Department of Chemical Engineering

Undergraduate programmes

MEng / BEng programmes in:
Chemical Engineering
Biochemical Engineering
Why Chemical Engineering?

Chemical engineering is fundamental to everyday life as many of the products we use daily, like food, water, clothes and fuel, rely on it. It is all about creating useful products from raw materials using safe, environmentally-friendly and economical methods, for example, petrol and nylon from oil, drinking water from sea water, and antibiotics from bacteria.

Engineers use specialist scientific knowledge, analysis and innovative thinking to come up with creative solutions to real-world problems. They design and develop new chemical processes and products, as well as improving the performance of existing ones. It is their understanding of fundamental science and the properties of materials that make engineers so much in demand across the world.

The transferable skills that students develop at university make graduate engineers employable across a broad range of industries. Chemical engineering is currently the third highest-paid profession in the UK behind dentistry and medicine.
**MEng (Hons) programmes in Chemical Engineering**

**Programme options**
Bath offers four-year MEng and three-year BEng programmes in chemical engineering and biochemical engineering, fully accredited by IChemE. Programmes are designed to give a thorough grounding in the principles and practices of chemical engineering, as well as in the topics which underpin professional chemical engineering, ranging from the pure sciences through to information technology, laboratory, and design, communication and management skills.

**Programme structure**
All programmes have a common first two years of core science, mathematics and chemical engineering. These first two years give you a strong foundation in all areas of chemical engineering so that your specialist knowledge is not at the expense of flexibility. After these first two years you have the freedom to choose your area of specialism. All programmes offer an optional, paid placement year in industry, which is increasingly considered a recruitment tool by prestigious employers.

**Teaching and learning**
Teaching and learning is mainly through lectures, tutorials, students’ private study, laboratory work and design projects. Plant visits and specialist external and internal speakers also contribute to teaching and learning.

### Chemical Engineering degree programme structure

<table>
<thead>
<tr>
<th>MEng 5 Year Sandwich Chemical Engineering/ Biochemical Engineering</th>
<th>MEng 4 Year Chemical Engineering/ Biochemical Engineering</th>
<th>BEng 4 Year Sandwich Chemical Engineering</th>
<th>BEng 3 Year Chemical Engineering</th>
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<tbody>
<tr>
<td><strong>Year 1</strong></td>
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<tr>
<td>Physical chemistry, biology &amp; bioprocesses, chemical engineering principles, chemical engineering skills &amp; practice 1, instrumentation &amp; control, transport phenomena, engineering chemistry, mathematics 1 and 2, design project.</td>
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<td><strong>Year 2</strong></td>
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<tr>
<td>Engineering thermodynamics, reaction engineering, transport phenomena, chemical engineering skills and practice 2, process design &amp; safety, management, separation processes, process dynamics, modelling &amp; control, particle technology.</td>
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<td><strong>Year 3</strong></td>
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<tr>
<td>Environmental management, management &amp; economics, transport phenomena, intermediate design project mathematical modeling, research project (carried out in Bath, UK industry or abroad).</td>
<td>Industrial placement</td>
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<td><strong>Year 4</strong></td>
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<tr>
<td>Industrial placement</td>
<td>Advanced biomedical engineering, advanced chemical engineering, product design, final design project and options from the list.</td>
<td>Advanced chemical engineering, advanced biochemical engineering, transport phenomena, environmental management, research &amp; design project.</td>
<td>Graduation Year 4</td>
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<tr>
<td><strong>Year 5</strong></td>
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<tr>
<td>Advanced biomedical engineering, advanced chemical engineering, process and product design, final design project and options</td>
<td>Options for Year 4 and Year 5 include: Legislation &amp; waste management, biomedical engineering, advanced materials and porous solids, micro-process engineering and molecular biochemical engineering.</td>
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<td>Graduation Year 5</td>
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Year one programme units

**Chemical engineering principles (conservation, transformation & separation)**
Introduces students to some of the most fundamental aspects of chemical engineering and provides an opportunity for students to apply their scientific knowledge to real-life challenges. Covers the basic engineering calculations required to design and operate reactors and their separation systems, such that mass and energy are conserved and used effectively.

**Chemical engineering skills & practice 1**
Involves hands-on experiments in our purpose built pilot hall including distillation, fermentation, heat exchanges and a pilot-scale pumping circuit.

**Physical chemistry**
Learn the essential physical chemistry tools to understand the physical principles applied to chemical processes, such as heat generated in a chemical process, fluid flowing along pipes or the separation of mixtures and solutions.

**Biology & bio-processes**
Understand the concepts of basic biology and biochemistry that are of relevance to develop bioprocesses that lead to products of industrial importance. For example, understand the structure and properties of lipids to design and develop a reactor for the generation of biofuels, a sustainable alternative to fossil fuels.

**Transport phenomena 1**
Understand the principles of fluid mechanics in relation to the processing of foods, chemicals and petrochemicals (liquids and gases). Fluid mechanics is concerned with the effects of forces on fluids and these forces usually arise as a result of a pressure difference in the fluid system. Includes the principles of heat transfer, fluid flow and momentum transfer in pipes, fittings and various devices.

**Engineering chemistry**
Engineering Chemistry for chemical engineers focusses on fundamental concepts such as atomic structure and chemical bonding, then thermodynamic and kinetic factors in molecular synthesis and process design. The subjects are brought to life through case studies focusing on the interplay between chemistry and reaction engineering in reactor design.

**First year design project**
Introduces students to team working in the real world of chemical engineering design. Working in small teams, decisions must be made in areas of uncertainty, such that a realistic design for an oil refinery process unit can be prepared. Smart phones and social networking sites can become just as important as the textbook and spreadsheet in the struggle to get the job done. This unit reinforces why studying chemical engineering is so very different from studying chemistry.

**Mathematics 1**
A basic introduction to the mathematical skills necessary to tackle process engineering design applications, mainly involving calculus. This unit brings everybody up to the same level of knowledge, recognising the variety in the content of Mathematics courses in the previous school or college.

Facilities

Our Department building provides some of the most up-to-date facilities for chemical and biochemical engineering teaching and research in Europe. Our computing and laboratory facilities range from bench scale to pilot scale. They include:

- biolabs (up to Class II) and cold rooms
- manufacturing facilities for membranes and adsorbents for separating gases and vapours
- microchannel reactor fabrication
- an underground bunker for the improved oil recovery laboratory
- dedicated facilities for acid recovery and handling
- the ability to study materials in a supercritical fluid
- cells for high-pressure experiments.
Projects and practical work

All undergraduates take part in individual and group design tasks throughout their degree programme and use dedicated chemical and biochemical engineering laboratories. Projects enable students to learn how to combine science and maths to take science from bench scale to process scale. This level of project work and practical work simulates the reality of a graduate job.

From a design project applying the fundamentals of chemical engineering in the first year to semester long research and design projects in later years, projects can cover a wide range of subjects such as:

- tissue engineering
- nanotechnology
- catalysis
- green chemistry
- energy research
- drug delivery.

MEng students undertake a semester-long, full-time product and process design project in their final year. Product design is a business-orientated task concerned with the design of consumer goods. The process design involves designing a chemical or biochemical process plant to manufacture the product. It brings together all four years of study, providing students with the opportunity to apply knowledge and skills to produce a process design for a major production facility. These projects are often developed in conjunction with major engineering companies.

Recent final year projects have focused on:

- a bioartificial liver device
- anti-ageing cream
- genetically-engineered human protein drugs
- waste treatment processes for nuclear submarines
- the production of renewable energy and fuel.

“I chose to study chemical engineering at Bath because of the opportunity to do a semester abroad and an integrated industrial placement with my studies. The variety of sports clubs, societies and volunteering opportunities at Bath is staggering and a great way to make new friends. My year at Dow Corning, a leading silicone manufacturer in South Wales gave me perspective on what chemical engineers can do and allowed me to apply knowledge I’d learnt to the real world.”

Kristen Cherry, MEng (Hons) Chemical Engineering

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Kristen Cherry, MEng (Hons) Chemical Engineering

“The Department has a real community feel to it, everyone is friendly and I know that, if I need it, support is always on hand. I chose chemical engineering as I wanted to study a subject with ‘real life’ application and also liked how a range of subjects was covered in the degree.”

Jess Sepe, MEng (Hons) Chemical Engineering

CESA Chemical Engineering Student Association

The student society for chemical engineering is very active, organising site visits to major UK companies, but also organising plenty of social events, including sports days, football matches and pub quizzes. A favourite event of the year is the Department ball, which is popular with students outside of the Department as well.
Placements

Over 70% of our students choose to spend a placement year in industry with a typical salary of £15,000-£24,000. The placement year lasting 12 months and based in the UK enables the development of skills in a commercial environment and hands-on learning about sophisticated engineering systems. It is an excellent opportunity to make industry contacts, and is increasingly used as a recruitment tool by major companies.

Our dedicated Faculty placement team offers a comprehensive service to both students and employers to ensure a worthwhile placement for any student who chooses this option. During the placement period, our team make regular contact with students and employers to gather feedback, monitor progress and ensure student wellbeing.

Recent placement students have worked in:
- offshore oil and gas facilities
- nuclear plants
- refineries
- breweries
- pharmaceutical research and development
- fast moving consumer goods, such as deodorant and make-up.

“Carrying out a placement with Ultra Electronics PALS has provided me with invaluable work experience in an engineering company, which will definitely help me with job hunting once I have graduated. I have enjoyed working with a variety of different people and making new friends in the workplace, as well as being involved in major projects, which will be sold to customers in the near future. The University provided me with constant updates on placement places available; they also provided the necessary contact details and forms needed to apply for placement positions.”

Jonathan Woodfield, MEng (Hons) Chemical Engineering

“The Department of Chemical Engineering is excellent. The staff and lecturers are really kind, approachable and enthusiastic. The Department has excellent facilities and there is some very interesting research being conducted there. The semester long research project allowed me to determine whether I would enjoy a career in research, and was particularly useful when applying for jobs as the skills gained from this project could be applied to any research and development job.”

Alex Hepworth
MEng(Hons) Chemical Engineering, now working at DPS as a products engineer

“Working in a small global company like DPS, being part of the Sales & Proposals team provided me with the opportunity to gain a broad exposure to not only the technical and engineering side of the job but, more importantly, the managerial and commercial aspect of it. The advice and support given for finding an industrial placement are some of the distinct advantages of doing a degree at Bath.”

Reza Saeedi
MEng(Hons) Chemical Engineering
Chemical engineering is a degree that is well respected in industry and commerce. A chemical engineering degree will equip you with skills that are easily transferable and graduates invariably take on considerable responsibility within a few years of graduation. For this reason, job prospects are excellent and often involve the chance to reach senior managerial positions at a young age.

Chemical engineering is the third highest-paid profession behind dentistry and medicine, with an average graduate starting salary of £27,000 according to the Institution of Chemical Engineers.

Chartered Chemical Engineers make an average of £50,000, which can rise to £60,000.

The range of careers you might consider includes:

- providing clean water for developing countries
- helping to develop spacecraft
- producing beer or chocolate
- developing alternative and renewable fuels
- developing drugs and pharmaceuticals
- working on new areas of medical science.

Future careers given the advances in chemical engineering might be in hydrogen storage, electronics and communications and alternative fuels. In biochemical engineering, research is leading to better healthcare products, safer disposal of toxic waste, the development of artificial organs and prosthetics, producing vaccines and stem cell therapies.

Typical careers of our recent graduates include:

- **Plant management** - overall responsibility for a plant
- **Project engineering** - organising and running projects for other companies
- **Operations engineering** - ensure the process runs smoothly
- **Plant commissioning** - design and set up new processes
- **Consultancy** - developing specialised areas of processes
- **Economic analysis** - working in the financial sector
- **Marketing and management** - taking a new product to market
- **Research** - take a PhD and specialise in developing new technologies.

"With a shortage of skilled people and the potential for career growth, the sector is highly attractive for graduates. The median chemical engineering salary was £53,000 last year, with the best-paid chemical engineers found working in the oil and gas production sector where salaries are typically in excess of £70,000.

Formal graduate training schemes are a great route into the sector – look out for those accredited by IChemE as this guarantees quality and highlights which employers are committed to helping their employees become chartered chemical engineers.”

The Guardian online February 2013
http://careers.guardian.co.uk/what-chemical-engineer-does

"Laleham Healthcare has employed placement students exclusively from the University of Bath for the last six years. We have always found them to be students of a very high academic calibre, quickly adapting to a working environment”

Don Johnson, Operations Manager, Laleham Healthcare
Entry requirements

Mathematics and Chemistry are essential and another science is desirable. Typical offers include:

A levels:
AAA including Maths and Chemistry.

Preferred third subject:
- Physics
- Biology
- Further Mathematics

International Baccalaureate:
36 points overall, including 6 points in both Mathematics and Chemistry at Higher Level.

European Baccalaureate:
For MEng, 80% overall required with 80% in Mathematics and the Chemistry option.

Other qualifications:
We are happy to consider other recognised equivalent UK and international qualifications and work experience.

Offers may vary, for the most up-to-date information on entry requirements, please consult our online prospectus at www.bath.ac.uk/study

English language requirements

Non-native speakers of English may be required to provide additional evidence of their English language proficiency. Typical minimum English academic requirements include GCSE, GCE Advanced Level, IGCSE and Cambridge O level English language at Grade C or above. Additional English language tests may be required such as IELTS at 6.5 including 6.0 in each element or PTE Academic at 62 with no less than 59 in any element.

For full details, visit the international office web pages at www.bath.ac.uk/international

You can apply online through the UK national admissions system at www.ucas.ac.uk

Other useful links include:
www.whynotchemeng.com
www.iche.com
www.headstartcourses.org.uk

Contact us:
Department of Chemical Engineering
University of Bath
Claverton Down
Bath
BA2 7AY

Tel: +44 (0)1225 386338
Email: chem-eng@bath.ac.uk