

## Part IB briefing notes - general information

[Link back to main IB briefing notes.](#)

### Table of contents

- [Part IB structure](#)
- [Lecture & lab start times & lateness penalties](#)
- [Part IB examples papers & classes](#)
- [Part IB coursework & labs overview](#)
- [Coursework credit](#)
- [Rearranging coursework & allowances](#)
- [Plagiarism avoidance: expectations of all students](#)
- [Progression through the Engineering Tripos](#)
- [Industrial qualification](#)
- [Accreditation of the MEng](#)
- [Part IIA student exchanges](#)
- [Prizes, Scholarships and Awards](#)
- [Additional course costs](#)
- [Feedback from students](#)
- [Dyson Centre for Engineering Design](#)
- [Inclusive teaching](#)
- [Undergraduate Teaching Office contact details](#)

## Part IB structure

### Lectures

The 8 papers in Part IB are taken by all students. Papers 1-7 are of 2 hours' duration. Paper 8 is of 2.5 hours' duration, except for those students submitting coursework in one foreign language, where it is of 1.5 hours' duration. The papers are:

|         |   |  |
|---------|---|--|
| Paper 1 | <b>Mechanics</b> (16 lectures)  |  |
| Paper 2 | <b>Structures</b> (20 lectures)   |  |
| Paper 3 | <b>Materials</b> (16 lectures)  |  |
| Paper 4 | <b>Thermofluid mechanics</b> (26 lectures)  |  |
| Paper 5 | <b>Electrical engineering:</b><br>Linear circuits and devices (10 lectures)<br>Electrical machines (10 lectures)<br>Electromagnetic fields and waves (6 lectures) |  |
| Paper 6 | <b>Information engineering:</b><br>Linear systems and control (14 lectures)<br>Signal & data analysis (7 lectures)<br>Communications (7 lectures)                 |  |
| Paper 7 | <b>Mathematical methods:</b><br>Vector calculus (14 lectures)<br>Linear algebra (8 lectures)<br>Probability (6 lectures)  |  |
| Paper 8 | <b>Selected topics:</b><br>Electives (14 lectures)  |  |

## Part IB briefing notes - general information

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|  |   |  |
|--|---|--|
|  | Compulsory section: Business economics (8 lectures) |  |
|  | (i) Civil & structural engineering                  | Design and construction of underground space |
|  | (ii) Mechanics, materials and design                | Mechanical engineering for renewable energy  |
|  | (iii) Aerothermal engineering                       | Design of a jet engine                       |
|  | (iv) Electrical engineering                         | Micro- and nano-electronic devices           |
|  | (v) Information engineering                         | Photo editing and image searching            |
|  | (vi) Bioengineering                                 | Engineering of the human eye                 |
|  | (vii) Manufacturing, management and design          | Bringing technology innovations to market    |

All lectures for Papers 1-7 are scheduled during the Michaelmas and Lent terms, and have associated experimental work, and examples classes. Colleges arrange supervisions on these topics

### Paper 8

Paper 8 consists of engineering activities taught in the context of design, and is divided into seven electives with the topics shown below. Students not submitting coursework in a foreign language are required to answer questions from two electives. Students who are submitting coursework in a foreign language are required to answer questions from one elective. The material in the electives is not considered prerequisite for Part IIA courses (although some preliminary reading may be expected by those who have not taken a particular elective).

In addition, all students are required to answer one question from the compulsory section on business economics, lectures for which are given in the Lent term. Lectures for all the other sections are given during the first four weeks of the Easter term. There are two examples papers per elective, for which fully worked solutions are available to students and examples classes included in the lectures. There are no supervisions for Paper 8.

### Language programme for engineers

Students who take the language programme for engineers in Part IB may offer this course as one of their two options in Paper 8, or they may choose to enter for a language certificate. The certificate will record the level of their course (i.e. beginners', intermediate or advanced) and the standard achieved.

### Coursework

See the [Part IB coursework introduction](#) for an outline of the activities, together with the timetabled sessions allocated to them.

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## Lecture & lab start times & lateness penalties

### Lectures

Lectures run from five minutes past the hour to five minutes to the hour, with the following exception:

**Part IA and IB lectures in LT0 will start promptly at 9am and 10am.** Lecturers will start lecturing at precisely 9am in order to fit in the full 50 minutes of teaching that they need to deliver:

- First lecture 09.00-09.50 (non-standard)
  - Second lecture 10.00-10.50 (non-standard)
  - Third lecture 11.05-11.55
  - Fourth lecture 12.05-12.55
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## Part IB briefing notes - general information

Published on CUED undergraduate teaching (<https://teaching15-16.eng.cam.ac.uk>)

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This schedule allows LT0 to empty and refill at 11am. Students should leave LT0 by the doors at the front and on the North side at the back (leading to the roadway), allowing students to enter from the foyer and the courtyard.

### Lab times and lateness penalties

Morning laboratory/coursework sessions begin at 5 minutes past the hour.

1. Students arriving up to 10 minutes late, i.e. by 15 minutes past the hour, will be penalised 1 mark for late arrival, but may be excluded entirely at the discretion of the demonstrator in charge.
2. Students arriving more than 10 minutes late, i.e. after 15 minutes past the hour, will be automatically excluded from any laboratory experiment. For other coursework activities (e.g. computing, drawing, IEP etc.) the student may, at the discretion of the demonstrator, be allowed to take part in the activity, but will be penalised for late arrival.
3. Students who arrive late due to circumstances beyond their control should first try to rearrange the coursework activity. If this is not possible they may make an application for recovery of marks using the standard allowance procedure.

### Afternoon activities

Afternoon activities start on the hour.

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## Part IB examples papers & classes

Part IB examples papers are issued on Fridays and are available from the red and blue boxes in the Inglis building corridor. After one week, they are transferred to the nearby wooden racks.

Solutions are not available to students. Some College libraries keep sets of solutions for students' reference. Students who have difficulty with the papers are encouraged to attend the examples classes on Fridays. Sets of solutions will be placed in the CUED Library during the Easter term for revision purposes.

Outstanding example classes from Lent Term courses will be held early in the Easter Term.

All examples papers and latest version of the rota can be found on the [IB examples paper Moodle page](#).

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## Part IB coursework & labs overview

### Introduction

Outlines of the Part IB coursework activities and experiments are given below, together with the number of timetabled sessions allocated to them.

Also see the [general information about Part I labs & coursework](#).

### Integrated coursework

An integrated coursework activity links four of the short labs (in vibration, structures, soils and signal processing) together round the common topic of "earthquake-resistant structures", with students choosing one extension activity to pursue in more depth, leading to a report and presentation.

It consists of:

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1. an introductory lecture to set the scene and define the problems;
2. 4 short experiments in vibrations, soil mechanics, signal processing and structures including a risk assessment;
3. an extension exercise, in which you will design and conduct a follow-up to any aspect of the short experiments (taking 1-2 lab sessions);
4. a report and short presentation on your extension activity.

The integrated coursework runs over a four-week period, in the term in which you are not doing the IDP. The goals of this lab are to make the coursework open-ended and inter-disciplinary, to relate the labs more closely to Part IA and IB lectures, and to promote teamwork and presentation skills.

### Computing

The Michaelmas term computing course provides an introduction to Octave/Matlab. Four practical sessions are timetabled, covering the Matlab language and environment, and students undertake exercises to display data and solve various numerical problems. The first session for each block of students (Mondays and Tuesdays in weeks 1 or 5) will be preceded by a short introductory talk in LR6. There are 12 qualifying marks of standard credit associated with this practical work. Students must attend all sessions promptly, until the last exercise has been marked.

The Lent term computing course consists of four programming exercises which reinforce the C++ programming skills introduced in the Part IA computing course.

### Integrated design project

Students work in teams of six to design, build and test a mobile robot vehicle as an integrated design project (IDP). Various tasks, typical of those faced by the automated guided vehicles used in modern manufacturing plants, are set for the vehicles. Each team member is individually responsible for a particular sub-system, e.g. structure and drive train, power supply, sensors, electronic control or software integration, as well as contributing to the overall system design and optimisation. The project builds on Part IA teaching in electronics, computing, mechanics and structures, and aims to develop teamwork and communication skills. Students spend three two-hour sessions for four weeks working on this project. The resulting vehicles are tested in a competition to determine the best. Assessment is by quality of the robot vehicle and of team, sub-team and individual reports.

For further details see the [IDP website](#).

### Sustainable engineering

In the Michaelmas term, a series of five lectures presents contemporary applications of the different disciplines to sustainable engineering. The lectures are delivered by a mixture of internal and external speakers and provide an opportunity to hear first-hand from some of the most influential workers in the field. Assessment is through a poster on a topic selected by the student, prepared over the Christmas vacation and submitted in electronic format at the start of the Lent term.

For further details see the [sustainable engineering syllabus](#). Coursework instructions will be given during the lecture course.

### Coursework activities

| Term                | Coursework   | No. of timetabled 2-hour (morning) lab sessions + afternoons                                   |
|---------------------|--|--|
| Michaelmas and Lent | Experiments<br>Computing<br>Integrated coursework<br>Integrated design project | 16 plus sign-up for long labs<br>8<br>5 + 2 or 3 morning/afternoon<br>13 + 1 afternoon lecture |

## Part IB briefing notes - general information

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| Term               | Coursework                          | No. of timetabled 2-hour (morning) lab sessions + afternoons |
|--------------------|-------------------------------------|--|
| Christmas Vacation | Poster on 'sustainable engineering' |  |

## Aims and purposes of Part IB labs

- To acquire practical skills from using different types of equipment and a variety of measuring techniques and to develop a critical approach to assessing the limitations and accuracy of the methods used.
- To learn to work to a sensible number of significant figures.
- To obtain direct experience of physical phenomena, such as the annealing of a metal or the reflection of an electric wave.
- To learn more deeply by doing. Lab work is designed to reinforce the treatment of topics covered in lectures.
- To foster interest and understanding in the subject through practical work that demonstrates engineering applications.
- To gain experience of situations where practical experiments are better than mathematical methods for solving problems.
- To develop an awareness of the limitations of mathematical modelling by testing the validity of models and the assumptions on which they are based against physical observation and experiment; and to reject unsatisfactory models and assumptions if necessary.
- To acquire presentational skills through practice in (a) recording accurately and in a professional manner observations made in the laboratory and (b) writing concise accounts of what has been observed, the significance of the results and the conclusions that can be drawn.
- To develop skills in organisation and co-operation through working in pairs or in larger groups on a common task to meet a specified deadline.
- To develop an awareness of the safety of the individual and the group through the safe and careful operation of potentially hazardous equipment.

This is a long list of aims to be achieved, and others could be added to it. Remember that departures from expected behaviour can be more interesting and thought-provoking than results that fit the predictions exactly. Experiments are the physical reality: if you find that to within the accuracy of your measurements there are discrepancies within the theory, then it is the theory or more likely the assumptions on which it is based that are wrong. Respect your measurements and remain sceptical about theories until the physical evidence is convincing.

## Experiments (Michaelmas/Lent terms)

All students undertake 20 experiments, as listed below. There is a mixture of long and short experiments.

| Associated paper                              | Experiment number and title    | Long or short |
|---|--------------------------------|---------------|
| Integrated coursework:<br>(interdisciplinary) | A1. Dynamic vibration absorber | S             |
|   | A2. Model structures           | S             |
|   | A3. Soil mechanics             | S             |
|   | A4. Fourier signal analysis    | S             |
| Mechanics:                                    | D1. Rotor dynamics             | S             |
| Structures:                                   | S1. Plastic collapse           | S             |
| Materials:                                    | M1. Materials characterisation | S + L         |
|   | M2. Heat treatment             | S             |

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Published on CUED undergraduate teaching (<https://teaching15-16.eng.cam.ac.uk>)

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| Associated paper         | Experiment number and title  | Long or short    |
|--------------------------|--|------------------|
|                          | M3. Torsion testing  | L                |
| Thermofluid mechanics:   | T1. Peltier heat pump<br>T2. Pipe-flow<br>T3. Boundary layers<br>T4. Heat transfer             | S<br>S<br>L<br>S |
| Electrical engineering:  | E1. Power amplifier<br>E2. Synchronous machine<br>E3. Induction motor<br>E4. Wave transmission | S<br>S<br>S<br>L |
| Information engineering: | 1. Spectrum analysis<br>2. Process control<br>3. Position control                              | L<br>S<br>S      |

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## Coursework credit

Coursework in Engineering includes lab work and projects, plus a number of other marked assignments.

## Coursework for standard credit at Part I

In Parts IA and IB, all coursework is for standard credit, which means that once students achieve a satisfactory standard in the various groups of activities the associated marks are capped at the qualifying level. Students who fail to reach the qualifying marks, or who fail to attend or hand in certain coursework, will have the shortfall deducted from their total in the Tripos. The marks available and qualifying marks are shown in the Faculty Board [Part IA](#) and [Part IB](#) coursework credit notices.

The standard credit scheme has been designed to encourage students to attend coursework sessions punctually, to complete each laboratory-based activity within an appropriate time to a satisfactory standard so as to achieve the main objectives of the activity, and to submit any written work for marking within a specified timescale.

The system aims to help students by discouraging them from spending an inordinately long time on any one coursework activity, at the expense of other aspects of their study. It also encourages innovation in design work, as there is not an undue loss of marks for a less successful outcome.

The majority of students are expected to gain the qualifying standard.

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## Rearranging coursework & allowances

Students are expected to make every effort to attend timetabled coursework sessions and meet coursework deadlines. If a student believes this may not be possible, they should first read '[Rearranging coursework & allowances: general rules](#)'.

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## Plagiarism avoidance: expectations of all students

The range of penalties for cheating in University examinations and coursework includes disqualification from the BA

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## Part IB briefing notes - general information

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and MEng degrees. Ignorance of the seriousness of plagiarism will **not** be an acceptable defense.

The University's Discipline Regulation 6 states: "No candidate shall make use of unfair means in any University examination. Unfair means shall include plagiarism\* and, unless such possession is specifically authorised, the possession of any book, paper or other material relevant to the examination. No member of the University shall assist a candidate to make use of such unfair means."

\* plagiarism is defined as submitting as one's own work, irrespective of intent to deceive, that which derives in part or in its entirety from the work of others without due acknowledgement.

To ensure that you understand what constitutes plagiarism and how to avoid it through good academic practice you are required to read:

- the University's [statement on plagiarism](#);
- the Department's guidance on [distinguishing between cooperation & cheating](#), which includes links to sources of further information and support.

If you do not fully understand the information in these documents you must seek clarification at the **earliest opportunity** from your Director of Studies or supervisor.

All work submitted electronically may be subjected to checking for plagiarism using Turnitin text-matching software. You are required to:

- read the [terms and conditions of use for Turnitin text-matching software](#) and electronically submit a completed consent as part of the registration process

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## Progression through the Engineering Tripos

A summary of the results that students must obtain to continue with the next part of the course is available [at this link](#). Formal and detailed information about progression requirements is contained in [Statutes and Ordinances](#).

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## Industrial qualification

The deadline by which [industrial experience](#) must be completed and confirmatory documents submitted is Wednesday 10 February 2016.

For details of firms offering work experience or to make an appointment with the Industrial Experience Coordinator see the [Industrial Experience website](#).

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## Accreditation of the MEng

All students are encouraged to become student or affiliate members of one or more of the professional engineering institutions, and hopefully later become full members. [This link contains details of the accreditation of the Cambridge Engineering degree](#).

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## Part IIA student exchanges

The Department runs a number of exchanges that allow students to spend a year at one of a number of prestigious overseas institutions instead of doing Engineering Part IIA or MET IIA. Students then return to Cambridge for Part IIB. [Follow this link for an overview of the available exchanges](#).

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## Prizes, Scholarships and Awards

There are a large number of Prizes, Scholarships and Awards available: some are awarded for excellent performance on the course, others are open competitions (in particular, note the [Head of Department's Annual Design Competition](#)). Details of all prizes and awards are on the [CUED Prizes and Scholarships webpage](#).

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## Additional course costs

[This link](#) describes any additional costs that students will be expected to pay to complete the course.

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## Feedback from students

We are keen to hear what students think of the courses that we give, and so encourage students to [complete the online survey](#) and [vote for the 'best' lecturer](#). They can also use the ['Fast Feedback' to send messages anonymously](#).

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## Dyson Centre for Engineering Design

The Dyson Centre for Engineering Design will be opening during the Michaelmas term, providing a modern design-and-make space at the heart of the Trumpington Street site. More details are available [here](#).

The vision is to provide a modern workspace for engineering students to develop their creativity and enthusiasm for engineering, providing a home not only for the design, build and test projects that are a core activity within the undergraduate teaching programme but also for the extracurricular student-led projects and the school outreach schemes. The large projects will have bases here, but the aim is also to provide facilities for students to explore individual or small-group projects.

Students will be able to come together to think, exchange ideas, design, experiment, and build. They will have access to facilities for prototyping and making, using traditional hand- and machine-tools and also modern computer-controlled machinery, 3D printers and laser cutters.

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## Inclusive teaching

The Equality Act (2010) requires higher education institutions to take positive steps to make their education accessible to disabled students and to make 'reasonable adjustments' to provision to ensure that disabled students are not disadvantaged. Disabilities may include physical or mental impairments: the majority of these students have specific learning difficulty (SpLD) in the form of dyslexia. Cambridge University Disability Resource Centre has some standard recommendations for appropriate academic support for such students. Further provision may be required in particular cases.

In an organisation of our size and complexity, individual variations in provision are potentially disruptive. However, many of the suggested adjustments are just good educational practice, so represent things we should be doing anyway as a Department that takes pride in the excellence of its teaching. Indeed, we already follow many of the recommendations (e.g. provision of cribs). The approach we have adopted is therefore to aim to have inclusive standard procedures for all teaching activities. Students are expected to make use of available resources to suit their needs, and to contact staff themselves (e.g. lecturers, lab leaders) if additional material is required.

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## Part IB briefing notes - general information

Published on CUED undergraduate teaching (<https://teaching15-16.eng.cam.ac.uk>)

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Link to list of [IA](#) lecturers, [IB](#) lecturers and lab leaders for [IA](#) and [IB](#).

Contact details of part II lecturers can be found on the relevant syllabus pages.

Any enquiries should be addressed to the [CUED Director of Undergraduate Education](#).

### **The following recommendations have been agreed by the Faculty Board (12 November 2012):**

- Electronic versions of handouts should be made available on-line 24h in advance of lectures or other teaching sessions (e.g. labs). [This allows students who do have special requirements to produce their own customised hard copy if they wish: e.g. single-sided; large format; non-white background].
- Filled-in versions of notes should be made available on-line after lectures.
- Recording lectures (audio) is often recommended to students as a learning aid. They must sign an agreement to use the recording only for their own personal study, and acknowledging IP and copyright. The agreement form can be found [here](#), and students are asked to provide the Teaching Office with a copy. Lecturers are asked to consent to their lectures being recorded under these conditions. A list of students who have completed agreement forms can be made available on request.
- In labs, instruction should be provided in both written and verbal form.
- Lecturers should remember to pay attention to 'signposting' e.g. statement at start of each lecture of what is being covered; tracking progression throughout lecture; summary of main teaching points at end.
- All staff should make particular effort to put new vocabulary into context and explain new concepts. It is helpful to provide some repetition.

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## Undergraduate Teaching Office contact details

The Undergraduate Teaching Office organises and oversees the provision of undergraduate courses, projects and teaching activities. The Office is located on the office floor of the Baker building.

Individual contact details of Undergraduate Teaching Office staff are as follows:

[Dr Claire Barlow](#), Deputy Head of Department (Teaching), tel: (3)32627

[Dr Alexandre Kabla](#), Director of Undergraduate Education, tel: (3)32883

[Sonia McLintock](#), Administrative Officer, tel: (3)32619

Sonia looks after examinations and much of the teaching administration, including TODB, teaching allocations and timetabling. Her normal days of work are Tuesday, Wednesday and Thursday.

[Madeline McKerchar](#), Administrative Officer, tel: (7)62423

Madeline looks after Faculty Board and Teaching Committee, and will be in the office Mondays and Fridays.

[Mary Wilby](#), Senior Administrator (Teaching Office), tel: (3)32704

Teaching Office Manager

[Sally Kwong](#), Administrator, tel: (3)32807

Supports examinations, the Faculty Board and room bookings.

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[Klara Cichovska](#), Administrator (Teaching Office), tel: (3)32625

Production and distribution of examples papers, Teaching Office enquiries.

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