

Cambridge University Engineering Department Newcomers Guide 2022

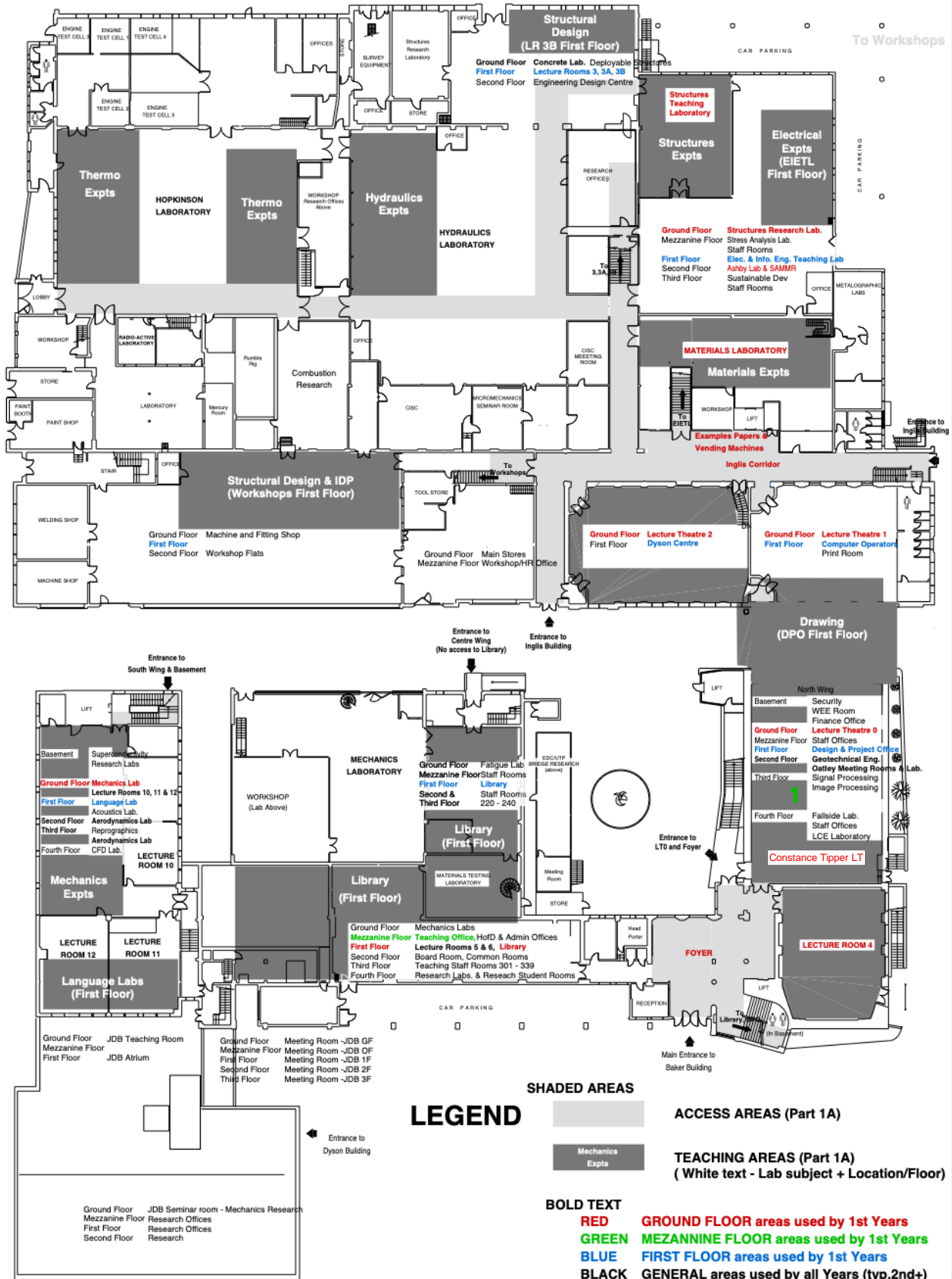
Produced by Cambridge University Engineering Department Staff and Students



Engineering Department buildings at West Cambridge. Photographs courtesy
Jim Woodhouse



Department of Engineering



Cambridge University Engineering Department

The Department of Engineering is the largest department at the University of Cambridge and is one of the leading centres of engineering in the world. Renowned for both its teaching and its research, the Department's aim is to address the world's most pressing challenges with science and technology. To achieve this aim, the Department collaborates with other disciplines, institutions, companies and entrepreneurs. The Department's strength lies in its integrated approach to research and teaching.

Since its foundation in 1875, the Department has grown to become about 10% of Cambridge University and is the largest integrated engineering department in the UK with nearly 200 academics and principal investigators, 300 contract research staff and research fellows, 900 graduate students and 1200 undergraduates.

Internationally, Cambridge is among the best universities for Engineering and Technology, typically leading the UK rankings and jockeying with the top four American institutions for pole position. The REF2021 assessment of UK research rated 99% of our research as world-leading or internationally excellent and awarded us a perfect score for research environment. The combination of academic excellence and a superb environment enabled Cambridge to deliver the highest concentration of world-leading impact in general engineering, creating real benefits to industry and wider society.



Professor Dame Ann Dowling: Silent Aircraft. Photo courtesy Engineering at Cambridge.

The Department consists of six divisions, comprising teams and facilities that maintain and develop leading positions in research and teaching in the different engineering disciplines:

- A. **Energy, fluid mechanics and turbomachinery** – building on research in fluid mechanics and thermodynamics to develop a systems view of energy generation and utilisation, particularly in ground and air transport, to mitigate environmental impact.
- B. **Electrical engineering** – pursuing fundamental electrical, electronic and photonic research at the material, device and system levels with a focus on creating integrated solutions in the fields of nanotechnology, sensing, energy generation, energy conversion, displays and communications.
- C. **Mechanics, materials and design** – extending fundamental and applied research in mechanics, materials, and design, exploiting cross-disciplinary partnerships across the University and building on existing strengths to develop excellence in bioengineering and healthcare systems research.
- D. **Civil engineering** – advancing the mechanics of civil and structural engineering systems within the broader context of the design, construction and operation of sustainable infrastructure and the stewardship of Earth's resources and environment.
- E. **Manufacturing and management** – developing new understanding of manufacturing technology, operations, strategy and policy, in close partnership with industry, in order to improve industrial performance.
- F. **Information engineering** – developing fundamental theory and applications relating to the generation, distribution, analysis and use of information in engineering and biological systems.

The Department operates across two sites in Cambridge. The original buildings at Trumpington Street house the main lecture theatres and teaching labs, the library, the Dyson Centre and the administrative offices, together with about half of the research activity. Divisions B, D, and E as well as the Whittle lab (associated with Division A) are based in facilities at the University's West Cambridge site (featured on the notebook cover).



Photo courtesy Engineering at Cambridge.

Teaching

The undergraduate course is based in the Engineering Department at Trumpington Street. Course content is delivered through lectures and reinforced through coursework and supervisions. The first two years (Part I) are combined (General) engineering and you study all subjects. For the final two years (Part II) you choose which modules you want to study; you can focus narrowly on a single engineering area or take a wider range of subjects according to your interests. Most lectures are also recorded so you can review the material later.

Course material can all be found on [Moodle](#) (the Virtual Learning Environment used in the University), including digital copies of lecture handouts, examples papers and coursework documents. Recorded lectures are hosted using Panopto and can be accessed via the Moodle page for the relevant course. Administrative documents such as lecture and lab timetables, as well as past exam papers, details about the course structure and syllabus, and more, can be found on the [Undergraduate Teaching](#) website.

During and since the Covid-19 pandemic, some teaching has moved online or adopted a “blended” or “hybrid” format, meaning a combination of online and in-person elements. Specific details will be provided on the Moodle and syllabus pages for each course as well as on MS Teams for certain parts of the course.



Gyroscope demonstration



Formula student team in Dyson Centre

Photos courtesy Engineering at Cambridge.

Lectures

Lectures contain the core content of the course. They last 50 minutes (generally starting at 5 minutes past the hour) and are fast-paced and intensive. You’re provided with a set of lecture notes with some gaps for things like equations, key words and diagrams to fill in during the lecture. Some lecturers liven things up by interspersing the talking with demonstrations and video clips, but lectures are hard work; you really have to concentrate! Lectures are an efficient way to find out what you’re expected to learn for the exams. Watch carefully, read and understand the notes, work through the examples papers, and you’ll be in good shape to do well!

In the first two years, lectures usually take place in the big lecture theatre, LT0, which seats 360. (In Michaelmas 2021 the large lectures which would normally be held in LT0 will instead be online.) Although lecturers won’t mind you sticking your hand up and asking for clarification during a lecture, it can be scary in such a big class so most people prefer to ask more privately. You can go up to the lecturer afterwards and ask quick questions, ask through

the web-based [Fast Feedback Facility](#) or ask your supervisor for that subject. Alternatively, there is a forum section on each course's Moodle page where you can pose questions; you can ask anonymously if you wish. If the lecturer is going too fast, you can't see what they're writing, or if something else is wrong, then do tell them!



Large lecture room. Photo courtesy of Engineering at Cambridge

Coursework

Coursework refers to the laboratory experiments, projects, essays and other activities that you do throughout the year. For undergraduates it accounts for over 10% of the final grade in the first year, and more in later years of the course. In the first two years, coursework is for “standard credit”: you get full marks as long as you turn up at every lab and do conscientious work. In later parts of the course you will be formally assessed on your written work and it counts towards your final grade.

With all coursework, it's important to keep in perspective the number of marks you can get and so the time you should spend on it. Some things are fun (yes, really!) and you find you're spending many hours on them - particularly some of the project work where you're working in teams on more open-ended problems.

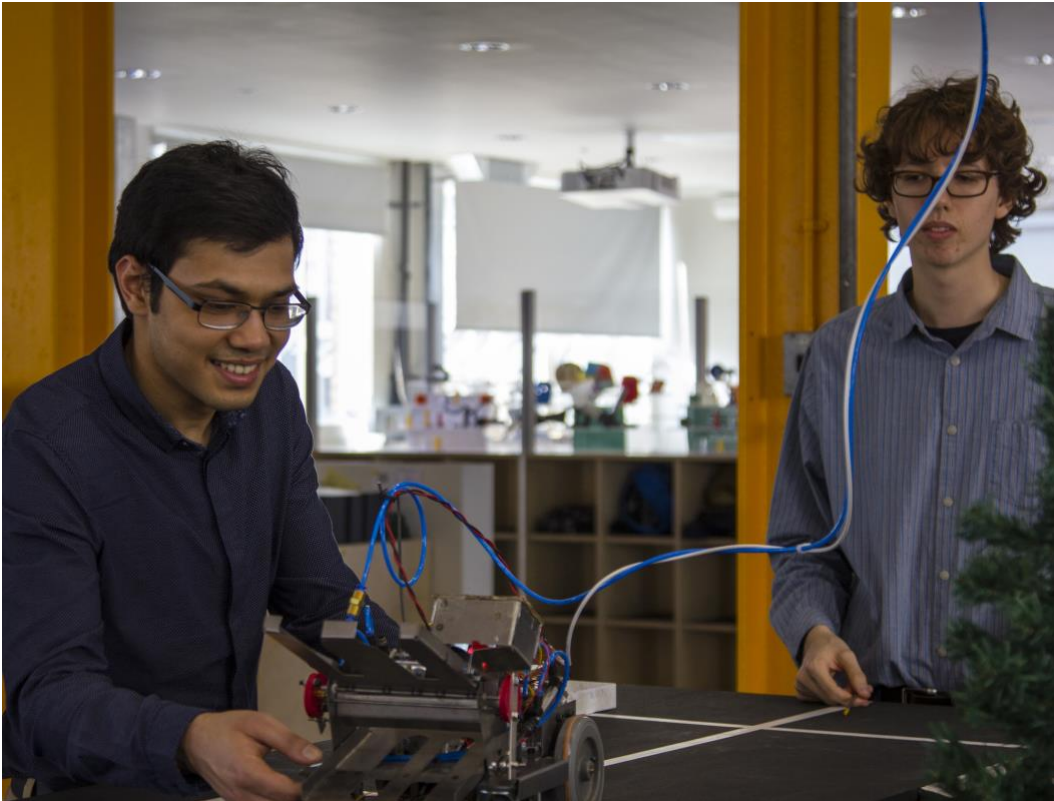
Most of the coursework in the first two years is made up of experiments, exercises and project work. Experiments involve a two-hour lab session in which you do something hands-on, sometimes followed by writing a lab report which is then marked. “Short” labs do not have a report, and “Long” labs do. During sessions demonstrators are on hand to help you use the equipment and understand the results.

Exercises include computing and drawing (engineering drawing both by hand and using computer-aided design software). These will often be self-paced with regular checkpoints where your work is marked and your understanding tested, allowing you to fit it flexibly around your schedule.

Project work, which takes place over a number of weeks, is for many students the most enjoyable and memorable part of the course.

In the first year one of your projects is the Part IA Structural Design Project. You and your lab partner will design and build a cantilever or bridge out of steel or aluminium, and then apply a brutal load and watch it tear itself to pieces! It may be a little daunting if you've never done any metalworking before, but you'll be shown all the necessary techniques, and the workshop technicians are very helpful.

In the second year there is the Integrated Design Project, the IDP, where you build a mobile robot to perform a task. You do this in a team of six, so you'll have to demonstrate some project management ability as well as learning the technical skills to design and build the robot. Getting both your robot and your team members to obey orders and complete the task is quite a challenge, but it's a great feeling when it all works!



*IDP team
members testing
their creation
Photo courtesy of
Engineering at
Cambridge*

Examples papers

Examples papers drive your work and form the centre of your studies. They are put together by lecturers and are sheets of problems intended to ensure you fully understand the lecture material and are able to apply your knowledge correctly. The papers often include some questions from previous years' exam papers (exams are known as Tripos) and form an essential part of the course. Examples papers together with additional Tripos questions will provide the foundation for your revision.

Everything you need to know in order to finish an examples paper is in the relevant lecture notes. However, if you understand a basic principle but are having trouble applying it to problems then you may find it useful to get a different perspective on the work by consulting textbooks, such as those recommended by the lecturer, or searching for resources on the web.

If you have difficulty with a paper, discuss it with friends, supervision partners and your supervisor. There are worked answers, "cribs", available, but try hard not to look at them before you've had a really good go at the questions. It's easy to fool yourself into believing that you understand something if you just read the solution, but you can't be certain until you work it through yourself. Even better, explain it to someone else; this will help them as well as you! Remember that you are not expected to be able to answer every question before your supervision. A large part of the purpose of the papers is to identify what areas to discuss in supervisions.

Supervisions

Supervisions are College-based small-group teaching sessions during which you discuss your attempts at examples papers and consolidate your understanding of the concepts in the course. Usually two or three students will meet for an hour with a supervisor, an experienced engineer who can be anyone from a postgraduate student to a professor. You normally get about one supervision a fortnight in each subject, so you have two or three supervisions a week.

These sessions can be a lifeline in the Cambridge course, as they give you the opportunity to clarify any queries or uncertainties you have about the course and identify gaps in your understanding. They aren't part of the assessment, so you don't need to worry about impressing your supervisor! Rather, they're informal and are there to help you check your learning, so be honest about the problems you're having.

Try to make the most of supervisions by doing as much as you can of the examples paper before the supervision and agreeing with your supervision partner what you want to cover. If the supervisor isn't able to provide the assistance you need, talk to your College Director of Studies (DoS). If you are finding the work difficult, feel you can't work fast enough and are having genuine difficulty keeping up-to-date and comprehending the material, let your supervisors know. If you don't, they may think you're just being lazy, but if they know you're trying your best, they will be sympathetic and will work hard to help you.



Pouring liquid nitrogen. Photo by Quang Ha

Dyson Centre for Engineering Design

The [Dyson Centre](#) is a modern workspace for students to develop their creativity and enthusiasm for engineering. It provides a home for extra-curricular student-led engineering projects, both team and personal, and for the design, building and testing for coursework projects.

Students can come together to think, exchange ideas, design, experiment and build. Access is provided to laser cutters, 3D printers, computer-controlled and manual machine tools, traditional sheet metal working machinery and 48 bench spaces for electronics and mechanics work, as well as expert help from the Centre's technicians.



*The Dyson Centre
Photo by Quang Ha*

It is hoped that most engineers will engage in some extra-curricular engineering project work in the Centre at some point during their four years in Cambridge, as it's a good way to enhance your portfolio beyond the largely theoretical skills which the course will teach you.



Library



The Department Library is staffed between 9am and 5pm Monday to Friday all year round, except for a week or so at Christmas. It's much more than just a traditional library! There are books, journals, dedicated spaces for silent study and for collaboration, but there is also attention to wellbeing and recognition that students need a range of spaces and resources to suit their mood and need. De-stressing facilities include bean bags, jigsaws and treasure hunts, and there's free food and drink at the weekly Engineers' Café. This is all subject to change as long as COVID restrictions of some sort are in place, so do keep an eye out for any notices.

The library staff are incredibly helpful so don't hesitate to ask them if you can't find what you need. They can advise on a wide range of information-related topics, from literature searching and evaluating the information you've found to reference management and structuring your essay.

Keep an eye on their emails about new resources, training sessions and drop-in clinics, and suggest new services and developments by commenting on their feedback wall.



Student team in the library's Collaborative Space

Centre for Languages and Inter-Communication (CLIC)



The Department has its own language teaching facility. You can take taught language courses in French, German, Spanish, Chinese or Japanese, or use the private study resources to brush up your skills or to teach yourself new languages. The staff are always very helpful and the atmosphere is relaxed. You can find out more on the [CLIC website](#).

Diversity and Equality

The Department seeks to promote a culture in which all staff and students feel valued, respected, and supported. We have, since 2017, held an Athena SWAN Silver Award. This

prestigious national award recognizes our ongoing commitment to gender equality in higher education and research. In 2020 we established a Diversity Committee to promote diversity and diversity policies and initiatives across the Department, in line with the University's commitment to the [Race Equality Charter](#). To find out more, visit the [Engineering Diversity website](#).

Cambridge University Women in Engineering Society (CUWES) is a student-led society focused on helping students on their journey towards a career in engineering. We organise industry-related events and socials throughout the year, where we aim to foster a supportive environment, contribute to our members' professional development and inspire prospective students to choose engineering-related degrees. Though our focus is on supporting women, as they are an underrepresented group in the world of engineering, we encourage all Cambridge students with an interest in engineering to join and attend our events. For more information, visit our [website](#), follow us on [Facebook](#) or contact us at cuwes-committee@srcf.net.

The Staff-Student Joint Committee (SSJC)

The [SSJC](#) is a group of staff and students whose collective purpose is to contribute to the continuous improvement of the undergraduate Engineering course and the provision for graduate students. It meets twice a term and provides an opportunity for the student representatives to raise questions and concerns on behalf of the student body, as well as enabling Department staff to seek the student voice on a wide range of important matters. Students from the SSJC are also involved with the departmental committees on Teaching, Diversity, Safety, Library and Environment.

There are two or more elected representatives from each year group, as well as officers from the Engineering Society (CUES) and SU reps who sit on the Faculty Board which oversees the Department. These students act as a point of contact for the student body and can be contacted [here](#).

Feedback, Complaints and Support

If you would like to give feedback, raise an issue or ask for support, there are several ways to do this:

- Feedback about the course can be communicated directly or via your student reps in various ways which are summarised on this [webpage](#).
- Complaints can be raised formally with the [Office for Student Conduct, Complaints and Appeals \(OSCCA\)](#). This includes complaints about student experience, examination results, inappropriate staff and student conduct and more.
- Support is best obtained in the first instance through your College Tutor, who will be able to help you directly or assist you in finding the appropriate source of support.

Further Tips

Don't forget about the free coffee (until 11.30) and tea in the 2nd floor Café

The CUES magazine has published an article on "[10 Things I Wish I Knew Before Starting Cambridge Engineering](#)"

Engineering Outreach and Getting Involved

Outreach at the Department of Engineering aims to introduce school children to the fun and excitement of engineering within a university research environment. Teams of student volunteers are given the chance to make engineering more accessible through activities such as public lectures, summer schools for A-level students, workshops aimed at Primary School children and a huge flagship event for Cambridge Science Festival at the end of lent term.

Typically, volunteers help small groups of young people in a 'design, build and test' activity, e.g. building a rocket launch pad. There is no set time commitment for volunteers; you can volunteer for as many or as few activities as fits in with your other interests and studies. To find out about events as they happen, email outreach-officer@eng.cam.ac.uk and ask to join the Outreach mailing list.



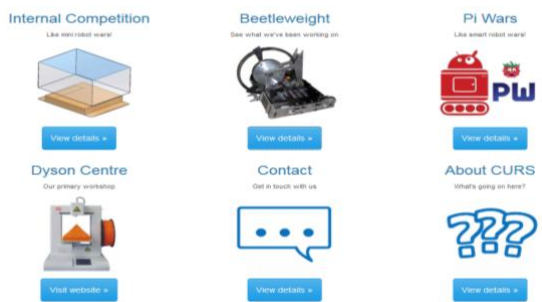
An Engineering Outreach event

Student Societies, Teams, Groups and Clubs

Student-led projects at Cambridge University Engineering Department showcase the initiative, technical brilliance and teamwork of our students. The projects are of great value in terms of educational and personal growth of the students, seizing public imagination around the world, raising the profile of modern engineering and developing some really creative engineering solutions. Funding for student teams is available from the Student-led Projects and Industrial Partnership (SPIP), which is currently supported by the following organisations:



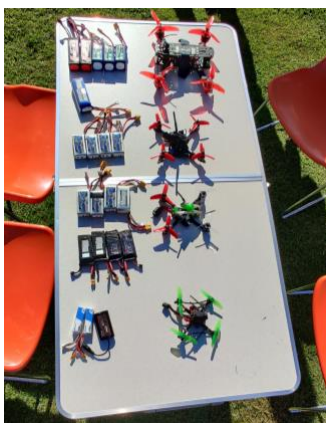
For information about projects and sources of funding, see the [Dyson Centre website](#) and [funding website](#). Read on for details of just some of the societies and activities that take place in the Department and beyond:



<http://curobotics.soc.srcf.net/>

Cambridge University Robotics (CUR) was founded in 2015, and since then we have grown into a flourishing society with over 60 active members.

Our flagship projects include participating in the RobocupRescue competition for semi-autonomous disaster response robots, utilizing reinforcement learning to improve the dexterity of robotic arms, and building a humanoid robot using 3D printers. In addition, we run introductory and intermediate projects and workshops throughout the year. Sign up to our mailing list at <http://curobotics.soc.srcf.net/sign-up/>, or email us at curoboticsoc@gmail.com.



<http://cuds.soc.srcf.net>
<https://discord.gg/SmewwF1r>

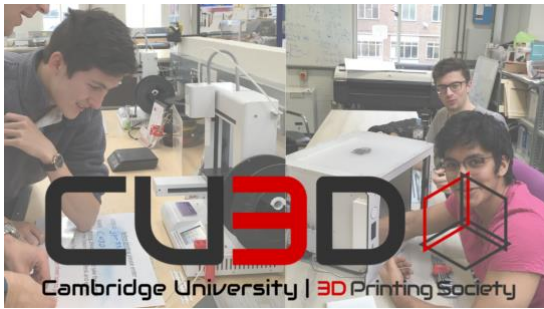
Cambridge University Drone Society (CUDS)

Whether you're a gamer, adrenaline seeker or seeking an engineering challenge, CUDS has something for everyone! We hold weekly flying sessions in person in Churchill and/or online on a simulator. Even if you've never flown before, we have a couple extra sims (and drones coming soon) for people to try out. Our aim is to compete in the International Universities Drone Racing Organisation (IUDRO), and we have taken the first step by designing and manufacturing our own prototype carbon fibre racing frame.

Even if racing isn't your thing, we hold weekly sessions for various projects:

- frame design
- testing motors with a microcontroller
- using computer vision to avoid obstacles
- casually flying quadcopters and fixed wings

Check out our website and come say hi to us on Discord!



<http://www.cu3dsoc.com>

Cambridge University 3D Printing Society (CU3D)

was formed in 2016 explores all things 3D printing. Despite the last academic year being a tough one without access to the Dyson Centre we've continued full steam ahead!

Our "Spicy Tower" project is a fun and challenging way to develop your SolidWorks skills, where students are tasked with designing a floor of a large tower, requiring them to create innovative locking mechanisms between connecting floors. We are also currently working on a software-based project to get 3D printers to print non-planar surfaces with standard printers and a project to redesign an old Prusa 3D printer with a high volumetric flow hotend. These projects will continue this year, and if you have any other exciting ideas then come along on Wednesdays at 2pm and see where it takes you! For more information contact Peadar at pb745@cam.ac.uk



www.cuer.co.uk

Cambridge University Eco Racing (CUER)

is a 60-strong student organisation that designs, build and races solar powered vehicles. Founded in 2007, we race in the World Solar Challenge, the world's foremost solar endurance race, held in Australia. Team mission is to inspire as well as innovate, leading to outreach programs, both nationally and internationally. Recent highlights include attendance at the Gadget Show Live and High-Performance event at the London Science Museum.

Contact contact@cuer.co.uk for more details.



www.facebook.com/EWBcambridge

Engineers Without Borders (EWB) Cambridge

is the local arm of EWB UK, a charity that leads a movement to inspire, enable and influence global responsibility within the engineering community, to achieve social and environmental justice. There is a climate emergency upon us requiring urgent action. Simultaneously, countries around the world are failing to meet their basic human rights obligations and there is extreme global inequality. As engineers, we are often described as problem-solvers. We are therefore uniquely positioned to be a part of the solution and, through engineering, can work towards a future which serves both people and the planet better.

Engineers Without Borders Cambridge runs events throughout the year, such as guest speakers, design challenges and outreach events, to help promote this mission and better equip students with the skills and knowledge to forge a future in globally responsible engineering.

To join our mailing list, visit

<https://lists.cam.ac.uk/mailman/listinfo/soc-ewb-cam>, or get in touch at cambridge.chapter@ewb-uk-movement.org



<http://www.fullblueracing.co.uk/>

Full Blue Racing (FBR) is the Formula Student (FS) team of the University of Cambridge.

Established in 2006, we first made it to the tracks the following year, and since then we have been involved in at least one FS competition every year. In FS Spain 2016, we were also the best-performing British team, and we are looking to expand our international involvements. We are a student-led team of around 30 that designs and builds a single-seat racing car every year to be entered into the IMechE Formula Student competition. Formula Student teams are not only evaluated on speed and handling of the car, but also on business, cost and design presentations.

Contact getmore@fullblueracing.co.uk for more details.



<https://www.srcf.net/>

<https://www.cauv.org/>

Student-Run Computing Facility (SRCF)

We provide web hosting, mailing lists, and other computing services, available for free to all students and societies/groups.

We are also a community of computing enthusiasts who welcome anyone with an interest in computing regardless of their ability. We provide an opportunity to get involved with server hardware and software, which, as well as being fun, looks good on your CV. Our system administrators ('sysadmins') help maintain the services that a thousand students and societies use and have the increasingly rare opportunity to see how the internet works behind the scenes.

Take a look at our website, where you can sign up, find more information or join our chat.

Cambridge Autonomous Underwater Vehicles

(CAUV)'s core aim is to design and build, from scratch, another small AUV over the next two years, suitable for commercial and research applications.

See our website for more information, or contact soc.cauv.management@gmail.com



twitter.com/cuspaceflight

Cambridge University Spaceflight (CUSF) is a student society that designs and builds high-powered rockets and engines.

We aim to equip students with real-world engineering experience as well as connecting them with top space companies and facilitating their transition into the industry upon graduation.

We have launched three high powered rockets as part of our Martlet series, which reached up to heights of 10km when launched from the USA. We recently fired PULSAR, our in-house hybrid rocket which holds the record for the most powerful nitrous engine ever fired in the UK. Our mission is to reach the Karman Line (100km) in 2023 through a two-stage rocket called Griffin 1. We are also developing our next engine, White Giant, which is a regeneratively cooled, bipropellant liquid engine, as well as our hypersonic second stage, Aquila.

All experience levels are welcome, if you're interested in helping send a rocket into space email

contact@cusf.co.uk for more details.

Notebook information provided by students and staff
Cambridge University Engineering Department, MMXXI

<http://www.eng.cam.ac.uk/>