FOREWORD

Statement of Coverage
This handbook applies to students starting the MEng in Engineering Science in Michaelmas Term 2015. The information in this handbook may be different for students starting in other years.

Disclaimer

The Examination Regulations relating to the MEng course in Engineering Science are available at www.admin.ox.ac.uk/examregs/. If there is a conflict between information in this handbook and the Examination Regulations then you should follow the Examination Regulations. If you have any concerns please contact the Faculty Office at faculty.office@eng.ox.ac.uk.

The information in this handbook is accurate as at 5th October 2015, however it may be necessary for changes to be made in certain circumstances, as explained at www.ox.ac.uk/coursechanges. If such changes are made the department will publish a new version of this handbook together with a list of the changes and students will be informed. The up-to-date version may always be found on WebLearn.

<table>
<thead>
<tr>
<th>Date of Amendment</th>
<th>Version control</th>
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WELCOME

Head of Department’s welcome:

The department of Engineering Science was established in 1908 and we have been involved in educating and training some of the world’s finest engineers ever since. Today, we have a world-class reputation in many aspects of engineering, working closely with companies such as Google, Rolls-Royce, Jaguar Land Rover and Dyson to name but a few.

The Professors who will be teaching you are at the forefront of developing innovations which are not only important to industry, but which will also improve people’s everyday lives, such as prosthetic limb joints, apps for smartphones, monitoring jet engines in flight, and driverless cars. Our work on the design of turbine blades for jet engines has also long been regarded as world-leading, and we have created a “Video Google” system which enables automatic searching for a particular scene in a video. You may even have used a product which an Oxford Professor has helped to develop.

I was an undergraduate in this department in the late 1970s and really enjoyed my time as a student. After graduating, I worked in industry and then came back to be a Professor in the department 27 years ago. I am absolutely convinced that the Department of Engineering Science in this University is a wonderful place in which to study and we will do everything that we can to help you develop your engineering skills during the next four years.

Prof Lionel Tarassenko, CBE FREng FMedSci

Associate Head of Department (Teaching) welcome:

Let me begin by congratulating you on getting to Oxford to study for the MEng degree in Engineering Science. You have been selected through a rigorous process from a wide pool of very able applicants, and opportunities are just about to open up. There will be times when you need to know the detailed syllabus, when to select optional courses, when to submit project work and a lot more besides. You will find all this information in the handbook and other sections of WebLearn (the Department’s web resource for course material). My advice is to read the Handbook through at the start of your course so that you get to know where to find essential information.

The MEng course has been designed to cover the key disciplines of engineering science; the first and second year laying the broad foundations on which later specialisation will develop. You will discover that it is not possible to understand the engineered world without mathematics and experimental observations on how physical things actually behave. So there will be an emphasis on developing your skills in mathematics and attending labs. In fact, throughout the course we have carefully designed the balance of theory covered in lectures and reinforced in tutorials with coursework completed in laboratory exercises. In years three and four you will select your course options and engage in project work on a well-defined research topic; the decisions you make on your course selection will help define the type of engineer you will be after graduation.

In addition to the academic staff (Professors) you will see in lectures and labs there are a large number of people working in the department as support staff. You will receive regular communications from the Faculty Office notifying you of events and course related deadlines. If you have any concerns about the course then please reach out to the Faculty Office staff. They are very likely to have the information you need and to help you make the best of the opportunities ahead. If you are industrious, you will find your time here both rewarding and enjoyable.

Prof Steve Sheard, CEng MIET
1. KEY CONTACTS IN THE DEPARTMENT

The Faculty Office on the 8th Floor in the Thom Building is the main location to go to hand in or collect coursework/assignments, or if you have any general queries.

Our usual opening hours are 8.45am to 5.00pm, Monday to Friday. The Faculty Office closes for lunch between 1-2pm each day. Please email faculty.office@eng.ox.ac.uk or call 01865 273006 in advance if you are planning to make a special trip to the department and you will be travelling some distance to reach us, as occasionally we may need to operate reduced hours.

The Faculty Office team is headed up by a lead academic – the Associate Head (Teaching). Details of the current Faculty Office team and associated staff supporting teaching are listed below:

**Associate Head (Teaching)**
Professor Steve Sheard, steve.sheard@eng.ox.ac.uk

**Deputy Administrator (Academic) / Disability Contact**
Ms Jo Valentine, jo.valentine@eng.ox.ac.uk

**UG Administrative Assistant**
Miss Claire Rylatt, faculty.office@eng.ox.ac.uk

**Exams Administrator**
faculty.office@eng.ox.ac.uk

**Head of Laboratory Support**
Mr Clive Stayt, clive.stayt@eng.ox.ac.uk

**Departmental Safety Officer**
Mr Gary Douglas, gary.douglas@eng.ox.ac.uk

Other useful general contact email addresses:

**Faculty Office** – for all general queries relating to course administration and teaching
faculty.office@eng.ox.ac.uk

**Engineering Science Reception** – for general queries to the department
reception@eng.ox.ac.uk

**Engineering Science IT Helpdesk** – for help with IT
support@eng.ox.ac.uk
www.eng.ox.ac.uk/intranet/it-eng

**Engineering Science Print Room** – for printing/binding of dissertations, project reports etc.
printroom@eng.ox.ac.uk
2. IMPORTANT SOURCES OF INFORMATION

Examination Regulations – the ‘Grey Book’

The **Examination Regulations**, commonly known as the “Grey Book” due to its grey coloured cover, is the authoritative document on University examinations. You should receive a free copy of the relevant part of this book through your College at the beginning of your first term. The **Grey Book** defines the syllabus for examinations, and changes to it are strictly regulated by the University to ensure that you cannot be disadvantaged by any changes which are made after you start your course. It is available online at [www.admin.ox.ac.uk/examregs/](http://www.admin.ox.ac.uk/examregs/). The most up to date version of examination regulations are always available online.

Engineering Science WebLearn site

The most comprehensive source of information for your studies is the Engineering Science WebLearn site at [weblearn.ox.ac.uk/portal/hierarchy/mpls/eng](http://weblearn.ox.ac.uk/portal/hierarchy/mpls/eng). On this site you can find details of the syllabus, lecture notes, example sheets, solutions, details of student representatives, and many other useful pieces of information.

Proctors and Assessors Memorandum

A booklet entitled, *The University Student Handbook* is produced by the Proctors and Assessor and is handed out by colleges to new students at the start of Michaelmas Term. The booklet explains the role of the Proctors and Assessor and provides useful information about welfare, support, recreation, examinations and University regulations. It is available to download at [www.admin.ox.ac.uk/proctors/info/pam/index.shtml](http://www.admin.ox.ac.uk/proctors/info/pam/index.shtml).

Important Reference Documents

The student portal at [www.ox.ac.uk/students](http://www.ox.ac.uk/students) provides a single point of access to information, services and resources for students.

Please ensure that you are familiar with the following University policies:

- Equal Opportunities Statement for Students
- Disability
- Harassment
- Safety for Students
- Proctors’ and Assessors Memorandum (*The University Student Handbook*)
- Computer Usage Rules and Etiquette
During the course of your studies you might also need to consult other policy documents such as those on:

- Intellectual Property Rights which is set out in the University Statues and Regulations at [www.admin.ox.ac.uk/statutes](http://www.admin.ox.ac.uk/statutes)
- Data Protection at [www.admin.ox.ac.uk/councilsec/dp/policy.shtml](http://www.admin.ox.ac.uk/councilsec/dp/policy.shtml)

The online version of the Examination Regulations is available at [www.admin.ox.ac.uk/examregs](http://www.admin.ox.ac.uk/examregs).

You might also find the programme specifications for the Engineering courses a useful source of information on the expected outcomes of your course. These documents are available on WebLearn in the Resources for Undergraduates section.

### 3. DATES TO NOTE

#### Dates of Term 2015-16

- **Michaelmas Term**: Sunday 11th October – Saturday 5th December 2015
- **Hilary Term**: Sunday 17th January – Saturday 12th March 2016
- **Trinity Term**: Sunday 24th April – Saturday 18th June 2016

#### Assessment Dates

- **B1 Project**: 5pm on Friday of week one of Hilary Term to Faculty Office
- **B3 Third Year Project (3YP)**: Noon on Wednesday of week 4 in Trinity Term to Exam Schools
- **Fourth Year Project (4YP)**: Noon on Wednesday of week 4 in Trinity Term to Exam Schools
4. FINDING YOUR WAY AROUND

4.1 Location of the Department of Engineering Science

The Department of Engineering Science is located on four sites across Oxford. Maps of Oxford showing the location of these sites can be found at www.eng.ox.ac.uk/contact-us or view the interactive map at www.ox.ac.uk/visitors/maps-and-directions/searchable-map-large.

Main site – central Oxford

Most of the department’s buildings are on the ‘Keble Road Triangle’ between Banbury Road, Parks Road and Keble Road.

Most undergraduate teaching takes place in the Thom Building, the main entrance of which is at ground level on Banbury Road, up steps or via the wheelchair accessible ramp.

4.2 Opening Hours

Thom Building

The main door to the Thom Building and the Thom Building reception desk is open on weekdays between 07:45 hours and 18:00 hours all year around.

Holder Building

During weeks 1-8 of term the main doors to the Holder Building on the first floor are unlocked from 08:30 and are locked at 16:45. They are permanently on swipe-card access during vacations. Detailed rules governing access to the department are included in Appendix C.

4.3 Floor guide to the Thom Building

A list of what is located on which floor in the Thom Building is below. You will also find this list by the lifts on each floor in the Thom Building, and another copy inside each lift.

<table>
<thead>
<tr>
<th>Floor</th>
<th>Facilities</th>
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<tbody>
<tr>
<td>8</td>
<td>Lecture Rooms 4, 5 and 6; Reading area; Faculty Office</td>
</tr>
<tr>
<td>7</td>
<td>Staff offices – HR, Accounts, Head of Finance and Administration, Head of Department</td>
</tr>
<tr>
<td>6</td>
<td>Computing Labs – Software Labs A and B; IT Helpdesk</td>
</tr>
<tr>
<td>5</td>
<td>Electronics Control Lab; Electrical Machines Lab; Electronics Workshop</td>
</tr>
<tr>
<td>4</td>
<td>Design, Build &amp; Test Lab; Staff/Student Workshop; Ocean Engineering &amp; Dynamics Lab</td>
</tr>
<tr>
<td>3</td>
<td>Materials Lab; Chemical Engineering Lab; Fluids Lab; Thermofluids Lab</td>
</tr>
<tr>
<td>2</td>
<td>Staff offices</td>
</tr>
<tr>
<td>1</td>
<td>Lecture Rooms 1, 2 and 3; Access to Holder Building</td>
</tr>
<tr>
<td>G</td>
<td>Main Entrance/Exit; Reception; General Office; Print Room; Stores; Workshop</td>
</tr>
<tr>
<td>B</td>
<td>Maintenance Workshop</td>
</tr>
<tr>
<td>BB</td>
<td>Heat Treatment Lab; Heat Engines Lab</td>
</tr>
</tbody>
</table>
4.4 Thom Building 8th Floor Study Area

The open study area comfortably seats forty students on the eighth floor in the Thom Building. There are ten individual study carrels and the area also houses a small reference collection of books. However, books are available for loan from the Radcliffe Science Library and may also be available from college libraries.

The Oxford Wireless LAN (OWL) is available on the eighth floor. Laptops require Cisco VPN client software to connect information about VPN (virtual private networks) can be found at www.oucs.ox.ac.uk/network/vpn. Students are welcome to use their laptops in the open study area but are asked to sit close to a plug socket if their laptop needs to be connected to a power source. Trailing electrical leads may cause a trip hazard in open study areas. Alternatively, students may use the individual study carrels as all have a power socket.

Students are asked to vacate the eighth floor study area promptly at 19:00 hours. Please note that you will not be able to gain access to the Thom Building after 18:00 hours. If you leave the building after 18:00 hours you will not be able to gain access again so please keep your personal belongings with you at all times.

4.5 Other engineering science locations

Just to the north of the Thom Building is the Holder Building which houses the Holder Café where you can purchase food and drinks. Beyond that, you will find the Engineering and Technology (E & T) Building in which the Design Office is located. Both the Holder and E & T Buildings are shared with the Department of Materials.

The Information Engineering Building is located on the Banbury Road alongside these buildings and includes lecture rooms 7 and 8 on the ground floor. At the northern tip of the Triangle is the Jenkin Building which housed the whole Engineering Science department from 1914 until 1963, and now contains staff offices, a student workshop and several research laboratories.

Southwell Laboratory
The Thermofluids Research Laboratory in the Southwell Building is situated at Osney Mead not far from the Rail Station. The new laboratory was opened by the Vice Chancellor in 2010 as part of the University's strategic investment in the UK's science base. The laboratory houses some of the most sophisticated turbine and high speed flow facilities in the world, and the research group includes internationally recognised experts in CFD, flow and heat transfer experiments. The laboratory is home to the Rolls-Royce University Technology Centre in Heat Transfer and Aerodynamics and is where we work with colleagues in industry to develop more fuel efficient jet engines.

Institute of Biomedical Engineering
The department’s Institute of Biomedical Engineering (www.ibme.ox.ac.uk) is located on the Churchill Hospital campus next to Oxford's major clinical teaching hospitals. It offers a centralised venue for engineers and clinicians to work together to coordinate expertise, discoveries and best practice to enhance the diagnosis and treatment of a range of conditions. The Institute provides purpose built research laboratories, shared common support facilities, a core of securely funded staff, the latest
equipment for research and development and the right setting to promote collaboration among medical, biological and physical scientists and engineers.

**Begbroke Science Park**

The Begbroke Science Park is a fully integrated research and development facility, located north of the city. It hosts over 20 research groups from a range of departments in the Mathematics, Physical and Life Sciences Division of Oxford University – including Engineering Science.

**4.6 Radcliffe Science Library**

The Radcliffe Science Library (RSL) [www.bodleian.ox.ac.uk/science](http://www.bodleian.ox.ac.uk/science) is the main science research library at the university. The library holds copies of all of your reading list items, and most of your engineering library research will be done using this library’s resources. The library is located less than 5 minutes away from the Engineering Science department, at the corner of Parks Road and South Parks Road.

There is also an online library guide [ox.libguides.com/EngineeringUGProjects](http://ox.libguides.com/EngineeringUGProjects) specially prepared to help you find information for your 3rd and 4th year projects in Engineering Science.

The subject librarian responsible for Engineering Science is Alessandra Vetrugno [alessandra.vetrugno@bodleian.ox.ac.uk](mailto:alessandra.vetrugno@bodleian.ox.ac.uk), and she is based at the RSL. Please contact her for assistance, if you have any questions, such as:

- How do I use the library catalogue to find books and journals?
- How do I request items from the closed stack?
- How do I get started using article databases?
- How can I quickly and easily create bibliographies?
- What tips and tricks can I use to improve my searches?
- Where can I find a group study room?
- Which libraries can I use?”
5. GENERAL INFORMATION

5.1 Communications

The Faculty Office uses email as the main means of communication with undergraduates. It is expected that you will check your college email account on a daily basis at the very least. While last minute timetable changes are not frequent, get into the habit of checking your email before you leave your accommodation before you set off for the department. You could save yourself a wasted journey.

Department and course information is available online:

- Course-related materials and resources (e.g. lecture notes and timetables) are made available on the University’s Virtual Learning Environment, otherwise known as WebLearn [www.weblearn.ox.ac.uk/portal](http://www.weblearn.ox.ac.uk/portal).
- You will need to login to your ‘Oxford Account’ on the top right hand side of the page - on the left hand side menu follow the link for ‘MPLS’ and then ‘Engineering Science’ and finally, ‘Undergraduates’.
- The home page at [www.eng.ox.ac.uk](http://www.eng.ox.ac.uk) includes a link to the department's intranet (accessible from the ‘ox.ac.uk’ domain only).
- You can also follow the department on Twitter @oxengsci.

Members of staff may be contacted by e-mail, phone or in person – details are available at [www.eng.ox.ac.uk/people](http://www.eng.ox.ac.uk/people).

Digital display screens along with noticeboards on the ground floor and first floor of the Thom Building carry timetable information and other important announcements. It is essential to check these regularly. The examinations notice board is located on the eighth floor of Thom Building.

5.2 Student Bulletin

Details of visits from companies to the department, opportunities for further study, announcements by engineering related student societies etc, are emailed weekly during term time to all students via the weekly Student Bulletin. Some are also posted on the noticeboards in the Thom Building eighth floor study area, and the noticeboard by the Holder Café.

If you represent a society or organisation which you feel would be of interest or benefit to engineering students, email the text you would like to be included in the Student Bulletin to faculty.office@eng.ox.ac.uk and we may include it in the next bulletin. We reserve the right to refuse to include material if it is deemed inappropriate for the audience. The Editors’ decision is final.

The Careers Service is also an invaluable resource, right from your first year. Visit [www.careers.ox.ac.uk](http://www.careers.ox.ac.uk) to find out more about how the Careers Service are able to assist you in improving your employability skills. The Careers Service also have a job search database called CareerConnect for internships, placements and graduate opportunities.
5.3 Computing facilities in the Department

The Software Laboratory on the sixth floor of the Thom Building houses a network of workstations running Linux and MS Windows operating systems. These provide a wide variety of software and Computer Aided Engineering packages.

Each undergraduate is given an account which is used for the first-year Computing Laboratory, various Coursework Modules and projects. Undergraduates can also use them to access e-mail and the internet which they may use, outside timetabled laboratory hours, for academic purposes.

A design suite is located on the ground floor of the Engineering and Technology Building. The majority of the PCs are used for timetabled laboratories, but four are made available for project work.

All these computing facilities are supported by the Engineering IT Services section www.eng.ox.ac.uk/intranet/it-eng. Notes are issued to all new users, who will also be asked to sign an undertaking to abide by the University Rules for the use of computers. You must ensure that you read and understand the Oxford University Computer Usage Rules and Etiquette at www.ict.ox.ac.uk/oxford/rules.

5.4 Undergraduate liaison

Undergraduate opinion on lectures, examples sheets, and laboratory experiments, as well as on the general quality of life in the department, can be very helpful and is valued by staff. Comment is particularly helpful if you provide it as soon as possible after the event, and is most likely to be effective if presented politely.

There are several mechanisms for liaison between undergraduates and staff:

- Undergraduates may approach lecturers directly, or through Tutors. Constructive criticism will always be welcome.
- A Joint Consultative Committee (JCC) provides discussion between undergraduate students and staff on administrative and academic matters. Undergraduates elect their own representatives to serve on this committee. Open meetings, with staff members present, are held once a term. This body has an important function in collecting and communicating student opinion in an organised way.
- There are JCC representatives on relevant Departmental and University Committees.
- The Engineering Science Confidential Reporting System - the intention is that this Confidential Reporting System (CRS) will help highlight hazardous and dangerous situations, understand what causes these and pinpoints unsafe practices. Further information is available at www.eng.ox.ac.uk/intranet/systems/engineering-science-crs.
- The Faculty collects feedback on teaching, on a termly basis.
- Students on full-time and part-time matriculated courses are surveyed once per year on all aspects of their course (learning, living, pastoral support, college) through the Student Barometer.
Previous results can be viewed by students, staff and the general public at [www.ox.ac.uk/students/life/feedback](http://www.ox.ac.uk/students/life/feedback).

- Final year undergraduate students are surveyed through the National Student Survey (NSS). Results from previous NSS surveys may be found at [www.unistats.com](http://www.unistats.com).

### 5.5 Food etc.

The Common Room in the Holder Building is managed by Baxter Storey and is open between 08:00 hours and 15:30 hours each day. Items available to purchase include hot and cold drinks and food. Food and drink **must not** be taken into lecture rooms, computer rooms, or the student study area on the eighth floor.

### 5.6 Student Societies

#### The Oxford University Engineering Society

The Oxford University Engineering Society [www.ouengsoc.org](http://www.ouengsoc.org) exists to promote a wider interest in Engineering than is possible through the academic courses. A regular programme of meetings and visits is run by an undergraduate committee with the support of a senior member from the staff of the department. You are warmly invited to participate.

#### Women in Engineering

A women’s networking group has been established in the department with the intention of organising talks, social events and other networking activities (for all members of the department). Membership of this organising group consists of Postdoctoral Research Assistants, Postgraduate students, Undergraduate students and an academic member of staff.

If you are interested in joining the network organisation group please email engs-wie@maillist.ox.ac.uk. Organising meetings are usually held termly over lunch.

#### Oxford Engineering Alumni (OEA)

This looks ahead to after you graduate from Oxford, but may be of interest to you now. As a current student you automatically become an associate member of this society, and you will become a full member when you graduate. OEA is a society for former students who have graduated from the department, and for present and former members of the teaching and research staff. Its purpose is to help former Oxford Engineering students and staff keep in touch with each other and with the department, for their mutual benefit, when they move on to other things after leaving the university. More information is given on the alumni page of the department’s web-site at [www.eng.ox.ac.uk/alumni](http://www.eng.ox.ac.uk/alumni).
6. THE COURSE

6.1 Overview

All engineering teaching is based on a general course in Engineering Science. We offer this unified course because we believe that future engineering innovation will benefit from broad foundations as well as specialised knowledge. Links between topics in apparently diverse fields of engineering provide well-structured fundamental understanding, and can be exploited to give efficient teaching.

The Engineering Science course is planned by the Faculty of Engineering Science, which consists mainly of the department’s academic staff.

The information in this handbook relates to the four year undergraduate MEng in Engineering Science degree course. The course is taught to Level 6 of the Frameworks for Higher Education Qualifications (FHEQ) guidelines. The course is taught and developed within the subject benchmark statement\(^1\) guidelines issued by the Quality Assurance Agency (QAA), the independent governing body for monitoring and advising on standards and quality in UK higher education.

6.2 Accreditation by the Engineering Institutions

Many Oxford engineering graduates will want to become corporate members of a Professional Engineering Institution and seek Chartered Engineer status. Satisfactory completion of an accredited university course gives exemption from certain requirements of the main Engineering Institutions. University courses are considered for accreditation by each major institution separately, and this approval is reviewed regularly. Following the Oxford review in 2012, the Institutions accredited our courses as follows:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Accredited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil and Structural</td>
<td>Yes</td>
</tr>
<tr>
<td>Electrical (IET)</td>
<td>Yes</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Yes</td>
</tr>
<tr>
<td>Measurement &amp; Control</td>
<td>Yes</td>
</tr>
<tr>
<td>Chemical</td>
<td>Yes</td>
</tr>
</tbody>
</table>

In some cases appropriate options are required for accreditation; details are available on WebLearn.

For further information you should ask the institution concerned, the Deputy Administrator (Academic), or one of the department’s liaison officers as follows:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution of Civil Engineers</td>
<td>Dr R.P. Jacob</td>
</tr>
<tr>
<td>Institution of Engineering and Technology (IET)</td>
<td>Prof D. Howey</td>
</tr>
<tr>
<td>Institution of Mechanical Engineers</td>
<td>Prof D.R.H. Gillespie</td>
</tr>
<tr>
<td>Institution of Chemical Engineers</td>
<td>Prof N.P. Hankins</td>
</tr>
<tr>
<td>Institution of Measurement and Control (InstMC)</td>
<td>Prof. S.R. Duncan</td>
</tr>
</tbody>
</table>

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6.3 Course Aims

- To provide students with: a systematic understanding of the knowledge-base of Engineering Science: the ability to analyse complex issues both systematically and creatively, make sound judgements in the absence of complete data and communicate their conclusions clearly; the ability to be self-directed and innovative in tackling and solving problems; the independent learning ability required for continuing professional development.

- To provide a broad curriculum which provides state-of-the-art knowledge and practical skills in Engineering.

- To provide a learning environment that enables students of high innate ability to reach their full potential, personally and academically, so that on graduation they are free to choose from many different careers, and have the understanding, knowledge and personal maturity to make a rapid contribution to their chosen employment or research area.

- To provide a course which meets the educational requirements of all the appropriate Engineering Institutions for Chartered Engineer status.

6.4 Learning Outcomes

To meet the conditions of accreditation by the Professional Engineering Institutions a degree course must have learning outcomes that satisfy established criteria across six key areas of learning. The following section is a statement on how the Engineering Science programme delivers these outcomes at the integrated Masters (MEng) level.

Science and mathematics
The application of advanced mathematical methods to a comprehensive range of tutorial problems, underpinning the engineering principles and tools required in their solution. The scientific practice and application of mathematics in a substantial group project (3YP) and higher level individual project (4YP).

Engineering analysis
The application of engineering concepts to solve set problems in tutorial work. The collection, analysis and application of data through laboratory based coursework (practicals), group project (3YP) and an individual research project (4YP).

Design
Lecture courses that cover the general principles of design, product development, materials and processing. The 3YP is a substantial group design project centred on a viable product; planning the design process, evaluating the business and wider engineering context. The individual research project requires the student to engage in a series of creative design processes, build and evaluations.
Economic, legal, social ethical and environmental context
A Lecture course on ‘Engineering in Society’ and associated coursework and examination; includes professional and ethical responsibilities, environment, safety, management and business practices.

Engineering practice
Laboratory work in general and particular engineering disciplines, covering a range of techniques and practice. A lecture course in the first year on Engineering Practice. The 3YP group design project requires understanding of the different roles in the engineering team. The individual project is a substantial research project, assessed by report and interview.

Additional general skills
Creativity and innovation through tutorial work and coursework modules. The group project is the setting for developing teamwork, communication and presentational skills. Foundations for lifelong learning through opportunities such as societies, seminars and broader engagement.

These are covered by the following methods:

<table>
<thead>
<tr>
<th></th>
<th>Lectures</th>
<th>Tutorials/ Classes</th>
<th>Practicals</th>
<th>DBT</th>
<th>CWM</th>
<th>3YP</th>
<th>4YP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science and mathematics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Engineering analysis</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Design</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Economic, legal, social</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Engineering practice</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>General skills</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
6.5 Course Description

Course Structure

The table below gives an outline of the MEng Engineering Science course structure:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PART</th>
<th>ELEMENT</th>
<th>WRITTEN PAPER (WP) OR COURSEWORK (C)</th>
<th>CORE OR OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRELIMS</td>
<td>P1 Mathematics</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>PRELIMS</td>
<td>P2 Electronic and Information Engineering</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>PRELIMS</td>
<td>P3 Structures and Mechanics</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>PRELIMS</td>
<td>P4 Energy</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>PRELIMS</td>
<td>P5 Engineering Coursework</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>A1 Mathematics</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>A2 Electronic and Information Engineering</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>A3 Structures, Materials and Dynamics</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>A4 Energy Systems</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>A5 Engineering Practical Work</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>B Papers (choose 5 options)</td>
<td>WP</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>B1 Engineering Computation</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>B2 Engineering in Society</td>
<td>WP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>B3 Group Design Project (3rd Year Project)</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>B4 Engineering Practical Work</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>C Papers (choose 6 options)</td>
<td>WP</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>4th Year Project</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

6.6 Course Syllabus

More detailed information on the syllabus is available on WebLearn, the University’s Virtual Learning Environment weblearn.ox.ac.uk/portal/hierarchy/mpls/eng/ug.

Syllabi may be revised annually on the advice of relevant Faculties and Standing Committees, and where appropriate, after scrutiny by the University, for example to safeguard the interests of those who have already started a course. If you have any problems accessing the material that you need on WebLearn email faculty.office@eng.ox.ac.uk.
7. TEACHING AND LEARNING

7.1 Overview

Engineering Science at Oxford is taught by various mechanisms: lectures, tutorials, classes, laboratory coursework and projects. The course is planned so that these mechanisms support each other; none is optional.

A very rough guide to quantities is that for Prelims you may have in each week of full term up to about ten lectures, two College tutorials, and one coursework session of five hours. Lecturers produce a sheet of about ten tutorial examples to accompany each set of four lectures and to provide a basis for College tutorials. A tutorial is usually concerned with one particular example sheet, which might require of the order of ten hours of your time in preparation.

In an ideal world, each set of about four lectures would be closely followed by a time of private study with the set of examples to work through, followed by a tutorial in College to discuss any difficulties. Laboratory experiments would also happen shortly after the associated lectures.

In practice, lectures are subject to one set of timetabling constraints, tutorials to another and laboratories to another. The ideal is not always attainable and Tutors may find it necessary to schedule some tutorial work ahead of the lectures rather than afterwards. On these occasions you will have to put in a great deal of well-organised study. Tutors will try not to let it happen frequently to the same people. In any case, the confidence and ability to master an unfamiliar topic quickly is a valuable asset, and a little enforced practice does no harm.

As you progress through the course, tutorials will be replaced by intercollegiate classes which are run in the department. The pattern remains as one example sheet for every four lectures, but the material will be taught by specialists in the field.

When planning your study in relation to the lecture courses and examples sheets, remember that they are the lecturer’s personal, and inevitably abbreviated exposition of a subject, and cannot be expected to tell you everything about it. Attending lectures and working through example sheets provide a base from which your own understanding can be developed; they are the beginning of your study, not the end.

Many lecturers hand out notes to accompany their lectures and in most cases these will also be available electronically on WebLearn along with reading lists. These are no substitute for your own notes, written as you yourself master the material. This mastery requires more time: you will need to read from text-books and you should certainly make your own notes.

Students who have declared a disability are encouraged to discuss their specific needs with the Department Disability Contact (Deputy Administrator (Academic)).
7.2 Timetable

The timetable for each term is released in 0th week and is published on the display screens on the ground floor reception area of the Thom Building. It is also on WebLearn at weblearn.ox.ac.uk/portal/hierarchy/mpls/eng/ug.

If you have any issues with teaching or supervision please raise these as soon as possible so that they can be addressed promptly. Details of who to contact are provided in section 10.2 Complaints and Appeals.

7.3 Preliminary Examinations

The First-Year Course

Work is mostly arranged around the syllabus for four written papers of the Preliminary Examination, held in June:

- P1 Mathematics
- P2 Electronic and Information Engineering
- P3 Structures and Mechanics
- P4 Energy Systems

There are 36 lectures for each paper, supported by one examples sheet of about ten tutorial problems for every four (or thereabouts) lectures.

There is a fifth 'paper', P5, consisting of assessment of coursework during the year which is considered as equivalent to half of a three hour written paper. In 2015-2016 the hours required for each laboratory are:

- Drawing and Design 10 hours
- Workshop Practice 2 hours
- Computing Laboratory 25 hours
- Mechanical Laboratory 25 hours
- Electrical Laboratory 25 hours
- Thermodynamics Laboratory 5 hours

For the Preliminary Examination, the possible outcomes are Pass, Pass with Distinction, pass in less than five papers or Fail. Those who fail some of the written papers may, if their College permits retake them in September. Candidates must offer all subjects at one examination provided that: (i) a candidate who fails in one or two written papers may offer those written subjects at one subsequent examination; (ii) a candidate who fails three or four written papers must offer all four written subjects at one subsequent examination. The coursework paper P5 may not be retaken, so failure in it will normally constitute failure of the examination.
7.4 Final Honour School

The Final Honour School in Engineering Science consists of three parts, A, B and C, normally taken at
the end of the second, third and fourth years respectively.

7.2.1 The Second Year Course (Part A)

Work in the second year will be arranged around the syllabus for the four written papers examined in
June of the second year:

A1 Mathematics
A2 Electronic and Information Engineering
A3 Structures, Materials and Dynamics
A4 Energy

In addition, A5 Engineering Practical Work will be examined by continuous assessment:

- Structural and Materials Laboratory  5 hours
- Dynamics Laboratory  5 hours
- Instrumentation and Control Laboratory  5 hours
- Communications Laboratory  5 hours
- Electrical Machines Laboratory  5 hours
- Thermofluids Laboratory  5 hours

You will not normally be required to submit your Engineering Practical Work. However, the examiners
may request practical work from some candidates. Such candidates will be named in a list posted by
the day of the last written examination.
7.2.2 The Third Year Course (Part B)

In the third year you will be required to take five optional written B papers from a list published annually and, in addition Paper B2 Engineering in Society. You will also be required to take three coursework subjects, as follows:

B1 Engineering Computation
B3 Group Design Project
B4 Engineering Practical Work

Paper B1 will consist of a report on a mini-project. The project task will be the solution of an engineering problem requiring the use of advanced numerical techniques and require a significant amount of serious program coding.

Paper B3 will consist of a report on your contribution to a design project carried out as part of a small team of undergraduates in the third year. Further information about third year projects can be found in Appendix F.

Paper B4 will be examined through continuous assessment. You will not normally be required to submit your engineering practical work. However, the examiners may request practical work from some candidates; such candidates will be named in a list posted by the day of the last written examination in Finals Part B.

7.2.3 Progression to the Fourth Year (Part C)

No candidate can progress to Part C unless he or she has been adjudged worthy of at least second class honours by the examiners in Parts A and B together at the first attempt.

A candidate who passes Parts A and B together, but fails to be adjudged worthy of at least second class honours at the first attempt, or who is adjudged worthy of at least second class honours in Parts A and B together, but who does not enter or withdraws from Part C, is able to leave with a Bachelor of Arts in Engineering Science (Pass or Honours with the classification obtained in Parts A and B together, as appropriate).

7.2.4 The Fourth Year Course (Part C)

The fourth year is devoted to specialist topics and a project which are assessed in the Part C examination at the end of the fourth year. You take six specialist C papers and work on a project to produce a report. Projects in the fourth year are normally undertaken by individual undergraduates, but sometimes a team of two or three may divide a larger exercise between them. Further information about fourth year projects can be found in Appendix F.
8. ASSESSMENT

8.1 Overview

To successfully pass the MEng in Engineering Science, you must pass four sets of University Examinations: Preliminary Examinations (Prelims) at the end of your first year, and three further sets of examinations of the Final Honour School (Finals or FHS) at the end of each subsequent year. These are public examinations and differ from collections you may sit periodically in college to help you and your tutors to assess your progress. You will also have to pass practical work (assessed coursework).

The following table summarises the examinable elements of the course:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PART</th>
<th>Item</th>
<th>Written Duration</th>
<th>Examination Units (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRELIMS</td>
<td>P1 Mathematics</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P2 Electronic &amp; Information Engineering</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P3 Structures, Materials &amp; Dynamics</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P4 Energy Systems</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P5 Engineering Practical Work</td>
<td>N/A</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Total Number of Examination Units – PRELIMS 4.5

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PART A</th>
<th>Item</th>
<th>Written Duration</th>
<th>Examination Units (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td>A1 Mathematics</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A2 Electronic &amp; Information Engineering</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A3 Structures, Materials and Dynamics</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A4 Energy Systems</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A5 Engineering Practical Work</td>
<td>N/A</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Total Number of Examination Units in Parts A and B combined 10

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PART B</th>
<th>Item</th>
<th>Written Duration</th>
<th>Examination Units (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td>B1 Engineering Computation</td>
<td>N/A</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B2 Engineering in Society</td>
<td>3 hours</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B3 Group Design Project</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B4 Engineering Practical Work</td>
<td>N/A</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Five Optional B Papers</td>
<td>1.5 hours each</td>
<td>0.5 × 5 = 2.5</td>
</tr>
</tbody>
</table>

Total Number of Examination Units in Part C 6

Total Number of Examination Units – FINAL HONOUR SCHOOL 16

A useful guide to examinations, including how to prepare and enter for examinations is available at www.ox.ac.uk/students/academic/exams.
Examiners are appointed independently from among the teaching staff, and are formally independent, though they naturally do their best to make the examination reflect the content of the lecture courses and their accompanying tutorial example sheets. Information about examining conventions for engineering papers is given below.

Reports of internal and external examiners from past examinations are available at www.eng.ox.ac.uk/intranet/students/undergraduate/examinations.

Past examination papers are available on WebLearn and on the Oxford Examination Papers Online (OXAM) website at www.oxam.ox.ac.uk.

Results of examinations are published via the student self-service pages.

All members of the University are required to wear academic dress with *subfusc* clothing when attending any university examination, i.e. dark suit with dark socks, or a dark skirt with black stockings or trousers with dark socks and an optional dark coat, black shoes, plain white collared shirt, a black tie or white bow tie.

### 8.2 Examination regulations

The examination regulations are published online at www.admin.ox.ac.uk/examregs.

### 8.3 Examination conventions

The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. Undergraduates should read the section on examinations in the ‘Proctors’ and Assessor’s Memorandum’. The formal syllabus requirements are set out in ‘Examination Regulations’ (the Grey Book).

*It must be stressed that to preserve the independence of the Examiners, candidates are not allowed to make contact directly about matters relating to the content or marking of papers.*

Any communication must be via the Senior Tutor of your college, who will, if he or she deems the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chair of Examiners.

Examination conventions are approved on an annual basis and examination conventions for 2016 will be made available to candidates on WebLearn as soon as they have been approved. This is normally no later than one whole term prior to the examination.
8.4 Calculators in Engineering examinations

In 2015, for all papers in the Preliminary Examination in Engineering Science candidates will be permitted to take into the examination room one calculator of the types listed below:

CASIO fx-83 series  
e.g. Current model is the Casio FX 83GTPLUS

CASIO fx-85 series  
e.g. Current model is the Casio FX85GTPLUS

SHARP EL-531 series  
e.g. Current model is the Sharp EL-531WB

Please note:

- The restriction on the use of calculators applies to examinations only. For all laboratory, project and tutorial work, you are free to use any calculator.
- You are encouraged to buy one of the permitted calculators early.
- The permitted list will be updated annually as new models are introduced or old models are discontinued. It is hoped that models can be retained on the list long enough that you need only buy one such calculator during the course.

8.5 Plagiarism

If you find yourself under pressure as the deadline approaches for submission of coursework (laboratory write-ups, engineering and society assignments, project reports), you might be tempted to cheat by copying from a book, a published article, or even the work of one of your friends. This is not clever, nor is it harmless. It is a serious offence called plagiarism.

In The University Student Handbook, there are clear guidelines issued regarding the issue of plagiarism in section 8.8. It states that:

“All students must carefully read regulations 3, 4 and 5 in the Proctors’ Disciplinary Regulations for University Examinations, which make clear that:

- you must always indicate to the examiners when you have drawn on the work of others, using quotation marks and references in accordance with the conventions of your subject area
- other people’s original ideas and methods should be clearly distinguished from your own
- the use of other people’s words, illustrations, diagrams etc should be clearly indicated regardless of whether they are copied exactly, paraphrased or adapted
- material you have previously submitted for examination, at this University or elsewhere, cannot be re-used unless specifically permitted in the special Subject Regulations.
Failure to acknowledge your sources by clear citation and referencing constitutes plagiarism. The University’s description of plagiarism should be read carefully. That description includes a link to the University’s online course about understanding what plagiarism is, and how to avoid it. You are strongly advised to complete the course.”

In recent years, the examiners have uncovered several instances of plagiarism in relation to engineering coursework. All cases were referred to the Proctors who imposed heavy penalties on the offenders.

For information about good academic practice and how to avoid plagiarism, please refer to the University’s website at:

8.6 Prizes

Each year, the department awards prizes to students for excellent performance in examinations or assessments. Many of these prizes are sponsored by external donors or by engineering institutions. A full list of the prize-winning students is published annually at www.eng.ox.ac.uk/study-here/prizes-and-awards.

For a central list of other prizes and awards, go to www.ox.ac.uk/students/fees-funding/prizes-and-awards.
9. PRACTICAL COURSEWORK

9.1 Introduction

Practical coursework is an essential element in the education of every professional engineer. As well as illustrating ideas and topics from lectures and tutorials, it has a special place in our training.

A basic function of practical work is to gain experience and understanding of using a piece of equipment to perform a task or make a measurement. You will see that theoretical principles are not merely intellectual ideas, but are there for practical use. Another function, realised in recording and presenting the results of experiments, is training in the skill of technical communication; this skill is essential in the real world of engineering where people work together on large enterprises.

Project and design work have a special function in training engineers to make things function. Projects can promote the development of a fundamental engineering attitude which cannot be conveyed in any other way. This is the awareness that engineers are concerned not merely with obtaining correct answers to calculations but with taking creative and responsible decisions, based upon all available knowledge.

The special importance of practical work is reflected in the accreditation requirements of the Professional Engineering Institutions. They specify what practical work a course must include if it is to be accredited. In order to meet these requirements, satisfactory performance in the laboratory is an essential part of the Oxford course.

Three types of coursework are integral to our course: basic laboratory exercises, coursework modules, and projects. Credit will be given for the quality of work undertaken in laboratory exercises as well as for projects (see section 2.6).

9.2 Safety

There are always risks associated with the operation of equipment. Undergraduates are not permitted to work in laboratories or workshops unsupervised.

A risk assessment is completed for each laboratory experiment, and will be included with the associated paperwork and will also be displayed in the laboratory in which the experiment is being undertaken. You should read the risk assessment before the laboratory and identify the hazards before starting an experiment. The ‘Introduction to Laboratory Work’ lectures at the beginning of Michaelmas Term of the first year will include information on safety. If you come late to a laboratory and miss an essential safety briefing, or if you disobey safety rules, you may be refused access to equipment.

The guidance notes for undergraduates on health and safety are contained in Appendix A.

Guidance notes for what to do in the event of an attack by an armed person are in Appendix D.
9.3 Log-books

You should keep a personal, bound log-book as a consecutive, dated and complete record of all laboratory work irrespective of topic. This book must be in use and available for inspection during every attendance in every laboratory. It constitutes an important proof that everything you wrote at the time is still there. Loose-leaf notes are not acceptable. Recommended for this purpose is the Chartwell A4 641 K Student Laboratory Book; these are purchased in bulk by the department, and sold at a discounted price. The current selling price for the 2015/16 academic year is £6.00 per log-book.

The main way to purchase log-books is through the University’s online store at www.oxforduniversitystores.co.uk/browse/product.asp?compid=1&modid=1&catid=288. A maximum of three log-books may be ordered in each transaction and payment is by card only. Once your order has been placed, your log-book will be ready for collection from the Faculty Office after two working days. Log-books are not posted out to students’ addresses. Due to the heavily discounted price, and to ensure that log-books are being provided to University of Oxford engineering students only, you must show your University card as proof of identity on collection. If you forget your log-book, the Faculty Office has a small emergency stock of log-books. We are unfortunately unable to take card payments in the Faculty Office so please make sure you have the exact money available as we do not have a large amount of change.

Do not be reluctant to enter calculations and results directly into a log-book because you fear you will make a mess. Alterations or deletions will not be criticised, and tidy habits can be expected to develop with experience. What is important is that your log should be written on the spot as your permanent, personal dated diary of everything you have done, every measurement that you have made and every decision you have taken in the course of each successive exercise. Record it in such a way that if you referred to it again a year later you would be able to make sense of what you wrote. Where a pro-forma is issued for your observations, it may be pasted into your log-book.

Data are often recorded as tables of numbers for use in subsequent calculations. It helps if you plan these calculations and tables in advance. The log-books include graph pages and whenever possible you should plot a rough graph as the data values are recorded. Although this seems tedious, it actually reduces work because, watching your graph grow, you will not waste time taking unnecessary readings. Also, you will spot gaps or inconsistent data before it is too late to repeat a measurement or add another. In many cases, you can complete much of the data-processing as the experiment proceeds, which immediately gives a clear impression of the results.

Writing reports is quite different from keeping records in your log-book. For some experiments, you will not write a report at all, but will merely complete a pro-forma or be asked to show your log-book and answer some questions. On other occasions, a report will be required. If your log-book record is adequate, you will have ready all the information needed to write up any previous experiment at any time.

Some suggestions about writing reports on laboratory exercises are included in section 9.7.
9.4 Timetabling and attendance

Laboratory classes are announced in the Lecture List, which is published each term. Detailed timetables are published on the web (follow the link 'intranet' on the department’s home page at www.eng.ox.ac.uk then ‘Information for Undergraduates’ and finally 'Timetables').

Usually the timetables provide for working in pairs, and a specific day and time will be allocated to each pair, for each experiment. You are responsible for finding out in advance the times of your experiments and for attending at those times, even if it happens to be on the first Monday of term. Apparatus is usually fully used and it may be impossible to reschedule an experiment that has been missed. If you are ill, it is important to inform the laboratory organiser as soon as possible, and try to exchange times with another group. However, if this is not possible and you are unable to complete a laboratory through illness you should obtain medical evidence as soon as possible - usually from your doctor or college nurse – where it states which laboratory sessions were affected. Notification of such matters to the Examiners must be undertaken by the Senior Tutor of your college and is channelled through the Proctors’ Office.

9.5 Record forms and instruction sheets

You will be given a form for each laboratory, to record completion and assessment of the exercises. It is your responsibility to obtain the necessary staff signatures for work accepted, and to keep these record forms safely so that there can be no doubt as to whether you have completed any exercise. You will be given the opportunity to check your practical record, as held by the Faculty Office, in the Trinity Term of years one, two and three, prior to the presentation of this information to the Examiners. In the event of a query regarding the completion of a laboratory, the record will only be amended in the light of supporting evidence, normally the signing-off sheet.

Instruction sheets are issued for each experiment. To ensure full benefit from each exercise, you should obtain this sheet in time for any necessary background study before your scheduled experiment. Failure to do this can result in confusion, frustration, and waste of irreplaceable scheduled time in the laboratory. Where preparatory work is specifically required in an instruction sheet, you will not be allowed to start the experiment until this preparation is completed satisfactorily.

9.6 Assessment of practical coursework

Formal regulations for laboratory work are set out without detail in the ‘Examination Regulations’. Within this framework, the Faculty of Engineering Science has to specify detailed requirements for each part of the course.

All engineering laboratory work (including Coursework Modules) is assessed on a continuous basis, with the marks being used by the examiners. The labs are normally scheduled for a 5-hour session, with the intention being that the average student should be able to complete the lab in 4 hours.

9.6.1 Protocols for assessment in engineering laboratories
These protocols for laboratory work have been agreed by the Engineering Faculty. Protocols for the assessments of your Engineering practical work in subsequent years will be confirmed at the start of each academic year.

The labs are assessed on a scale 0-5, and the marking is intended to be done within the timetabled lab slots. There are no ‘+’, ‘-’ or fractional marks.

(a) Students are expected to read the laboratory instructions before attending the lab.  
(b) The marking scale for each assessment will be 0-5. These will be allocated:

5 marks: This is broadly equivalent to a distinction/1st. These are for students who are well prepared for the lab, and show intelligent understanding when interrogated about their work.

4 marks: The mark that the majority of students will obtain for work that is essentially correct and complete.

3 marks: The mark for work that is either incomplete or incorrect or required a lot of help.

2 marks: The mark for work that is both incomplete and incorrect.

1 mark: Did little more than attend the lab and make some attempt at recording activities.

It is the responsibility of the student to ensure that their presence is recorded in the register, by a demonstrator, before the start of the lab. Students who arrive later than 10 minutes after the start will be penalised by 1 mark. You are expected to arrive within the first 5 minutes, and the 10 minute rule is a concession.

• No-shows because of certified justifiable reasons (e.g. medical) will be allowed to attend in another empty lab slot, if available, or (as always) to appeal to the Proctors for exemption. Late arrivals (beyond 30 minutes), without prior permission or agreement by the lab organiser that there are exceptional circumstances, may be refused access to the lab.

• Planned absences. If you wish to attend an outside event (e.g. job interview, funeral, award of a prize), then you should contact the Lab Organiser [copying the message to your tutor and the Deputy Administrator (Academic)], normally at least a week in advance so as to obtain an alternative slot. If you can arrange a swap with another student, so much the better, but inform the Lab Organiser.

• There is only a single opportunity for the work to be marked and signed-off. In other words, you cannot do additional work after a ‘first marking’ in order to try and attain an improved mark.

• If any dispute about marking cannot be resolved by the Senior Demonstrator present, then it should be referred to the Lab Organiser, or failing that the Associate Head (Teaching).

• If work is done on loose sheets of paper it will be marked on a ‘provisional’ basis, and the mark will only be ‘validated’ and entered into the Marks Register once the loose sheets have been stuck into a logbook.
9.6.2. 1st Year (P paper) lab assessment protocol

(a) The minimum generic skill set to be assessed consists of:
   i. clear and precise record-keeping of experimental details;
   ii. clear, full and precise recording of experimental data obtained;
   iii. the appropriate use of basic statistical treatments of data (use of the various means, averages, standard deviation, standard errors, linear regression, correlation coefficients...);
   iv. clear design drawings, design calculations and statements of design ideas and final proposals, for Design-Build-Test (DBT) activities. Lab instruction sheets will specify the details of what is wanted.

(b) Work to be assessed will be the student’s record in their laboratory log-book. There is no requirement for a separate write-up.

(c) For each of the three DBT exercises, assessment will be done twice. For example, if an exercise consists of 2x5 hours of preparatory experimental labs + 3x5 hours of DBT-type activity, the assessment could be done first at the end of the 10 hours of labs, and again at the end of the whole exercise. Assessment of log-books will normally be done within the laboratory, in the presence of (and in discussion with) the student, towards the end of the timetabled laboratory period (typically in the last hour).

(d) All of two marks of 0-5 will be weighted to give a total mark of 0-25.

(e) The two Drawing Exercise sessions are special cases in that the written work to be assessed will be solely drawings instead of log-books. Workshop Practice is another special case: it lasts 2 hours, there will be no assessment, but there is a mark of 5 for attendance and satisfactory completion. There are eighteen 5-hour sessions.

9.6.3. 2nd Year (A paper) lab assessment protocol

(a) Lab instructions include preparatory reading (or from specified and easily available sources, of not more than one hour for an average student), in case the lab occurs ahead of the lecture. No other preparatory work is expected.

(b) The assessed work will be a “basic write-up”: the student’s completion of a pro-forma consisting of a questionnaire concerning their results, interpretation and conclusions, and their log-book records of the lab.

(c) Coursework Modules (CWMs) (including Design modules) are special cases. Each will include at least a small piece of individual assessed work, of a nature to be decided by the CWM organiser: e.g. a short report, (examples might be: 2-4 pages of design proposals, or a 2-4 page pro-forma, or 3-page contribution to a group report), or a presentation. The assessment will be in two halves: 0-4 for attendance (100% attendance = 4 marks, less for (unexcused) partial attendance); 0-5 for the assessed work.
9.7 Reports on Laboratory Exercises

The reports that you will be required to write will be on a very diverse range of activities, so it is difficult to give more than very general advice. For any particular activity, advice is often given at the time. The following is offered here:

- Log-books are not normally ‘handed in’ to anyone. So a short report on a set experiment that will be marked in the laboratory should be written in the log-book, on the pages following the results taken at the time. But something that is going to be handed in, whether to demonstrators or examiners, should be produced as a separate item.

- Untidiness in log-books is sometimes unavoidable, but for a separate report, aim at a good standard of presentation. After all, you might want to show it to someone in the hope of making a good impression. If that is not the case with the one you are doing now, it might be with a later one, so practise now. As an extreme example of what NOT to do, don’t write with a worn-out biro on both sides of the cheapest paper available. People have actually done this occasionally, and the result looks awful.

- Spelling and grammar are important.

- Levels of explanation should normally be such that another reasonably competent undergraduate in your own year, and reading the same subject, should be able to understand it.

- If you are reporting decisions you took, give reasons for them. ‘Reasons’ do not necessarily have a mathematical basis, even in engineering. ‘Because it seemed more elegant’ or ‘because it was readily available’ are perfectly respectable reasons for choosing between alternatives that are otherwise technically acceptable.

- There should be a ‘conclusion’, and it should match the object of the exercise. For instance, if the exercise is to produce a working such-and-such, then the conclusion should state to what extent, and how well, it did work.

- Try to make your reports readable and interesting. Extraneous information, if it must be included, can go in Appendices.

9.8 Project work

Project and design work forms a major part of the Engineering courses. The first-year course includes three Design, Build and Test (DBT) type activities and the third and fourth years include projects, as described in Part 1.

Projects differ from laboratory class exercises in that the objective is defined but the details of the task are not. Instead, time is allowed for initiative and individual creative thinking. The final product is either a piece of engineering equipment that works, or a full technical report, or both. In all cases the necessary specialist information and equipment are made available and appropriate supervision is offered, but the role of the supervisor or demonstrator is to help and encourage rather than to control what is done. You are expected to exercise initiative and engineering judgement, and to make appropriate use of all relevant knowledge from the preceding parts of the course.
To assist with the projects there is a Teaching and Design Support Group (TDSG) and the University has appointed Visiting Professors in the Principles of Engineering Design.

### 9.9 Exchanges

To prepare for a global engineering career, there is no substitute for experiencing different cultures first hand. The Department of Engineering Science at Oxford currently offers opportunities for up to five undergraduate students each year, per exchange partner, to participate in an exchange year in the Faculty of Engineering at a partner institution during the whole of the fourth year.

**Why participate in an exchange?**

An exchange provides you with an opportunity to experience, in depth, the culture of another country whilst studying, and to make new friends and connections. Students who have participated in exchanges may also be more attractive to potential employers. It demonstrates that you are flexible, self-reliant, and can adapt quickly to the unfamiliar and to different cultures. Many students who have participated on an exchange also say that it has helped them to mature as a person.

We currently run exchange programmes with:

- Princeton University, USA
- The National University of Singapore (NUS)

Both of these institutions offer world-class teaching and learning opportunities and have been consistently ranked highly in the global rankings.

**What will I do when I am on exchange?**

You will live, study, and be assessed in the same way that students at your exchange partner will be. This means that the way you are taught, and assessed, in the fourth year, will be different from the way you would be taught and assessed at Oxford. To make the most of your experience, it is best to be open to, and tolerant of, different cultures, an autonomous learner, and have the resilience to cope with adapting to a different way of studying and living.

**What support will I receive while I am on exchange?**

As well as the support you will still receive from Oxford, our exchange partners have comprehensive systems in place which will provide advice and guidance to you before you even arrive in their country. They will provide advice on tuition fees, living costs, and any additional costs such as health insurance.

Once you are studying with an exchange partner, you will also normally be assigned an academic mentor who will keep track of your academic performance on a semester by semester basis.

Information on exchanges available to third years are communicated via email directly to eligible students and the relevant information published on WebLearn.
10. STUDENT LIFE AND SUPPORT

10.1 Help and advice

It is possible that at some point during your time here, you may run into a problem. It could be that your work gets on top of you. You might have health problems, or difficulties with your personal life. All of these things can stop you from enjoying your time at Oxford, and prevent you from studying effectively.

If you do get into difficulties, the main thing to remember is that, although it may not feel like it, you are unlikely to be the only person to have had a particular problem, and many people are available to offer advice and support.

Do ask for help if you need it - don’t struggle on and wait for the problem to go away of its own accord.

In College:

The natural person for you to turn to first is your college tutor. He or she can help you if you are having a work crisis, maybe by rescheduling tutorials or offering extra help on a part of the course you are finding difficult. Your tutor may also be able to help with non-academic problems, but if you don’t feel able to turn to them, there are many alternatives within the college community, such as the Senior Tutor, JCR Welfare Officers, Chaplain, Nurse, Doctor, and Tutor for Women. Your college handbook or website may also be a useful source of information on who to contact and what support is available through your college.

In the Department:

Staff with a particular responsibility for undergraduate issues are:

- Professor Lionel Tarassenko (Head of Department)
- Professor Steve Sheard (Associate Head (Teaching))
- Ms Jo Valentine (Deputy Administrator (Academic))
- Dr Joanna Rhodes (Head of Finance and Administration)
- In the department, your first port of call for any problems concerned with teaching provision should be the Faculty Office on the eighth floor of the Thom Building (ask to speak to the Deputy Administrator (Academic)).

At University level:

At University level, you can seek advice and counselling from:

- The University Counselling Service (270300)
- Nightline: Listening and Information Service (270270)
Harassment:

The University condemns harassment as an unacceptable form or behaviour, and has an advisory system to help people who think they are being harassed. Harassment includes any unwarranted behaviour directed towards another person which disrupts that person’s work or reduces their quality of life. Further information and guidance is available at [www.admin.ox.ac.uk/eop/harassmentadvice](http://www.admin.ox.ac.uk/eop/harassmentadvice).

The Department of Engineering Science has two confidential advisors. At present these are Ms Jo Valentine, Deputy Administrator (Academic) and Ms Lucy Townsend, HR Manager, either of whom may be consulted in relation to matters of harassment.

Equality and Diversity:

Information about the University’s Equality and Diversity Unit can be found at [www.admin.ox.ac.uk/eop](http://www.admin.ox.ac.uk/eop).

Disabilities:

If you have any form of disability, we strongly encourage you to disclose this to the Deputy Administrator (Academic) in order that we can make provision for you. Furthermore, your college will advise you of your Disability Contact who will be pleased to talk to you in the strictest confidence.

Students who have already declared a disability, for example on their UCAS form, will be contacted by the Disability Advisory Service by early Michaelmas Term to discuss their specific needs.

Students with a disability may also find useful advice and guidance on the University of Oxford Disability Office web page at [www.ox.ac.uk/students/welfare/disability](http://www.ox.ac.uk/students/welfare/disability).

10.2 Complaints and Appeals

Complaints and academic appeals within the Department of Engineering Science

The University, the MPLS Division and the Department of Engineering Science all hope that provision made for students at all stages of their course of study will make the need for complaints (about that provision) or appeals (against the outcomes of any form of assessment) infrequent.

Nothing in the University’s complaints procedure precludes an informal discussion with the person immediately responsible for the issue that you wish to complain about (and who may not be one of the individuals identified below). This is often the simplest way to achieve a satisfactory resolution.

Many sources of advice are available within colleges, within faculties/departments and from bodies like Student Advice Service provided by OUSU or the Counselling Service, which have extensive
experience in advising students. You may wish to take advice from one of these sources before pursuing your complaint.

General areas of concern about provision affecting students as a whole should be raised through Joint Consultative Committees or via student representation on the faculty/department’s committees.

**Complaints**

If your concern or complaint relates to teaching or other provision made by Department of Engineering Science, then you should raise it with the Associate Head (Teaching), Professor Steve Sheard who will attempt to resolve your concern/complaint informally.

If you are dissatisfied with the outcome, then you may take your concern further by making a formal complaint to the University Proctors. The procedures adopted by the Proctors for the consideration of complaints and appeals are described on the Proctors’ webpage ([www.admin.ox.ac.uk/proctors/complaints/proceduresforhandlingcomplaints](http://www.admin.ox.ac.uk/proctors/complaints/proceduresforhandlingcomplaints)), the Student Handbook ([www.admin.ox.ac.uk/proctors/info/pam](http://www.admin.ox.ac.uk/proctors/info/pam)) and the relevant Council regulations ([www.admin.ox.ac.uk/statutes/regulations/247-062.shtml](http://www.admin.ox.ac.uk/statutes/regulations/247-062.shtml)).

If your concern or complaint relates to teaching or other provision made by your college, you should raise it either with your tutor or with one of the college officers or Senior Tutor (as appropriate). Your college will also be able to explain how to take your complaint further if you are dissatisfied with the outcome of its consideration.

**Academic appeals**

An academic appeal is defined as a formal questioning of a decision on an academic matter made by the responsible academic body.

For undergraduate or taught graduate courses, a concern which might lead to an appeal should be raised with your college authorities and the individual responsible for overseeing your work. It must not be raised directly with examiners or assessors. If it is not possible to clear up your concern in this way, you may put your concern in writing and submit it to the Proctors via the Senior Tutor of your college.

Please remember in connection with all the academic appeals that:

- The Proctors are not empowered to challenge the academic judgement of examiners or academic bodies.
- The Proctors can consider whether the procedures for reaching an academic decision were properly followed; i.e. whether there was a significant procedural administrative error; whether there is evidence of bias or inadequate assessment; whether the examiners failed to take into account special factors affecting a candidate’s performance.
- On no account should you contact your examiners or assessors directly.
10.3 Policies and Regulations

The University has a wide range of policies and regulations that apply to students. These are easily accessible through the A-Z of University regulations, codes of conduct and policies available on the Oxford Students website at www.ox.ac.uk/students/academic/regulations/a-z.
APPENDIX A     Health and Safety

Introduction

In England and Wales, everyone has a ‘duty of care’ under Common Law both to themselves and others. Each one of us must take reasonable care of our own health and safety and that of others who may be affected by our acts and omissions. Further, under Statute Law in Great Britain, everyone has a duty to co-operate with their employer, in this case the department, so far as is necessary to enable the department to comply with its duties under the Health and Safety at Work Etc Act 1974. Undergraduates, as visitors to the department, do not have the same responsibilities under Sections 7 and 8 of the Act. However, as visitors, you will be expected to comply both with the spirit of the law and, when the occasion demands, the letter. To this end, the department has a basic set of safety rules that apply to all undergraduates and these are listed below.

Departmental safety rules for undergraduates

1. Undergraduates may use apparatus in laboratories only when supervised and within normal working hours, for the following purposes:

   (a) Programmed experiments as timetabled, under the direct supervision of the laboratory organiser and which satisfy current safety regulations.

   (b) Programmed experiments outside timetabled hours (see Access Hours and Lone working information in Appendix B) by specific permission of the organiser of the relevant laboratory class which satisfy current safety regulations and which are directly supervised. Fourth year undergraduate students working on project work may be granted access outside these hours following completion of an extended access permit.

   (c) Project work by arrangement between the project supervisor, the staff member responsible for safety in the relevant laboratory and the staff member responsible for the apparatus required providing all necessary risk assessments under current safety regulations have been completed before the project work starts.

   (d) For the purposes other than programmed experiments or project work by permission of:

       • the member of staff responsible for the safety in the relevant laboratory or,
       • the Administrator or,
       • the head of the relevant workshop

       providing all necessary risk assessments under current safety regulations have been completed before the work starts.

2. Outside normal working hours, undergraduates may use apparatus only if there is a specific reason for which approval is granted by the Head of Department or Associate Head (Teaching).
This use must be in the presence of a member of staff. Such approval is currently granted for supervised access to computing facilities only.

3. Machine tools in the Staff/Student Workshop may be used only when supervised by an authorised person or by the technician in charge. The technician must be satisfied that the undergraduate is competent to operate the required machinery safely. The technician in charge has full authority to refuse anyone the use of machine tools if evidence of competency cannot be provided.

4. Except by permission of the member of staff responsible, undergraduates are not permitted to enter research laboratories, staff offices, stores, workshops, roof areas, service areas, photographic darkrooms, reception areas (except public spaces), or any room displaying a specific hazard warning notice. Except in the case of fire, undergraduates will not access the seventh floor balcony of the Thom Building.

5. Each practical and experimental exercise will provide more detailed safety requirements. All undergraduates will be expected to abide by these additional specific safety requirements and act on them accordingly.

6. It is an offence under law for anyone to intentionally interfere with or misuse anything provided in the interests of health, safety and welfare. It is also an offence not to use any personal protective equipment (PPE) provided in the interests of health and safety. PPE must be maintained in good order and you have a duty to report any PPE that is damaged or if it does not suit your needs. Report the fact to your supervisor or member of staff responsible for the laboratory or workshop.
APPENDIX B  Department of Engineering Science – Access and Lone Working

This table provides guidance for undergraduates, postgraduates and members of staff. Detailed guidance is available on the department’s health & safety intranet page at this link: [www.eng.ox.ac.uk/intranet/services/health-and-safety](http://www.eng.ox.ac.uk/intranet/services/health-and-safety)

<table>
<thead>
<tr>
<th>Category/Hours</th>
<th>Core Hours 08:00-18:00</th>
<th>Non-Core Hours Monday to Friday 18:00-22:00</th>
<th>Weekends 08:00 - 22:00</th>
<th>Late Working 22:00 – 08:00</th>
<th>Departmental closed periods e.g. Easter, Christmas and Bank Holidays outside term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>Access allowed from 08:00 – 18:00, 0-10th week inclusive (Hilary and Michaelmas Terms) and 0-8th week inclusive (Trinity Term). Undergraduates are allowed to remain until 18:00 apart from the 8th floor study area where access is allowed until 19:00</td>
<td>Access requires Extended Hours Permit &amp; Risk Assessment</td>
<td>Access requires Extended Hours Permit &amp; Risk Assessment</td>
<td>No access</td>
<td>No access</td>
</tr>
<tr>
<td>Postgraduate &amp; Staff Members (Academic, Research Assistants, Support Staff)</td>
<td>Access allowed</td>
<td>Access allowed</td>
<td>Permitted for office-based work only</td>
<td>Permitted for office-based work only</td>
<td>Permitted for office-based work only</td>
</tr>
</tbody>
</table>

Note: Core hours for IBME are 08:00 – 18:00 (Monday to Friday)

**Lone Working**

Lone working (other than for solely office-based activities) is only permitted for students and staff subject to a Risk Assessment by their Line Manager or Supervisor. In all cases arrangements for summoning assistance in the event of an accident should be established and this information communicated to all relevant persons.

*August 2015*
APPENDIX C  Access to Departmental Buildings

1. Undergraduate Students are permitted to use the main entrances to the Thom (including 8th floor study area) and Holder Buildings in the Keble Triangle between the hours of 08:00hrs and 18:00hrs during the following periods:
   a. Weeks 0th-10th (inclusive) in the Michaelmas and Hilary terms
   b. Weeks 0th – 8th of the Trinity term

2. This permission is granted for the purposes of attending lectures and other course related meetings, visiting the 8th floor study area and undertaking work related to Third Year Projects (3YP) or Fourth Year Projects (4YP).

3. This permission is granted on the strict condition that the only activities that can be undertaken are desk based, e.g. computer analysis of data, literature reviews or writing up of results but not the use of mechanical, electrical or chemical equipment and materials which would in other circumstances require the Undergraduate Student to be supervised in its use.

4. In certain circumstances and under conditions set by the Departmental Safety Officer (DSO), this access permission can be extended to allow activities by the Undergraduate Student which involve tests and experiments using mechanical, electrical or chemical equipment and materials which are deemed by the DSO to be hazardous to health and safety. The minimum condition will normally be that the Undergraduate Student is supervised by a competent person (usually a member of academic staff).

5. If an Undergraduate Student applies for extended access permission to undertake activities of the nature described in clause 4, the application must include a full description to enable the DSO to fully assess the risk and determine whether the activity can be allowed and, if so, the precautions that need to be taken and the supervision that will be required. At the discretion of the DSO extended access to nominated areas may then be permitted for a short, specified period under clearly defined conditions.

6. This permit, together with a current University Identity Card, must be carried at all times within the department, and produced upon request. Any Undergraduate Student that is unable to meet these requirements will be asked to immediately leave the department premises.

7. IMPORTANT NOTE: Random checks on Undergraduates Students present in the department during the periods and hours listed in Clause 1 will be conducted by the Head of Finance and Administration and the DSO. Students found to be not complying with the conditions of issue of the extended access permission or undertaking works or activities that have not been specifically authorised (including the manner in which this authority was given) will have their extended access permission withdrawn and the Head of Department notified.
APPENDIX D  

Guidance in the event of an attack by an armed person or persons

1. Be prepared and stay calm

The purpose of this guidance is to alert and not to alarm – it is not being provided in response to any specific information. Although students are asked to be mindful and alert, please do not be overly concerned. You are asked to carry on with your day-to-day life as normal.

In the event of an incident, quickly determine the best way to protect yourself.

2. Evacuate

- If it is possible to do so safely, exit the building or area immediately
- Have an escape route in mind (Fire Exit signs are a good point of reference)
- Evacuate regardless of whether others agree to follow
- Help others, if possible
- Prevent others from entering the area of danger
- Do not attempt to move wounded people
- When you are safe, call 999 and ask for the police

3. Hide

- If evacuation is not possible, find a place to hide where the offender is less likely to find you
- If you are in a room/office, stay there
- If you are in a corridor, get into a room/office
- Lock the door and blockade it with furniture
- Silence your mobile phone and remain quiet
- Turn off the lights and draw any blinds
- Hide out of view and behind something solid (desk or cabinet)
- If it is possible to do so safely, call 999 and ask for the police

4. Inform

If you contact the police, provide the following information:

- Location of and the number of offenders
- Any physical descriptions of the offenders
- Number and type of weapons used by the offenders
- Number and potential victims at the location
- Your location

STAY SAFE

Further information and advice is available from Oxford University Security Services on 01865 (2) 72944 or security.control@admin.ox.ac.uk
APPENDIX E     Expanded Syllabus for Prelims and Part A 2015

1     Expanded Syllabus for Prelims 2015

Paper P1: Mathematics

Calculus 1
The function concept. Definition and simple properties of hyperbolic functions. Differentiation of a product, quotient and function of a function. Elementary integration, including substitutions, integration by parts, partial fractions, tan half-angle, recursive formulae.
Elementary series: sum to n terms of linear and geometric series. McLaurin and Taylor expansions in one variable: examples including trigonometric and hyperbolic functions, \( \exp, \ln \). Linearization using the first 2 terms, and the error term. Concept of a limit. de l’Hôpital’s theorem.

Calculus 2
Partial differentiation: the chain rule and simple transformations of first-order (not second-order) partial differential coefficients. Multiple integrals and their evaluation, with applications to finding areas, volumes, masses, centroids, inertias etc. (excluding line and surface integrals and using spherical and cylindrical coordinate systems only).

Complex Algebra and Fourier Series
Fourier series: evaluation of periodic functions, including full and half range expansions, orthogonality, symmetry and anti-symmetry, Parseval’s relationship.

Mathematical Modelling of Physical Systems
Modelling of the physics of mechanical, electro-mechanical, thermal and fluid systems mathematically in terms of ordinary differential equations. Application of transfer functions. Second order time response, poles zeros and steady-state response. Block diagram representations and manipulation of block diagrams to simplify systems.

Ordinary Differential Equations
**Vectors and Matrices**

**Paper P2: Electrical and Information Engineering**

**Circuit Analysis 1**
Charge conservation, Kirchhoff’s laws, mesh/nodal analysis. Concepts of ideal voltage and current sources, and impedances. Thevenin and Norton theorems with emphasis on concepts of input and output impedances.

**Circuit Analysis 2**

**Active Circuits and Devices**


Electrical conduction in semiconductors, PN junctions.

**Digital Electronics**
Basic gates, truth tables, combinational functions (AND, OR, NOT, EX-OR). The MOSFET as a switch; CMOS inverter, NOR and NAND gates. Karnaugh maps; algebraic laws (such as distribution and association).


Data converters; basic principles of DACs and ADCs. R-2R ladder based DAC. Principles of ADC (Flash and SAD).
Paper P3: Structures and Mechanics

Statics

Bending and Torsion

Materials and Solid Mechanics

Dynamics
Plane kinematics of particles: rectilinear and curvilinear motion in rectangular, normal-tangential, and polar coordinates; relative motion (translating, not rotating, axes). Plane kinematics of rigid bodies: translation, rotation, and general plane motion; relative motion; rotation about a fixed axis. Dynamics of particles: Newton’s second law; work, energy, power; impulse and momentum (linear and angular); conservation of energy and momentum (linear and angular); impact; central-force motion. Dynamics of rigid bodies: equations of motion for translation and fixed-axis rotation; moment of inertia; work and energy; impulse and momentum (linear and angular). Simple variable mass problems, i.e. rockets.
**Paper P4: Energy**

**Electricity and Magnetism**
Gauss' law. Electric field $D$, $E$, $\varepsilon$, potential $V$, capacitance, stored energy.
Magnetism, flux, flux density, flux over a closed surface $= 0$. Ampère's law, calculating magnetic fields, fields around conductors, magnetic circuits.
Forces on moving charges, forces between wires and fields. Electromagnetic induction, Faraday's law, Lenz's law, a simple model of a D.C. generator, inductance, stored energy, power factor, mutual inductance and transformers.

**Dimensional Analysis**
Dimensional homogeneity, dimensional parameters, dimensional analysis of governing equations, geometric and dynamic similarity, Buckingham pi theorem, worked examples in energy systems, limitations of dimensional analysis.

**Fluid Mechanics**
Hydrostatics, forces on immersed bodies. Stationary control volumes, continuity, momentum, Euler equations, streamline analysis. Bernoulli's equation, simple incompressible flows. Definition of viscosity, Couette flow, Poiseuille flow. Loss of total pressure in pipe flow. Laminar and turbulent flows.

**Thermodynamics**
Basic concepts and terminology of thermodynamics. Heat, work and the First law. Definition of internal energy. Applications and examples. First law applied to open systems. Definition of enthalpy, mass and energy balance. Chemical balance equations, examples to include combustion and fuel production (e.g. biodiesel and bioethanol). Formal definitions of imep, bmep, volumetric efficiency; the effect of AFR in SI engines on efficiency and bmep.
Expanded Syllabus for Part A 2015

Paper A1: Mathematics

Linear Algebra
Linear simultaneous equations: matrix rank and nullity; the echelon form; kernels; the possible solutions of $Ax = 0$; the general solution of $Ax = b$; matrix and vector norms; ill-conditioning; iterative methods for solution of $Ax = b$ when $A$ is square (e.g. Jacobi, Gauss-Seidel), including discussion of norms and errors; eigenvalue computation (power and Rayleigh methods).

Partial Differential Equations
Separation of variables: solution of Laplace, diffusion and wave equations; application of boundary and initial conditions; engineering examples such as electrical fields, thermal shock and vibrations.
1-D wave equation: general solution; wave propagation - travelling and standing waves; phase and group velocities; dispersion, attenuation and evanescence; reflection and transmission.

Statistics and Probability

Time-Frequency Analysis
Complex Fourier series: evaluation of complex coefficients for periodic functions; inversion relationship; the idea of spectra.
Fourier transform: derivation of transform from Fourier series; inverse transform; convolution integral; impulse response functions; proof and use of duality; convolution and Parseval’s theorems.
Introduction to sampling and reconstruction, including the sampling theorem and aliasing. Introduction to random processes.

Vector Algebra
Vector functions: differentiation of a vector function; gradient, divergence and curl - definitions and physical interpretations; product formulae.
Vector theorems: Gauss’ and Stokes’ theorems and evaluation of integrals over lines, surfaces and volumes (in Cartesian, cylindrical and spherical coordinates); derivation of continuity equations and Laplace’s equation in Cartesian and cylindrical co-ordinate systems.
Paper A2: Electronic and Information Engineering

Introduction to Control Theory
Introduction to feedback and its properties. Stability and performance of closed-loop systems. The Nyquist diagram as an analysis tool, gain and phase margins and the prediction of closed loop behaviour. The specification of control system feedback performance, the trade-off between disturbance rejection and sensitivity to sensor noise, model information and gain. The design of a PI, PD and PID controller using simple design rules and a functional specification. Integral term desaturation.

Signal Conditioning
Sensors and signal conditioning. Interference avoidance and instrumentation amplifiers. Sources of noise (including quantisation noise) and noise reduction by bandwidth limitation; Filters and their applications. Non-ideal op-amps.

Microcontroller Systems
Microcontroller systems: components of a CPU, registers, buses. Instructions and instruction cycle. Memory and memory maps. I/O. Interfacing I/O and applications to data acquisition and closed loop control.

Discrete Systems

Communications and Electromagnetism
Wireless transmission. Maxwell's equations for a plane wave; free space impedance; reflection at a boundary; boundary conditions for E and H; current-carrying conductors in high-frequency fields, skin depth. Antennas; gain, types, link budget, dipoles, radiation resistance. Noise; sources, noise figure and temperature, link budgets, figures of merit.
Analogue modulation systems; DSB-AM, DSBSC, SSB, QAM, modulation index and efficiency; spectra and bandwidth for transmission, demodulation and coherent detection, superheterodyne receiver, overview of FM.
Digital transmission; sampling and recovery, PAM, PCM systems, TDM (time division multiplexing), intro to information theory, channel efficiency. Tradeoff between bit error rate and bandwidth for different coding schemes. Examples; mobile phones, digital TV.
Paper A3: Structures, Materials and Dynamics

Elastic Analysis of Structures
Elastic analysis of structures: Use of matrix methods to solve simple redundant elastic frames.

Structural Failure

Mechanics of Materials

Dynamics of Machines
Kinematics: Velocity and acceleration; motion in rotating frames of reference. Dynamics: Angular momentum (general definition), rigid body motion with rotation and translation. Mechanisms: general principles and classification; instantaneous centres, velocity and acceleration analysis (vector diagrams and basic computational analysis); dynamic force analysis (inertia forces; dynamically equivalent masses; application to crank-slider force unbalance, torque output and flywheel size); Gears: simple, compound, and epicyclic gear trains (velocity and torque ratios).

Mechanical Vibrations
Single DOF mechanical vibrations; free and forced vibration, transient response, effect of damping. Modelling of mechanical systems, use of standard results, applications in mechanical engineering. Vibrations of undamped two and three DOF systems.
Paper A4: Energy Systems

Electrical Machines
Electromagnetic actuators: principle, analysis of forces, limits of stability. Fundamental principles of electro-mechanical conversion using DC machines as an example: Equivalent circuit for this machine, emf equation and torque equation, PM motors, separately-excited motors, DC generator. Properties of magnetic materials.
The induction motor: principle of operation, slip, development of the equivalent circuit, characterisation and performance e.g. torque vs. speed, current vs. speed and starting.
Awareness of other machines, such as synchronous machines, brushless DC machines.

Applied Fluid Mechanics

Heat and Mass Transfer

Thermodynamics
APPENDIX F  Third and Fourth Year Projects

1. Third Year Project

Whilst detailed guidance on third year projects will be available at the start of the third year, the main features of your third year project work will be as follows:

- The design project is intended to provide you with experience of, and insight into, the engineering design process. Your objective is to produce, by the Wednesday of fourth week of Trinity Term of your third year, reports in the form of detailed design proposals. These proposals will contain sufficient engineering detail, together with costings and market and sustainable development evaluations, to enable the senior managers of a prospective manufacturing company to evaluate the engineering and economic feasibility of your design.

- The design exercise will be a “paper” one. As is common in industry, the depth and detail with which you will be able to pursue your design will be constrained by the limited time available, and you will have to work efficiently and enthusiastically to get your final design reports ready by Trinity Term.

- At the discretion of your supervisors, you will probably be divided into design teams and be given some freedom to organise the management of your team and the distribution of tasks to individuals within the team. This is a deliberate part of the exercise and effective team working is an important element of a successful project.

- Each project will have a supervision team consisting of academic staff, members of the Design and Project Group, Research Assistants and Technicians as appropriate. The Visiting Professors of Engineering Design may also participate. They are there to provide guidance and technical advice, but don’t expect them to do your design for you!

- The students and supervisors for each project will meet on a weekly basis, at a time arranged by individual project supervisors. The supervision team will provide the design briefs, and other material relevant to individual projects, and will help you plan an overall timetable for your project.

- You will need to keep a logbook in which all your design work and notes are entered. Supervisors will read logbooks from time to time, and an assessment of your logbook will contribute to the overall mark you receive for your third year project work.

- You will give progress presentations to your project group from time to time. Expect to receive and give constructive criticism.

- Final reports will take the form of a documented design proposal. They may either be written individually, or as a collaborative team report, as agreed with your supervisors. In team reports, the contribution of each author must be clearly identified (typically by an explanation at the beginning and by putting names on the contents page and at the top of each page of the report). Single reports will be limited by the Examination Regulations to a maximum of 30 pages (including all diagrams, photographs, references and appendices), and collaborative reports should not exceed this length per author.
• You will make a final presentation of your design proposal on a date set by the project co-ordinator in Trinity Term. This will take the form of the technical and marketing presentation you would give to the design and production managers of the company you are convincing to manufacture and market your design. An evaluation of your presentation will be entered on your assessment form by your supervisors. One of the Examiners will be present to assess your presentation.

2. Fourth Year Project

Projects in the fourth year are normally undertaken by individual undergraduates, but sometimes a team of two or three may divide a larger exercise between them. The work usually involves significant original design and construction, or original research, and is done in close consultation with a nominated supervisor from the academic staff. Topics are usually selected from lists published in Hilary term of your third year. It is sometimes possible to do a project on an idea of your own, but this is dependent on finding an academic supervisor.

The expectation is that students and supervisors will normally meet on a weekly basis, at a time arranged by individual project supervisors. Students are required to submit an interim report and attend an interim interview with an academic (not your project supervisor) who has knowledge of your research area. This normally happens during week 8 or 9 in Michaelmas Term. You will also have a final interview with an examiner in either week 5 or 6 of Trinity Term which will form part of your assessment.

The fourth year project report contributes 50% to Finals Part C and must not exceed 50 pages in length (including all diagrams, photographs, references and appendices). The supervisor is expected to:

• Discuss in detail the student’s outline for the report.
• Look carefully at the early drafts of chapters, making reasonably detailed comments and constructive suggestions on both the content and style (including grammar).
• Give a quick overview of later drafts, but not the finished report, and point out any major problems.

3. Project Reports: Declaration of Authorship

When you submit your project reports you will be required to include a declaration of authorship confirming that the work is your own; a pro-forma will be provided for this purpose (see next page for sample document). You may also download this document from WebLearn at weblearn.ox.ac.uk/portal/hierarchy/mpls/eng/ug.
FINAL HONOUR SCHOOL OF ENGINEERING SCIENCE
DECLARATION OF AUTHORSHIP

You should complete this certificate. It should be bound into your fourth year project report, immediately after your title page. Three copies of the report should be submitted to the Chairman of examiners for your Honour School, c/o Clerk of the Schools, Examination Schools, High Street, Oxford.

Name (in capitals): 
Candidate number: 
College (in capitals): 
Supervisor: 
Title of project (in capitals): 
Page count (excluding risk and COSHH assessments): _________

Please tick to confirm the following:
I have read and understood the University’s disciplinary regulations concerning conduct in examinations and, in particular, the regulations on plagiarism (The University Student Handbook. The Proctors’ and Assessors’ Memorandum, Section 8.8; also available at www.admin.ox.ac.uk/proctors/info/pam/8examinations/).

☐ I have read and understood the Education Committee’s information and guidance on academic good practice and plagiarism at www.admin.ox.ac.uk/edc/goodpractice.

☐ The project report I am submitting is entirely my own work except where otherwise indicated.

☐ It has not been submitted, either partially or in full, for another Honour School or qualification of this University (except where the Special Regulations for the subject permit this), or for a qualification at any other institution.

☐ I have clearly indicated the presence of all material I have quoted from other sources, including any diagrams, charts, tables or graphs.

☐ I have clearly indicated the presence of all paraphrased material with appropriate references.

☐ I have acknowledged appropriately any assistance I have received in addition to that provided by my supervisor.

☐ I have not copied from the work of any other candidate.

☐ I have not used the services of any agency providing specimen, model or ghostwritten work in the preparation of this project. (See also section 2.4 of Statute XI on University Discipline under which members of the University are prohibited from providing material of this nature for candidates in examinations at this University or elsewhere: www.admin.ox.ac.uk/statutes/352-051a.shtml#_Toc28142348.)

☐ The project report does not exceed 50 pages (including all diagrams, photographs, references and appendices).

☐ I agree to retain an electronic copy of this work until the publication of my final examination result, except where submission in hand-written format is permitted.

☐ I agree to make any such electronic copy available to the examiners should it be necessary to confirm my word count or to check for plagiarism.

Candidate’s signature: ……………………………………….. Date: ………………………….