILS.)

Each level has different entry requirements and leads to a different qualification.
Level 6 is usually a two-year course that leads to a Higher Certificate or a National Certificate. Level 7 is generally a three-year course that results in an Ordinary degree. Level 8 is normally a four-year Honours degree, while Level 9 is five-year programme that leads to a Masters degree.
Universities usually offer Level 8, 9 and 10 courses, while Institutes of Technology (ITs) can offer Level 6, 7, 8, 9 and 10.

Courses are usually structured so that a student can start at one level and move onwards over time. Level 6 and 7 students generally have an option to transfer to Level 7 and 8 after successful completion of their programmes.
So a student who starts at Level 6 can eventually progress to an Honours, Masters or even a Doctoral degree. This structure also means you can move between colleges over time.
Courses at Level 6 or Level 7 usually do not require Higher Level maths.

Check what level your course is before applying



AWARDING BODIES

Quality and Qualifications Ireland (QQI) makes awards in further and higher education and training

SEC - State Examinations Commission *(Department of Education and Skills)*

Institutes of Technology

Universities

AWARDS IN THE FRAMEWORK

There are four classes of award in the National Framework of Qualifications:

Major Awards: named in the outer rings, are the principal class of awards made at a level

Minor Awards: are for partial completion of the outcomes for a Major Award

Supplemental Awards: are for learning that is additional to a Major Award

Special Purpose Awards: are for relatively narrow or purpose-specific achievement

WHAT'S A CHARTERED ENGINEER, AN ASSOCIATE ENGINEER AND AN ENGINEERING TECHNICIAN?

The titles are awarded by Engineers Ireland, the representative body for professional engineers in Ireland, following an application and assessment process. The assessment takes into account your qualifications and your professional experience. In general, a Level 9 qualification is needed for the title of Chartered Engineer, Level 7 is required for the title of Associate Engineer, and Level 6 can lead to a Technician title. There are a number of routes to

NFQ LEVEL	QUALIFICATION	PROFESSIONAL TITLE
6	Higher Certificate	Engineering Technician
7	Ordinary Bachelor Degree	Associate Engineer
8	Honours Bachelor Degree	
9	Masters Degree	Chartered Engineer
10	Doctoral Degree	

CHARTERED ENGINEER, ASSOCIATE ENGINEER AND ENGINEERING TECHNICIAN ARE REGISTERED TITLES THAT FORMALLY RECOGNISE AN ENGINEER'S PROFESSIONAL COMPETENCE.

each title, and real-world experience is taken into account in applications for titles. The application process is more straightforward if your qualification is from an accredited course.

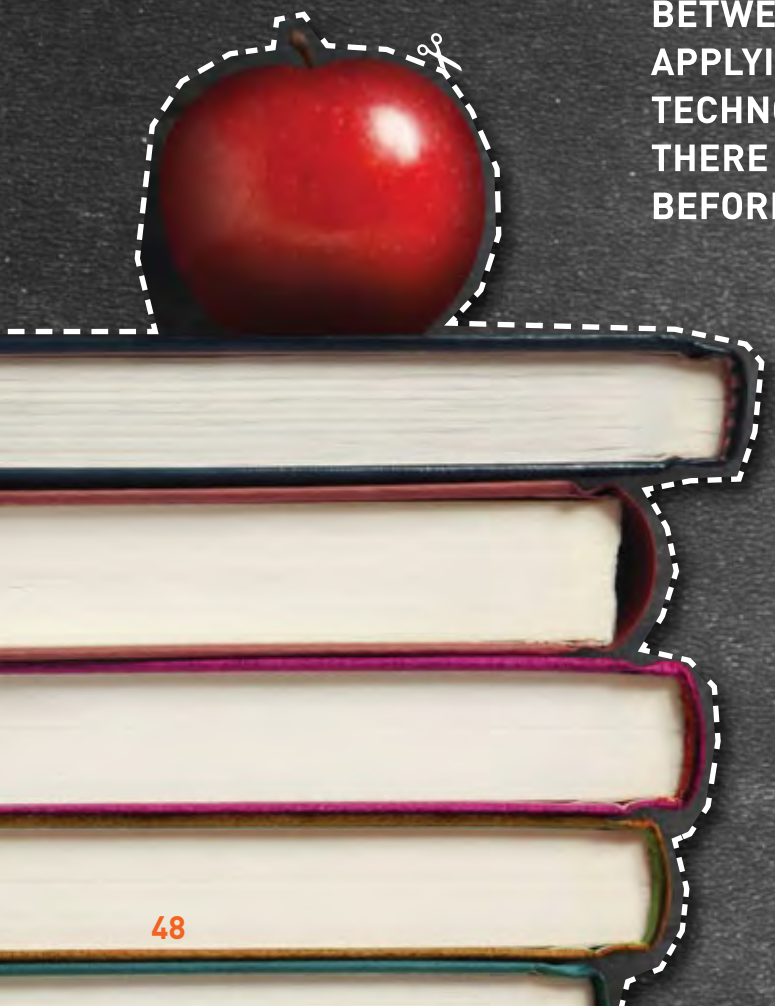
The three titles signify varying levels of professional competency. Employers often seek certain titles and may attribute greater responsibilities, more senior roles and even higher pay to an engineer with a title, especially to Chartered Engineers.

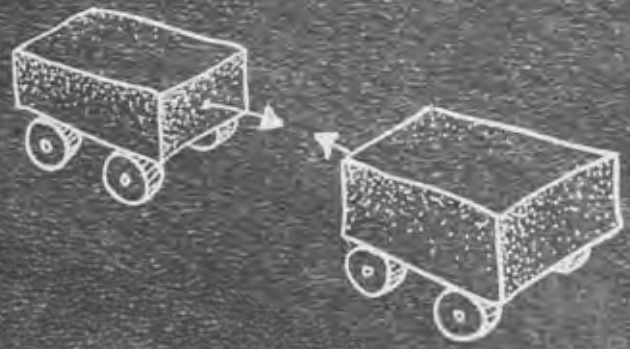
If someone is a Chartered Engineer, it means they have been assessed by their peers as "professionals delivering the highest standards of quality, expertise and innovation to serve the needs of society while ensuring public health and safety". Chartered Engineers are expected to adhere to the Engineers Ireland code of ethics. The title is internationally recognised and, under Irish law, certain engineering work is reserved for Chartered Engineers.

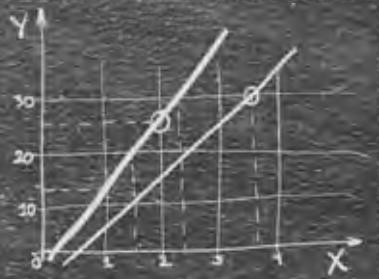
For more on registered titles, visit
engineersireland.ie/Membership/Registered-Titles.aspx

WHAT'S THE DIFFERENCE BETWEEN A UNIVERSITY AND AN INSTITUTE OF TECHNOLOGY?

MANY STUDENTS STRUGGLE TO DECIDE BETWEEN APPLYING TO UNIVERSITY AND APPLYING TO ONE OF THE MANY INSTITUTES OF TECHNOLOGY (ITS) AROUND THE COUNTRY. THERE ARE MANY FACTORS TO CONSIDER BEFORE MAKING UP YOUR MIND.







$$S_n = \frac{b_1(1-q^n)}{1-q} = \frac{b_1 - b_n q}{1-q}$$

Try to find out as much as possible about each institute before applying. If you can, attend Open Days, read the college website, and talk to graduates or current students.

Apart from academic considerations, your decision may be influenced by factors like geography (how far away from home is the college?), cost (how expensive is the course?) and size (how big is the college? Will I easily be able to make new friends?).

In terms of engineering at third level, the most important factor is to make sure your chosen course – whether at university or IT – is accredited by Engineers Ireland. (See the section on accreditation.) Check the Level of the course also. (See the section on levels.)

While many universities and ITs offer the same qualifications (e.g., Bachelor of Engineering), the education experience can differ between institutes. Universities tend to focus more on the theoretical aspects of engineering education, especially in the first years of a degree. ITs tend to take a more practical approach, incorporating more workshops and hands-on projects from the start.

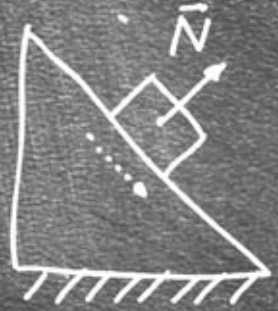
Class sizes are generally smaller at ITs, and the number of lecturers per student is usually higher.

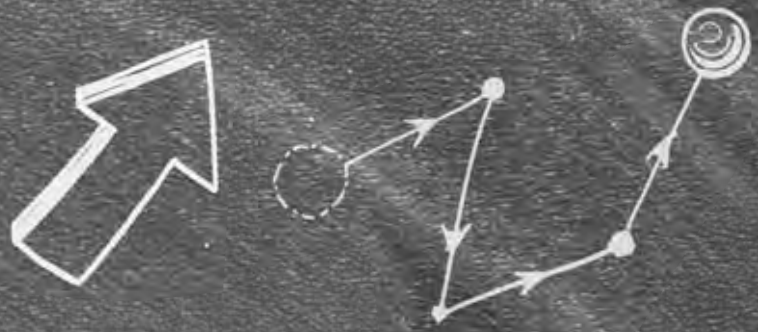
A certain amount of collaborative team work – working together in small groups on projects - is required on all courses.

This is a good way to get to know your classmates and reflects the real working life of an engineer, who must collaborate with different teams to deliver projects.

Many courses offer work placement opportunities or community-based projects in later years.

Research each college before applying





ABOUT THE ENGINEERS IRELAND STEPS PROGRAMME

ENGINEERS IRELAND'S STEPS PROGRAMME ENCOURAGES PRIMARY AND POST-PRIMARY STUDENTS TO EXPLORE THE WORLD OF ENGINEERING AND SCIENCE.

STEPS is a strategic partner of the national SFI (Science Foundation Ireland) Discover programme, and is supported by the Department of Education and Skills and a number of major engineering employers.
The programme aims to promote a positive attitude toward STEM (science, technology, engineering and maths) among students, parents and teachers, and to raise awareness and understanding of engineering as a career option.

The STEPS programme runs a number of initiatives year-round:

FREE SCHOOL VISITS PROGRAMME

The STEPS team matches enthusiastic industry volunteers with local schools around the country. Volunteer engineers visit primary and post-primary students in their own classroom, showcasing engineering as an exciting and diverse career.

To apply for a school visit, go to steps.ie

TRANSITION YEAR PROGRAMME

Hosted by a number of colleges around the country, the Engineering Your Future programme for Transition Year students provides a week of exposure to the various engineering disciplines. Attending students gain a meaningful, practical insight into engineering at third level and as a career – interacting with lecturers and graduates, taking part in workshops and meeting engineers during industry visits. Applications open each January, and the programme runs in May.

For details of the Engineering Your Future programme, visit steps.ie

ENGINEERING YOUR FUTURE
TRANSITION YEAR PROGRAMME

CAREER EVENTS

STEPS invites volunteer engineers to participate in career events aimed at second-level students, to talk to students directly about engineering as a career. Look out for our volunteers at a career fair near you.

ONLINE RESOURCES

A range of free resources for students and teachers are hosted on steps.ie and engineersweek.ie, including:

- Maths tutorial videos for Junior and Senior Cycle students
- Maths worksheets to support teachers in Project Maths lesson planning
- Career videos featuring young engineers discussing their work
- A complete guide to the engineering disciplines

Visit steps.ie and engineersweek.ie to access online resources

ENGINEERS WEEK

Engineers Week is an annual series of events that aims to raise the profile of engineering among students, parents, teachers and the general public. Engineers Week usually takes place every February, with hundreds of events happening across the country in schools, companies, museums and libraries. Learn more about engineering and enter a competition to win a prize.

For details visit engineersweek.ie

For more information on the STEPS programme, visit steps.ie

Got a question? Email steps@engineersireland.ie

EngineersWeek

USEFUL RESOURCES

INFORMATION ABOUT ENGINEERING

steps.ie	Engineering guides, career videos, maths resources, teacher support
engineersweek.ie	Engineering events, classroom activities, resources for Engineers Week
smartfutures.ie	Information on STEM careers, videos, profiles of STEM professionals
engineersireland.ie	Accreditation of engineering courses, guide to engineering titles
engineersjournal.ie	News from the engineering industry in Ireland

GENERAL RESOURCES

accesscollege.ie	Information on the HEAR and DARE schemes, which offer access to college for students from disadvantaged backgrounds and students with disabilities, respectively
alison.com	Free maths video tutorials for Junior and Senior Cycle students
careersnews.ie	Information for career guidance counsellors
careersportal.ie	Information for career guidance counsellors and career seekers
nfq.ie	A guide to the National Framework of Qualifications
qualifax.ie	Database of courses available in Ireland
studentfinance.ie	Information on financial support for further and higher education

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SMART FUTURES
EXPLORING CAREERS

SFI Discover
Science Foundation Ireland

www.thinkmedia.ie