Cambridge University Engineering Department Newcomers Guide 2018

Produced by Cambridge University Engineering Department Staff and Students

Engineering Department buildings at West Cambridge. Photographs courtesy Jim Woodhouse

UNIVERSITY OF CAMBRIDGE
Department of Engineering

Welcome to Cambridge and to the Department of Engineering

This CUED Notebook is your essential guide to studying at the University of Cambridge - Department of Engineering to help ensure that you get the most out of your time here.

In addition to providing a useful source of lined paper and dividers to organise your notes, the notebook contains information pages at the front on resources and opportunities and a useful monthly academic planner at the back.

We hope that you find the Notebook to be a useful reference resource during your studies.

TERM DATES 2018-19

Michaelmas term	Tuesday 2 October - Friday 30 November
Lent term	Tuesday 15 January - Friday 15 March
Easter term	Tuesday 23 April - Friday 14 June

This notebook belongs to:

Name: .....

Student number: .....

Email: .....

Contact tel: .....

Personal Tutor: .....

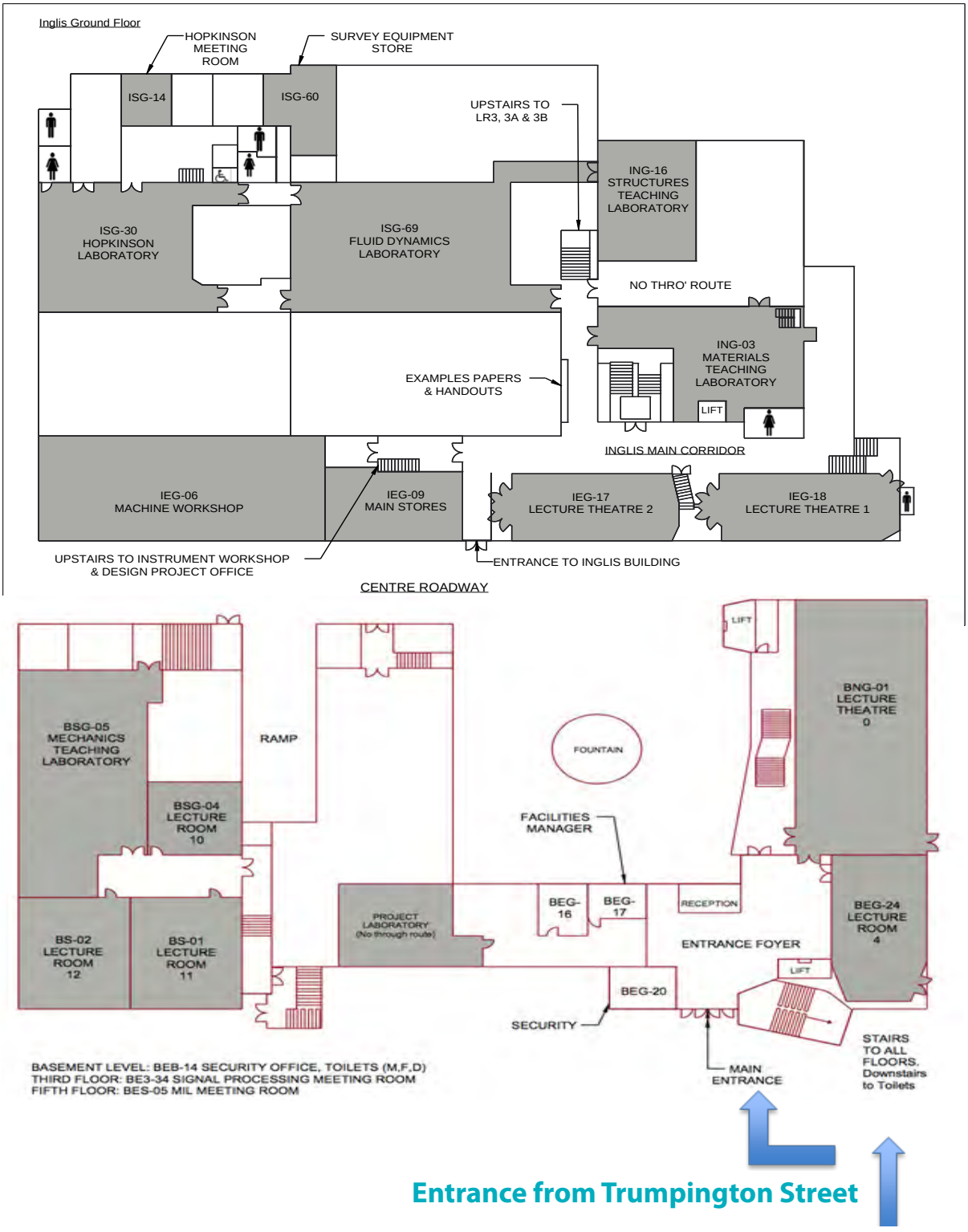
Name: .....

Room number: .....

Email: .....

Telephone number: .....

Cambridge University Engineering Department Map



Cambridge University Engineering Department

The Department of Engineering is the largest department at the University of Cambridge and 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; the unique way in which it applies its capability across all aspects of engineering and gathers partners to find solutions.

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 in the top flight of universities for Engineering and Technology, typically leading the UK rankings and jockeying with the top four American institutions for pole position. The REF2014 assessment of UK research showed that Cambridge has the greatest concentration of world-leading engineering research in the country and the best environment for engineering research. 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 society more widely.

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

The Department operates on two sites in Cambridge. The original buildings at Trumpington Street house the main lecture theatres and teaching labs, the library and the administrative offices, together with about half of the research activity. The whole of Divisions B and E are based in new facilities at the University's West Cambridge site (featured on the notebook cover), and will be joined by Division D this year.

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 ther modynamics 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 per formance.

Athena SWAN

The Department won a prestigious Athena SWAN Silver Award in 2017. This national award recognizes the Department's ongoing commitment to promoting a culture in which all staff and students feel valued, respected and supported.

To find out more, visit http://www-engineeringdiversity.eng.cam.ac.uk/

Teaching

The undergraduate course is based in the Engineering Department at Trumpington Street. It is delivered mainly through lectures, reinforced and illustrated by laboratory sessions and classes. The first two years are combined engineering and you do all subjects. For the final two years you can choose to specialise in what interests you most: you can focus narrowly on an engineering area, or take a wider range of subjects if you wish.

All the course material and administrative documents are available on-line. It's not always easy to find, but everything is there somewhere! The best way to locate what you're looking for is often to go to the 'Current undergraduates' webpage (purple) and to use the search box. Course material is all on Moodle (the Virtual Learning Environment used in the University).

Gyroscope Demonstrarion

Formula Student team in Dyson Centre

Photos courtesy of Engineering at Cambridge

Lectures

Lectures basically contain all the material you need in 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 fairly-complete set of lecture notes which have some gaps for things like equations, key words and diagrams that you fill in during the lecture: all the notes should be available on-line on the Moodle site for each course. Some lecturers liven up their lectures by interspersing the talking with demonstrations and video clips, but lectures are hard work and you really have to concentrate. Lectures are a very efficient way of find out what you're expected to learn for the exams. Go to the lectures, read and understand the notes, work through the examples papers and you'll be in good shape to do well!

Most lecture courses in the first two years are for everyone together in the big lecture theatre, LT0, which seats 360. Although lecturers won't mind you sticking your hand up and asking for clarification during a lecture, this takes some nerve in such a big class and most people prefer to ask more privately. You can go up to the lecturer afterwards and ask quick questions, or ask through the web-based Fast Feedback, or ask your supervisor for that subject. If the lecturer is going too fast, or doing something else wrong (e.g. you can't read their writing) then tell them.

Large Lecture room. Photo courtesy of Engineering at Cambridge

Coursework

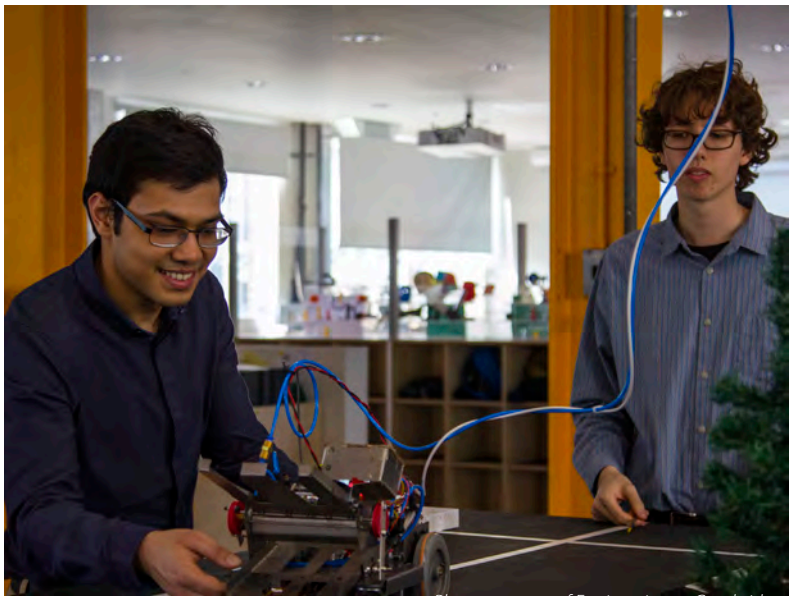
Coursework refers to the series of experiments, essays and projects that you do during the year. For undergraduates it accounts for over 10% of the final grade in the first year, and more in later years of the course. In the first two years, coursework is for "standard credit": you get full marks as long as you turn up at every lab and do conscientious work. In later parts of the course you're formally assessed on your written work, and it counts towards your exam mark.

With With all coursework, it's important to keep in perspective the number of marks you can get for it and so the time you should spend. 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.

The coursework in the first two years is a combination of short experiments and exercises, and more open-ended project work. The short experiments involve 2h in the lab doing something hands-on, and some of these you write up as reports which are marked. Exercises include computing and drawing (engineering drawing both by hand and using computer-aided design packages). The project work is what most students enjoy most and remember best.

In the first year one of your projects is the Part 1A Structural Design Project. You and your lab partner get to 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's a little daunting if you've never done much metalworking before, but you'll be shown all the techniques necessary, and the workshop technicians are very helpful if you get into difficulties.

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, and you 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 Photo courtesy of Engineering at Cambridge

Example papers

Examples papers drive your work and form the centre of your studies. They are handed out 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 are 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 text books or searching for web resources.

If you have difficulty with a paper, discuss it with friends, supervision partners, and your supervisor. There are worked answers, cribs, available, but don't be tempted to look at them before you've had a really good go at doing the questions. You can fool yourself into believing that you understand something if you just read it through, but you can't be certain until you work it through yourself. Even better can be to explain it to someone else, so helping them as well as yourself!

Supervisions

Supervisions are one-hour sessions, usually two students with an experienced engineer, who can be anyone from a postgraduate student to a Nobel Prize-winning professor, during which you discuss your attempts at examples papers and any other aspects of the course in which you may have problems. These sessions can be a lifeline in the Cambridge course. You will have opportunity to clarify any queries or uncertainties you have about the course, and consolidate your understanding of concepts.

Remember that supervisions are informal and are there to help you rather than being part of the assessment. You normally get about one supervision a fortnight in each subject, so you have two (or sometimes three) supervisions per week. Make the most of them! Do as much as you can of the examples paper before the supervision, and agree with your supervision partner what you want to get out of the supervision. Don't be afraid to let the supervisor know if you're having problems: it is their job to guide you through the course. If the supervisor isn't able to provide the assistance you need, then talk to your College Director of Studies (DoS).

Pouring Liquid Nitrogen
Photo by Quang Ha.

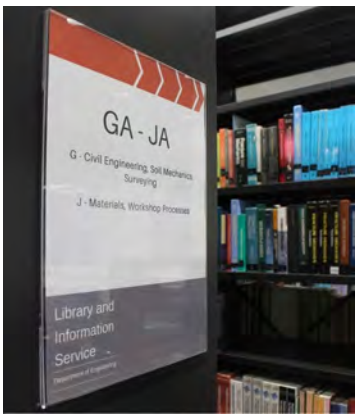
If you are finding the work difficult, or you don't feel you can work fast enough and are having genuine difficulty keeping up-to-date and comprehending the material, let your supervisors know. If you don't, they may think you're just being lazy. But if they know you're trying your best, they will be sympathetic and will work hard to help you.

Language Unit

The Department has its own language teaching facility. You can take formal language courses in French, German, Spanish, Chinese or Japanese, or you can 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 in the Unit is relaxed.

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.



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 Collaborative Space in the library

Dyson Centre for Engineering Design

The Dyson Centre is a modern workspace for students to develop their creativity and enthusiasm for engineering, providing a home for extra-curricular student-led engineering projects, both team and personal projects, as well as design, build and test projects of the teaching programme

Photographer: Quang Ha.

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 are for electronics and mechanics work.

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, with this being a good way to enhance your portfolio beyond the largely theoretical skills which the course will teach you.

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.

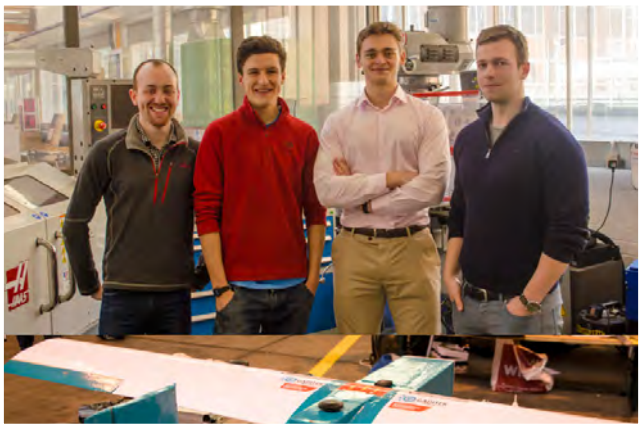
Funding for student teams is available from the Student-Led Projects and Industrial Partnership (SPIP), which is currently supported by the following organisations:
organisations:

SPIP events allow for teams to present their recent achievements and bid for SPIP funding in a Dragons' Den style event. For more information, visit **www.dysoncentre.eng.cam.ac.uk/spip-expo**

Some other funding sources for team and personal projects are given on
http://www.dysoncentre.eng.cam.ac.uk/funding

Some of the projects are described in the following pages. For complete lists and more information, look on the Dyson Centre webpages: **http://www.dysoncentre.eng.cam.ac.uk/**

Cambridge University Unmanned Air Systems Society (CUUASS)



(CUUASS) designs and builds all parts of an autonomous (fixed-wing) drone, including airframe, electronics, and software with the aim of winning the 2019 UAS Challenge held by the Institution of Mechanical Engineers (IMechE) in Wales. We are looking for members with practical experience to work in the following areas:

- Aircraft (including structural) Design and Manufacturing
- Electrical Design and Manufacturing
- Image Recognition and Machine Learning
- Organisational roles (Social Media Officer, Webmaster)

twitter.com/CUUASS

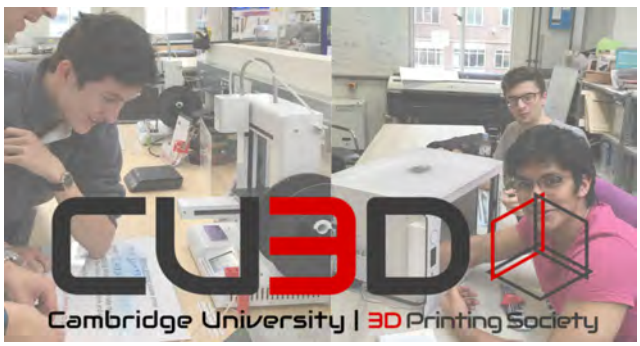
This is a great chance to work in a dedicated team and gain valuable hands-on engineering experience. Email Philip on pms67@cam.ac.uk for more information.

Cambridge University Space Flight (CUSF)

CUSF is a student society focused on high power rocketry and high altitude ballooning (HAB). Our Martlet series of rockets weigh in between 35-100kg and have reached altitudes of 3km to 10km. The society is currently working to complete Martlet 4 which uses our own custom built hybrid rocket engine and is designed to break the European Student Rocketry Altitude record. The Martlet programme operates on a two-year cycle culminating with launches in the New Mexico or Nevada Desert, USA. CUSF were pioneers in amateur HABs and regularly launch balloons to around 35km capturing views of the curvature of the Earth. The HAB team is currently experimenting with super-pressure balloons working towards the long-term goal of an unmanned circumnavigation of the globe. Contact Matt on mce32@cam.ac.uk for more details.

twitter.com/cuspaceflight

Cambridge University 3D Printing Society (CU3D)



FBR Formed in February 2016, CU3D is a student society at the Dyson Centre dedicated to 3D printing and other types of rapid prototyping. Recent and ongoing projects include creating ball bearing powered mechanical contraptions, prosthetic limbs and customisations to 3D printers. The society also gives lectures to get novices going with 3D printing. For more information contact Ben on bsy21@cam.ac.uk

http://www.cu3dsoc.com

Impact Through Innovation Cambridge (IITC)

IITC has one main goal: to research, design and produce products that help people who need it most. Research team members explore the actual needs that people have from around the world. Development team members design products based on the conducted research, considering different strategies in order to achieve a product that is affordable and reliable. We are currently working with a variety of charities and academics to help aid us in meeting our goals but we need a solid member base to being the projects to life.

Sign up on our **website http://iticam.org/**

Lego 'Bloc-Soc'

http://www.dysoncentre.eng.cam.ac.uk/bloc-soc

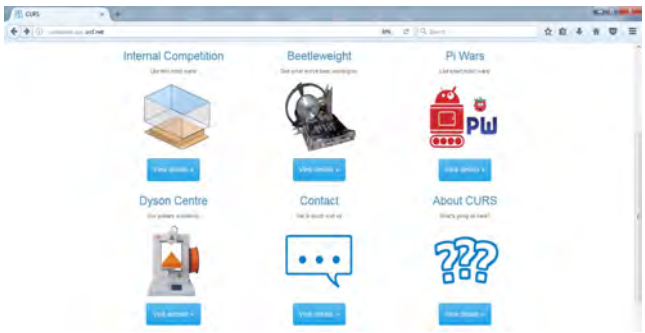
CDI BLOC-Soc is a creative building society dedicated to the use of Lego Bricks and Lego Mindstorms kit, involving creative building challenges, planned projects, robotics and problem solving. Recent projects have included a self-balancing Segway and a Wild West Styleshoot-em-up game. We welcome students of all ages and abilities - whether you are a budding structural engineer, clever coder, brilliant builder or just want to play around with some bricks. No previous experience necessary and a great way to meet new people. No commitment necessary. Just come along and try it out for yourself! For more information or to join our mailing list, contact Jibran on jw2007@cam.ac.uk

Camb. Uni. Locomotive Engineers' Society (CULES)

https://www.dysoncentre.eng.cam.ac.uk/cules

Whether you are interested in modern locomotive systems, electronic drives and instrumentation, or more traditional steam technology: model, miniature or full size, the Locomotive Engineers' Society caters for all. Recent activity includes : a miniature steam railway in one college's Fellows' garden for the day; driver experiences at the Wells and Walsingham Light Railway and the Mid-Suffolk Light Railway. For more information or to join, contact Zach on zb233@cam.ac.uk

Cambridge University Robotics Society (CURS)



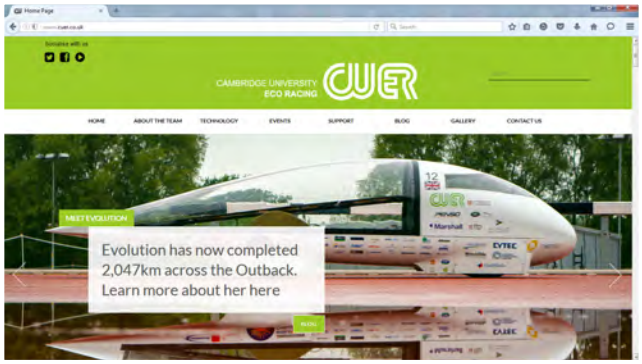
https://www.dysoncentre.eng.cam.ac.uk/cur

Cambridge University Robotics Society was founded in January 2016.
Aims of the society include:

- Improving accessibility of robotics to students
- Generating interest in robotics
- Making awesome robots
- Participating in robotics competitions

Contact Kai on kcj21@cam.ac.uk for more information.

Cambridge University Eco Racing (CUER)



60 strong student organisation that designs, build and races solar powered vehicles. Founded in 2007, they 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 nation ally and internationally. Recent highlights include attendance at the Gadget Show Live and High Performance event at the London Science Museum. Contact Xiaofan on xz353@cam.ac.uk for more details

www.cuer.co.uk

Full Blue Racing (FBR)

FBR is the Formula Student team of the University of Cambridge. Established in 2006, FBR is a team of around 30 students who, every year, design and build a single seater racing car from scratch, then compete against universities from around the world at the international Formula Student competition. Formula student teams are not only evaluated on speed and handling of the car, but also on business, costing and design presentations. Contact Harry on hfsg2@cam.ac.uk for more details.

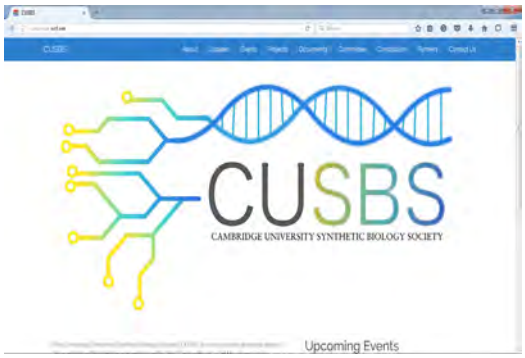
http://www.fullblueracing.co.uk/

Cambridge Development Initiative (CDI)

CDI is a student-led non-profit organization based in Cambridge working on four different international development projects in Dar es Salaam, Tanzania. We focus in particular on trying to catalyse sustainable change in Dar es Salaam by collaborating closely with our counterparts from Tanzanian Universities. Recent progress: WaSH project (previously called engineering project) is sponsored by the government sanitation agency, the project is trialing out to produce consistent biogas and work out a business model to make it sustainable. Opportunity: join us as a volunteer for the summer (may count towards industrial experience if working for the WaSH project).

www.cambridgedevelopment.org

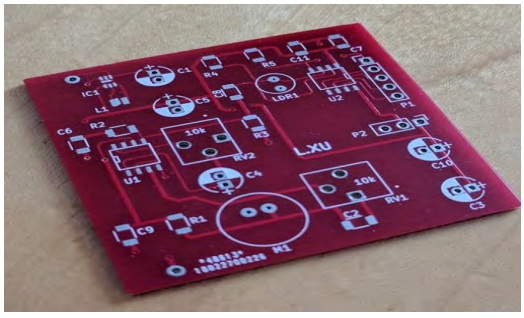
Cambridge University Synthetic Biology Society (CUSBS)



http://cusbs.soc.srcf.net/

Impact Founded in 2015, CUSBS aims to promote the field of synthetic biology amongst the student community and, via outreach work, within schools in Cambridge. The main focus is developing bio-hardware, and ultimately its output will be well-documented, open-source and low-cost scientific tools for use either in labs or as educational aids. Students work on projects in teams over the course of six months, involved in all aspects of projects from design and construction through to testin

Electronics Club



Formed in January 2016, Electronics Club aims to help people gain more experience in the field, both in theory and practice, by designing schematics and PCBs, soldering, testing and programming. In the coming year, we will do many small projects throughout the terms, which have different difficulty levels to suit people with different experience and interest.
Contact Richmondon lx242@cam.ac.uk for more details

http://www.dysoncentre.eng.cam.ac.uk/electronics-club

Tensegrity - Art Sculptures Club

Interested in creating engineering art?
Learn more about creating, designing and fabricating art sculptures, and be part of a team creating full scale sculpture for public display. Exciting engineer, architect and astist guest spaekers. Contact Ilakya on ip342@cam.ac.uk for more details.

http://www.dysoncentre.eng.cam.ac.uk/tensegrity

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. Last year, over 2000 young people and parents participated in one of our outreach events.

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.

Notebook information provided by students and staff

Cambridge University Engineering Department, July 2018

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