

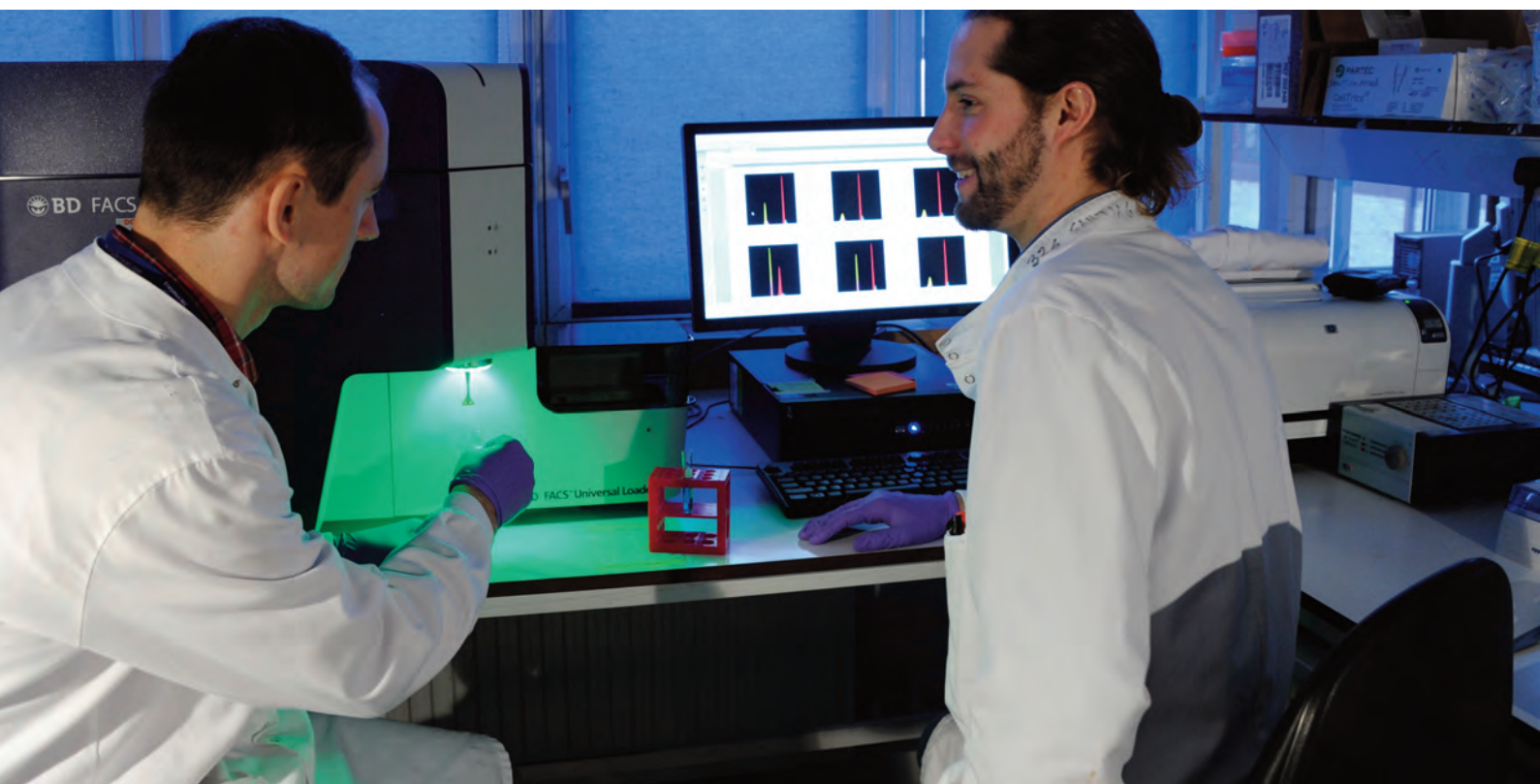


Department of Chemical Engineering and Biotechnology Graduate Studies



**UNIVERSITY OF
CAMBRIDGE**

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Welcome to the University of Cambridge

Department of Chemical Engineering and Biotechnology

Chemical engineering and biotechnology have key roles to play in global issues such as the environment, sustainability and healthcare.

The Department of Chemical Engineering and Biotechnology (CEB) identifies its strategic aim to 'fuse leading-edge biotechnology research with chemical engineering skills within an ethos of commercial awareness and exploitation'. Its research strategy targets sustainable reaction engineering, product engineering and healthcare technologies. We are committed to working at the interfaces of the underpinning science disciplines of engineering, chemistry, biology and physics. We create a unique multidisciplinary research environment where collaborations within the University and with external academic and industrial organisations can flourish.

The diversity in our department is a strength that facilitates the sharing of ideas and attracts international collaboration as we seek innovative solutions to global challenges in improving the quality of life, health and the environment.

We encourage exceptional and highly motivated graduates from all corners of the world to consider our range of engaging and stimulating study opportunities. Our innovative research, underpinned by a dynamic enterprise culture, spans the wide range of disciplines embodied by modern chemical engineering and biotechnology. Our commitment is to apply research for the benefit of society. We would like you to be part of our success in achieving this.



Professor Nigel Slater

Head of Department



Studying at Chemical Engineering and Biotechnology

Why study at CEB?

It is an exciting time to develop a career in chemical engineering and biotechnology and to apply your knowledge and skills to address the global problems faced by society today. Graduate study may lead to careers in areas as diverse as the control of carbon dioxide emissions to the development of new devices which seek to mimic biological organs and, as with many of our alumni, to leadership roles in academia and business across the globe.

The department offers a unique environment in which to undertake postgraduate study. Students join a vibrant research community staffed by world-leading interdisciplinary research scientists, many of whom have strong business skills as well as a keen interest in the education of the next generation of researchers and innovators. CEB is a relatively large department spread over three sites. It is comprised of some 50 postdoctoral researchers and close to 200 postgraduates. Individuals of almost 50 different nationalities bring a global perspective and diverse expertise, thus contributing to our world-class research output and reputation for academic excellence. Students enjoy close interactions with staff and fellow students and within and between research groups.

Research within the department is focused on key themes: Healthcare, Processes, Materials, Metrology, Modelling, Sustainability and Innovation. Research groups working in these specific research areas are listed on page 6. In the last UK Research Assessment Exercise, 85% of the department's research activity was rated as internationally excellent, placing CEB as the top ranked department in the country. Academic research undertaken here typically involves collaboration with other leading international universities and strong connections with industry. Research costs are supported in part by Government Research Councils and by a variety of industrial partners and multinational companies that invest in shared research interests and the application of emerging technologies.

The department is widely acknowledged for its entrepreneurial achievements and the successful integration of multidisciplinary research, commercial exploitation and management training. CEB spin-off companies have brought a range of patented products to market, including a functional food, next generation glucose sensors, novel therapies for the treatment of cancer and the diagnosis of disease as well as recycling and environmental technology solutions.



Study options

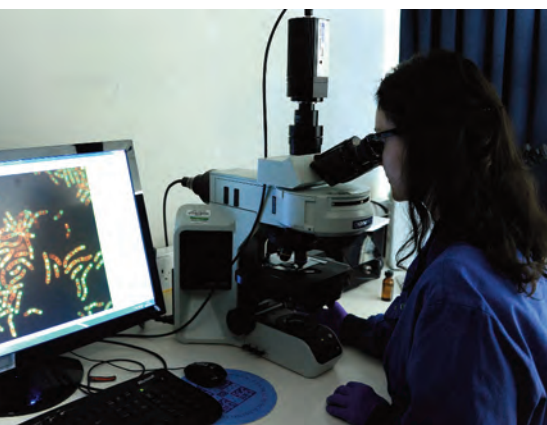
Students are invited to apply for any research or taught postgraduate degree programmes at CEB. We offer three-year research-based programmes leading to the award of **PhD in Chemical Engineering** or **Biotechnology**. The **MPhil in Chemical Engineering and Biotechnology** is a one-year research-based course which, upon successful completion, may count towards the entry requirements for a PhD programme.

For those choosing a taught degree course, we offer two Master's degrees: the **MPhil in Advanced Chemical Engineering (ACE)**, which includes a research component, and the **MPhil in Bioscience Enterprise (MBE)**. Both are professional practice courses that provide training in science and technology as well as business and management.

The University of Cambridge online Graduate Prospectus gives a full description of each of the courses, the entry requirements and funding opportunities:
www.admin.cam.ac.uk/students/gradadmissions/prospec/

Please note that all of our courses are full time. Participants must demonstrate a fluent command of the English language.

Degree options	Description	Entry requirements	Duration
Research studies	MPhil Chemical Engineering and Biotechnology Conduct fundamental and/or applied research in chemical engineering, chemical or biological science specialising in one of our declared research themes of Biotechnology, Measurement, Microstructure Engineering, Modelling and Processes. www.ceb.cam.ac.uk/mphilres	A 1st class or high 2.1 honours degree in a relevant subject. Chemical engineering, biological, physical or life science backgrounds are encouraged.	October – August
	PhD Chemical Engineering or Biotechnology Conduct fundamental and/or applied research in chemical engineering, chemical or biological science spanning across our declared research themes of Biotechnology, Measurement, Microstructure Engineering, Modelling and Processes. www.ceb.cam.ac.uk/phd	A 1st class or high 2.1 honours first degree or equivalent in a relevant subject. Chemical engineering, biological, physical or life science backgrounds are encouraged.	Three years Start in October, January or April
Taught courses	MPhil Advanced Chemical Engineering (ACE) Advanced Chemical Engineering with essential aspects of business administration. A five-month research project (not a taught element) complements the programme. www.ceb.cam.ac.uk/mphil	A 1st class or high 2.1 honours degree in Chemical Engineering or close equivalent.	October - August
	MPhil Bioscience Enterprise (MBE) Biotechnology and business professional practice course. Teaching covers the latest advances in biological and medical science, together with business management and the ethical, legal and regulatory issues associated with bringing scientific advances to market. www.ceb.cam.ac.uk/mbe	Excellent first degree in life or physical sciences, medicine, law, economics or allied disciplines.	October - June



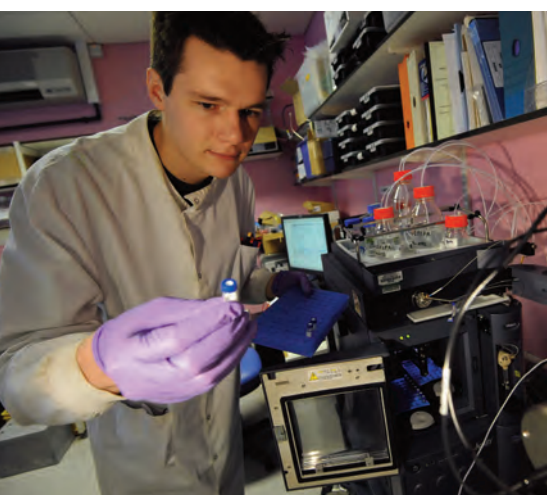
Research activities

Departmental research activities reflect the interdisciplinary nature of modern chemical engineering and biotechnology. Research is organised into the following themes that cover our contribution to grand challenges in the arena of chemical engineering and biotechnology:

Healthcare	Processes	Materials
Metrology	Modelling	Sustainability
Innovation		

Listed below are our research activities and the Principal Investigators who lead these research groups and laboratories:

- Adsorption on Porous Materials - Dr David Fairen-Jimenez
- Analytical Biotechnology - Prof Chris Lowe, Prof Lisa Hall
- Biochemical Engineering - Prof Howard Chase
- Bioscience Engineering - Prof Nigel Slater - in Cambridge Unit for Bioscience Engineering (CUBE) and Cambridge Unit for Responsive Biopolymers (CURB)
- Catalysis and Magnetic Resonance - Prof Lynn Gladden, Dr Mick Mantle, Dr Andy Sederman, Dr Patrick Barrie - in the Magnetic Resonance Research Centre (MRRC), the EPSRC National Centre for Nuclear Magnetic Resonance Imaging
- Cell and Organism Engineering - Prof Alan Tunnacliffe
- Colloidal Dispersions - Dr Alex Routh
- Combustion - Prof John Dennis
- Computational Modelling (CoMo) - Prof Markus Kraft
- Electrochemical and Micro Engineering - Dr Adrian Fisher - in the Centre for Research in Electrochemical Science and Technology (CREST)
- Fluids and Environment - Dr Silvana Cardoso
- Healthcare Biotechnology - Prof Chris Lowe - in the Institute of Biotechnology
- Laser Analytics - Prof Clemens Kaminski
- Molecular Microbiology - Dr Graham Christie
- Neuro-psychiatric Research - Prof Sabine Bahn - in the Cambridge Centre for Neuro-Psychiatric Research (CCNR)
- Paste, Particle and Polymer Processing Group (P4G) - Dr Ian Wilson, Dr Sarah Rough, Dr David Scott
- Process Systems Engineering - Dr Vassilios Vassiliadis
- Structured Materials - Dr Geoff Moggridge
- Process Systems Engineering - Dr Vassilios Vassiliadis
- Sustainable Reaction Engineering - Prof Alexei Lapkin
- Terahertz Applications Group (TAG) - Prof Lynn Gladden, Dr Axel Zeitler



For more information please go to: www.ceb.cam.ac.uk/research



Research events

Students enrolled on either research or taught programmes are invited to attend the department's science seminar programme career talks given by graduates. As students progress they are given training in preparing for practice in delivering poster and audiovisual presentations. PhD students regularly take part in research poster presentation and talks hosted by the department. Towards the end of their studies, the annual Research Conference provides later stage PhD students with a formal forum to present their findings to department colleagues, visiting academics and industrialists.

Students are encouraged to broaden their expertise by participation in a selection of options from the wide range of transferable skills development courses offered in the department and centrally by the University. Examples of these include information technology, project and time management training, communication skills and intellectual property awareness. For more information visit: www.skills.cam.ac.uk/

CEB also participates in the Industry Forum Initiative, a programme organised by Cambridge Enterprise and funded by the Engineering and Physical Sciences Research Council (EPSRC). These events have a workshop format, and aim to encourage early career researchers to think about the potential societal and economic benefits of their research and to understand how they may collaborate with industry. Among the companies that our talented researchers have interacted with are MedImmune and Kimberly Clark. As a result, new and fruitful collaborations are being explored and established, to help bridge the gap between industry and academia.

'On a professional level, it was exciting to be a part of a department and university with a reputation for excellence in research. On a personal level, the close-knit community atmosphere here made the department feel like a home away from home.'

*Dr Samantha Gooneratne,
former PhD student*



Course Overview

This unparalleled one-year, full-time taught Master's programme is for those seeking the advanced skills required by companies in which rapid change and interdisciplinary working is now standard practice. The MPhil ACE starts in the autumn of each year. The course is unique because:

- Candidates receive an education both in advanced aspects of Chemical Engineering and in essential areas of business administration, such as technology policy, company formation, finance and management, global economics and sustainable development;
- There is a management consultancy project for a UK client organisation, designed to develop professional problem-solving skills; and
- It offers conventional research experience at a leading academic institution.

Content

Students combine advanced chemical engineering studies with essential aspects of business administration. A wide range of science-based elective courses is also available. A five-month research project complements the programme.

Michaelmas and Lent Terms

Students take two advanced chemical engineering modules, the Management of Technology and Innovation module (run by the Judge Business School), two core chemical engineering modules, and five engineering/ business elective modules. The taught material

enhances basic knowledge on chemical engineering fundamentals, as well as offering experience of other science and business based disciplines. The modules are assessed by both examination and written coursework.

March – August

During this period, students undertake a full-time research project within the department. The research may include industrial collaboration. The project is assessed by seminar and dissertation.

Programme Objectives

The programme sets ambitious educational objectives for its students, including the development of:

- An advanced understanding of fundamental areas of chemical engineering;
- An understanding of essential areas of business administration, e.g. finance and management, technology policy, company formation and structure, global economics and sustainable development;
- Professional consultancy skills, including time management, teamwork and leadership abilities, whilst interacting with company personnel in order to obtain information effectively and define optimal outcomes for the client; and
- The ability to define, organise and undertake a research project, with possible extensive industrial collaboration, within a specified period of time and to present it as a dissertation and seminar.

Compulsory modules

Numerical Methods
Molecular Aspects
Management of Technology and Innovation

Core Chemical Engineering

Rheology and Processing
Electrochemical Engineering
Colloid Science
Biopharmaceuticals
Particle Technology
Catalysis
Modern Metrology
Optimisation

Business modules

Technological Innovation
Nuclear Power Engineering
Project Management
Enterprise and Business Development
Sustainable Water Engineering
Strategic Management
International Business Economics
Sustainable Energy

Please note the modules may change from year to year.

Teaching and Learning Methods

Students participate in lectures, small group teaching (supervisions), tutor-led seminars and demonstrations, consultancy projects, case studies and research projects.

Assessment

The assessment of taught modules involves a combination of some or all of the following:

- Coursework – individual or group
- Class participation
- Written examination
- Presentations – individual or group

To gain the MPhil degree, students are expected to pass satisfactorily both main elements of the course, namely:

- Formal taught modules
- Research project

Entry Requirements

The MPhil cohort is made up primarily of students with a good first class honours degree in Chemical Engineering. The extent of the course requires students who are very highly motivated, innovative, able to work efficiently both on their own and in a team and who have high levels of perseverance. Applicants need to demonstrate a high level of commitment and diligence, irrespective of formal academic qualifications, when they apply.

'A very rewarding course that gives the opportunity to study in an environment of diversity and excellence.'

Marc Pripp, MPhil ACE student

For further information contact:

Dr Sarah Rough
MPhil ACE Programme Manager
slr1002@cam.ac.uk
www.ceb.cam.ac.uk/pages/m.phil-in-advanced-chemical-engineering.html



'I have thoroughly enjoyed my Cambridge experience in the past year. The MBE programme provided me with discipline-specific knowledge, transferable business and management skills and a comprehensive understanding of the global healthcare industry. The professional network I developed through this programme will continue to benefit my career pursuits in the future.'

Celine Zeng, MBE student

Course Overview

The MPhil in Bioscience Enterprise (MBE) programme is a taught science, technology and business course intended for those who have the ambition to found technology companies or take up leadership, executive, or consultancy roles in the life science sector.

All students follow the same syllabus during the first two terms of this intensive nine-month professional-practice programme. Teaching covers the commercial exploitation of the latest advances in biotechnology together with the business and management skills associated with bringing scientific opportunities to market. There is a particular emphasis on understanding how companies are created, funded, and developed. Learning is based on real business scenarios, and lectures and case studies are frequently delivered by senior company executives.

Science syllabus: Small molecule and biopharmaceutical drug development; medical devices, diagnostics; agri-biotech.

Business syllabus: Product and company valuation; partnerships and alliances; healthcare economics; accounting and finance; regulatory affairs; technology and innovation management; marketing; strategy; intellectual property and corporate law.

Students have numerous opportunities to apply their skills and the principles learned, for example, when working in teams on a consulting project and in developing a plan for a concept company. During the third term students are engaged on an internship with a life science company where they are responsible for a defined business project and collect data and analyse it as the basis for a dissertation.



The MBE course offers participants an unparalleled educational experience in both the department and the neighbouring Judge Business School, with access to leading scientists, entrepreneurs, and academics and the life science business network. The department is unique in its practical and successful approach to bio-entrepreneurship and is widely acclaimed for the excellence of its science and business graduates.

International Perspective

Students gain an international perspective of the industry during a faculty-led study tour to the Boston, MA, USA life science cluster. In addition, class members usually organise a study visit to another destination, including in recent years Switzerland, China, and Sweden. Please note that additional charges are made for travel and other expenses associated with the programme.

Assessment

Whilst there are no formal examinations, attainment is assessed throughout the course with emphasis on learning through problem-solving and teamwork in the

research, preparation and delivery of presentations and project work. Written submissions include science and technology papers, various short reports and critical appraisals, a client briefing paper and a dissertation. Students are encouraged to participate in extracurricular enterprise activities including regional and national business competitions and are required to submit a business plan as one of the course assignments.

Entry Requirements

Applicants must hold an excellent first degree in the biological, medical, or physical sciences or have experience in the financial or legal sectors. A strong interest in pursuing a business career in the life sciences, and a fluent command of English are essential. A higher degree or postgraduate experience in an academic or business environment is highly advantageous.

For further information please visit the website or contact the course administrator:

Tel: +44 (0)1223 766337

Email: biosci@ceb.cam.ac.uk

Website: www.ceb.cam.ac.uk/mbe



Graduate Student Experiences

Jacob Brubert

Chemical Engineering PhD



I'm now in the second year of my PhD research at the Department of Chemical Engineering and Biotechnology. I am part of the structured materials group, under Dr Geoff Moggridge's

supervision. I am working on the development of a novel prosthetic heart valve, an exciting, multidisciplinary project where we aim to overcome the shortcomings of current prostheses.

The department allows me the space to be creative, and my daily interactions with researchers using similar principles and tools in vastly different scenarios is a constant source of inspiration and stimulation. CEB allows me the freedom to pursue exciting research, whilst supporting my personal development.

My work is part of a British Heart Foundation funded project, however I am funded by the Armstrong Foundation, a Cambridge fund for collaborative clinical engineering research. I also completed my undergraduate studies in Cambridge, and the opportunity to continue in an academically stimulating department and city was one not to miss! The collegiate environment is an (almost) unique setup, which significantly enriches the graduate experience.

Santiago Lago

Biotechnology PhD



I completed my undergraduate degree in Neuroscience at the University of Edinburgh, specialising in the genetics of Bipolar Disorder, and have a Master's degree in

Biotechnology and Biomedicine from the University of Malaga. Prior to starting my PhD, I worked for five years as a research assistant in the biotech industry at Novasite Pharmaceuticals in San Diego and Vivia Biotech in Madrid. I focused on the development of novel screening assays for drug discovery, personalised medicine and toxicity prediction in disease indications including haematological cancers, diabetes and obesity.

My motivation for initiating a PhD was the desire to apply my previous experience in the biotech industry in an attempt to provide new solutions for the treatment of neuropsychiatric disorders. The Bahn research group are world leaders in the field of biomarkers for neuropsychiatric disorders, and are credited with having developed the first blood-based diagnostic test for schizophrenia. We are currently developing a novel platform for high throughput functional exploration of patient cells *ex-vivo* for biomarker and drug target discovery and have plans to commercialise our findings.

Jelena Renić

MPhil Chemical Engineering (ACE)



Originally from Croatia, I completed the BSc in Chemical Engineering at Villanova University in the US. I started the MPhil ACE in October 2013 and have greatly enjoyed it so far.

My future plans include working in industry for some period of time before pursuing a PhD and thus this course is ideal for me. MPhil ACE provides a unique mixture of technical and business/management modules alongside a research project. The core and elective modules cover a wide variety of topics, from biopharmaceuticals to nanotechnology, so students can choose what they find most interesting.

I am particularly enjoying rheology, which was initially daunting, but the lecturers are extremely passionate and are able to keep the students engaged. Overall I find the academic staff easily approachable and very helpful. I am excited to soon start my research project with one of them.

However, the aspect of this course that I enjoy the most is the chance to interact with my amazing fellow students. The MPhil is a small group of diverse students who completed their previous degrees in different parts of the world. Some are planning to pursue a PhD in chemical engineering while others are applying for a job with consultancy companies. Our next challenge is a team consultancy project, which will definitely be an enjoyable experience with such a brilliant group of people.

Dr Jenny Versnel

MPhil Bioscience Enterprise (MBE)



I was born in Cambridge, but the majority of my education took place in South Africa where I trained in Genetics and Microbiology. Following my first postgraduate degree, I worked for several

years on MRC funded research projects latterly focusing on rejection factors associated with organ transplantation. On returning to the UK, I moved to the charitable sector and before joining the MBE programme was Executive Director of Research and Policy at Asthma UK. There I was responsible for their £3 million research programme and its strategic development, health policy and influencing work at Westminster and in Brussels.

Being entrepreneurial by nature, I identified potential commercial opportunities, but I realised that I lacked the business skills required to bring these to fruition. Whilst initially believing the solution was an MBA, I soon recognised that what I wanted was a course more focused on innovation and entrepreneurship in the field of science. The Cambridge MPhil in Bioscience Enterprise programme aligned with my aspirations, and my ambition is to put this learning into practice and bring at least one of my ideas to market.

For me, the most stimulating lectures are those where I am learning first hand from entrepreneurs, but I also appreciate the breadth of topics covered in the course and diverse opportunities to hear from people across the industry. The varied educational and cultural backgrounds of my colleagues provide stimulating perspectives for group work and opportunities to combine skills to explore new business opportunities.



How to Apply

In order to study for a graduate course in Chemical Engineering or Biotechnology at the University of Cambridge you must formally apply to Graduate Admissions. More information about the application process is available from Graduate Admissions website: www.admin.cam.ac.uk/offices/gradstud

The Colleges

Graduate students at Cambridge are not only members of the University but also members of a College. The collegiate system creates an environment in which you will meet people from other disciplines and participate in a wide variety of cultural, sporting and social activities.

Colleges provide accommodation, meals and other amenities. Facilities vary but typically include student common rooms, libraries, laundry and computing facilities. Sports facilities such as rowing, rugby, football, cricket, athletics, squash, tennis and badminton are usually available at little or no cost.

Each student is assigned a graduate tutor who is responsible for their welfare and in addition supports all manner of graduate activities and interactions between students and college fellows.

Funding

The costs of tuition, College fees and maintenance, and advice on applying for scholarships and bursaries are given in the Graduate Admissions section of the University website: www.admin.cam.ac.uk/students/gradadmissions/prosper/studying/funding

Prospective students may be eligible to apply for funding from organisations including the UK Research Councils, Cambridge Trusts, Gates Cambridge Trusts and various other charitable organisations. In all cases the scholarship are highly competitive and the awards are usually subject to eligibility restrictions, on the basis of academic qualifications or nationality. The deadlines for making applications for financial support are often set many months in advance of the start of the course. Students are advised to check these details as soon as they decide to make an application.

Students may also support their studies through personal savings, family contributions and loans. The Carpe Diem Enterprise Trust has made available a limited number of tuition bursaries for the MBE programme, application for which is made through the department.

Please note that there are very few funding opportunities open to students who have already started their course. However, colleges may invite their graduates to apply for funds for travel, conferences, research abroad, child care or computing expenses and in cases of hardship. Please check individual college websites for detailed information.

Careers

In 2013 94.9% of Cambridge graduates gained employment or went on to further study. The University Careers Service provides resources information about vacancies and arranges specialist workshops and events. They can help you research the right opportunities and provide you with information

about applications and interviews. For more details visit www.careers.cam.ac.uk

You can also download The 2014 Careers Guide from <http://viewer.zmags.com/publication/b9c193f8#/b9c193f8/1>

Equality and Diversity

The University of Cambridge is fully committed to equality of opportunity, promotes an inclusive culture and values diversity. Talented applicants from any country and of any race, religion or group are encouraged to apply. Admission is determined only by performance and personal merit.

Student Welfare

Advice and support for students and their dependants in Cambridge are available through the Graduate Union and University Counselling Service.

University of Cambridge and Environs

Cambridge is a great place to be a student. If you have an image of Cambridge, it is probably one of ancient buildings, immaculate green lawns and people punting down a willow-fringed river. This is an accurate image - the city is stunningly beautiful - but there is a lot more to it than that.

Cambridge is a fascinating mix, but it is small enough to retain its community atmosphere. A town of bustling streets, theatres, cinemas, cafes and restaurants, it also has a thriving central market and a good range of shops. Green spaces and parks with cows grazing on the meadows are a feature of the city.

When you want to escape, the countryside is nearby with pleasant walking and cycle routes from the city centre to villages such as Coton and Madingley. Further afield, visit Ely to see the magnificent cathedral and absorb the unique and mysterious atmosphere of the Fens.

Cambridge has good road and rail connections to the rest of the UK, and London is only 50 minutes away by train. The city is also within easy reach of all London's international airports, and there is a direct 30 minute rail link to London Stansted Airport.

Information about the city and cultural events is available on the official tourism website: www.visitcambridge.org

For the student perspective about studying in Cambridge visit the Graduate Union website: www.gradunion.cam.ac.uk





UNIVERSITY OF
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Department of Chemical Engineering and Biotechnology

New Museums Site

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Cambridge CB2 3RA

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Fax: +44 (0)1223 334796

Institute of Biotechnology

Tennis Court Road
Cambridge CB2 1QT

Tel: +44 (0)1223 334160
Fax: +44 (0)1223 334162

Magnetic Resonance Research Centre

J J Thomson Avenue
Cambridge CB3 0HE

Tel: +44 (0)1223 334777
Fax: +44 (0)1223 334796

For further information please visit: www.ceb.cam.ac.uk or contact us at: emailus@ceb.cam.ac.uk