

## Engineering Tripos, Part IIB: Notice concerning Engineering Areas

Students choose eight modules from a list of eighty or so. Each module may have up to 16 lectures, or equivalent work, and is scheduled to be either wholly within the Michaelmas Term or wholly within the Lent Term (with the exception of a small number of vacation modules). There are no supervisions for fourth-year modules. Fourth-year modules may be assessed wholly by coursework, wholly by examination, or by a combination of the two (25% coursework, 75% exam). All module examinations are held in the first three weeks of the Easter Term.

The Engineering Areas are defined by the Faculty Board of Engineering in the following documents. To qualify in a particular Engineering Area, you must take a minimum number of modules falling within that area. The Engineering Area for your modules and project do not have to be the same.

You may find your module choice enables you to qualify in more than one area. You may do this; you do not have to choose between them. Alternatively, you may choose modules which do not allow you to qualify in any single area, in which case you will register for Engineering.

For advice on Engineering Areas and module choices, your Director of Studies should be your first port of call.

Please note that you must complete two management modules (E modules, 4I1 and 4D16 for those pursuing the civil engineering area) during Part II. If you did not take two management modules in Part IIA you will be required to select one in IIB.

NB. the module syllabus pages are the definitive source of information about pre-requisites for each module. A summary is also given on the [syllabus index page](#).

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## Part IIB Engineering Area requirements: Mechanical Engineering

Students intending to qualify in this Engineering Area in Part IIB must include at least **four** of the modules listed.

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Number	Title	Notes
4A2	Computational Fluid Dynamics	
4A3	Turbomachinery I	
4A7	Aircraft Aerodynamics and Design	
4A9	Molecular Thermodynamics	
4A10	Flow Instability	
4A12	Turbulence and Vortex Dynamics	
4A13	Combustion and Engines	
4B5	Quantum and Nano-technologies	
4B13	Electronic Sensors and Instrumentation	
4B19	Renewable Electrical Power	
4C2	Designing with Composites	
4C3	Advanced Functional Materials and Devices	

4C4	Design Methods
4C5	Design Case Studies
4C6	Advanced Linear Vibrations
4C7	Random and Non-linear Vibrations
4C8	Vehicle Dynamics
4C9	Continuum Mechanics
4C11	Data-driven and Learning Based Methods in Mechanics and Materials
4D6	Dynamics in Civil Engineering
4D2	Advanced Structural Design
4F1	Control System Design
4G1	Mathematical Biology of the Cell
4G5	Materials and Molecules: Modelling, Simulation and Machine Learning
4G6	Cellular and Molecular Biomechanics
4I10	Nuclear Reactor Engineering
4I11	Advanced Fission and Fusion Systems
4I14	Biosensors and Bioelectronics
4M12	Partial Differential Equations and Variational Methods
4M16	Nuclear Power Engineering
4M17	Practical Optimization
4M19	Advanced Building Physics
4M22	Climate Change Mitigation
4M23	Electricity and Environment (TPE22)
4M24	Computational Statistics and Machine Learning

**Advice**

Mechanical Engineering covers a very broad field: the main (traditional) areas are mechanics, materials, and design, and fluid mechanics and thermodynamics, but topics in control and instrumentation, electrical materials, civils, energy and bioengineering are also relevant. Combinations of courses can be found to suit many different career paths. It would be prudent for students to consult their Directors of Studies or the Engineering Area Coordinator before choosing a very eclectic mix of courses, in case a lack of overlap makes the workload unusually high.

Specialist advice can be obtained from module leaders, or from the Mechanical Engineering Coordinator whose details can be found on the [IIA Mechanical Engineering Area](#) webpage."

**Part IIB Engineering Area requirements: Energy, Sustainability and the Environment**

Students intending to qualify in this Engineering Area in Part IIB must include at least **four** of the modules listed.

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Number	Title	Notes
4A2	Computational Fluid Dynamics	
4A3	Turbomachinery	
4A9	Molecular Thermodynamics	
4A13	Combustion and Engines	
4B19	Renewable Electric Power	
4D13	Architectural Engineering	
4I10	Nuclear Reactor Engineering	
4I11	Advanced Fission and Fusion Systems	
4M16	Nuclear Power Engineering	
4M22	Climate Change Mitigation	
4M23	Electricity and Environment	

**Advice**

Power generation and environmental engineering are central to the advancement of a sustainable future in developed and emerging economies. Energy engineering and sustainability are broad interdisciplinary subjects. This Engineering Area offers the opportunity to draw together modules across electrical, mechanical and civil engineering, with application areas ranging from power generation in gas and steam turbine plants, to fuel cells and renewable energy technologies, to buildings and infrastructure.

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the [IIA Energy, Sustainability and the Environment Engineering](#) Area webpage.

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## Part IIB Engineering Area requirements: Aerospace and Aerothermal Engineering

Students intending to qualify in this Engineering Area in Part IIB must include one of the following combinations in their selection of modules:

- *either* **four** Part IIB core modules,
- *or* **three** Part IIB core modules + two Part IIB companion modules.

### Core modules

Number	Title	Notes
4A2	Computational Fluid Dynamics	
4A3	Turbomachinery I	
4A4	Aircraft Stability and Control	
4A7	Aircraft Aerodynamics and Design	
4A9	Molecular Thermodynamics	
4A10	Flow Instability	
4A12	Turbulence and Vortex Dynamics	
4A13	Combustion and Engines	
4A15	Acoustics	

### Companion modules

Number	Title
4B13	Electronic Sensors and Instrumentation
4B23	Optical Fibre Communication
4B24	Radio frequency Systems
4C2	Designing with Composites
4C4	Design Methods
4C5	Design Case Studies
4C6	Advanced Linear Vibrations
4C7	Random and Non-linear Vibrations
4C9	Continuum Mechanics
4F1	Control System Design
4F2	Robust and Non-linear Control
4F3	An Optimisation Based Approach to Control
4M24	Computational Statistics and Machine Learning

### Advice

Aerospace and Aerothermal Engineering is an interdisciplinary blend of subjects ranging from fluid mechanics, thermodynamics, structures, instrumentation, control, electronics and design to manufacturing. In essence

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Aerospace Engineering is concerned with flight and Aerothermal Engineering with the associated propulsion systems. In the past, development in these fields has been driven by technological issues. In the future, environmental concerns, minimising noise and pollution, and relentless pressure on design and manufacturing turnaround time will force novel solutions and paradigm shifts.

The essential interdisciplinary nature of the subject is reflected in the diversity of the recommended companion modules drawn from across the spectrum of the Department's teaching. This diversity increases in Part IIB.

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the [IIA Aerospace and Aerothermal Engineering Area](#) website.

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### Part IIB Engineering Area requirements: Civil Engineering

Students intending to qualify in this Engineering Area in Part IIB must include at least **four** of the modules listed.

Number	Title	Notes
4D2	Advanced Structural Design	4C11 Data-driven
4D4	Construction Engineering	
4D5	Foundation Engineering	
4D6	Dynamics in Civil Engineering	
4D7	Concrete and Prestressed Concrete	
4D9	Offshore Geotechnical Engineering	
4D10	Structural Steelwork	
4D13	Architectural Engineering	
4D16	Construction Management	
4M19	Advanced Building Physics	
4M22	Climate Change Mitigation	
4M24	Computational Statistics and Machine Learning	

#### Advice

Module 4D16 'Construction Management' can be counted as one of your two management modules for the purposes of accreditation by all institutions under the umbrella of the JBM (including the ICE and IStructE).

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the IIA [Civils Engineering Area](#) website.

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### Part IIB Engineering Area requirements: Electrical and Electronic Engineering

Students intending to qualify in this Engineering Area in Part IIB must include at least **four** of the modules listed.

Number	Title	Notes
4B2	Power Micro Electronics	
4B5	Quantum and Nano-technologies	
4B11	Photonic Systems	
4B13	Electronic Sensors and Instrumentation	
4B19	Renewable Electrical Power	
4B23	Optical Fibre Communication	
4B24	Radio Frequency Systems	
4B25	Embedded Systems for the Internet of Things	
4B27	Internet of Everything	
4C3	Advanced Functional Materials and Devices	
4F5	Advanced Information Theory and Coding	
4I14	Biosensors and Bioelectronics	

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**Advice**

Electrical and Electronic Engineering covers the range of topics which best represent the current trends in circuits, devices and systems for hardware implementations.

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the [IIA Electrical and Electronic Engineering Area](#) website.

**Part IIB Engineering Area requirements: Information and Computer Engineering**

Students intending to qualify in this Engineering Area in Part IIB must include at least **four** of the modules listed.

Number	Title	Notes
4B23	Optical Fibre Communication	
4B25	Embedded Systems for the Internet of Things	
4C11	Data-driven and Learning Based Methods in Mechanics and Materials	
4F1	Control System Design	
4F2	Robust and Non-linear Control	
4F3	An Optimisation Based Approach to Control	
4F5	Advanced Information Theory and Coding	
4F8	Image Processing and Image Coding	
4F10	Deep Learning and Structured data	
4F12	Computer Vision	
4F13	Probabilistic Machine Learning	
4F14	Computer Systems	
4G10	Brain Machine Interfaces	
4M17	Practical Optimization	
4M21	Software Engineering and Design	
4M24	Computational Statistics and Machine Learning	
4M26	Algorithms and Data Structures	

**Advice**

Information and Computer Engineering covers the digital representation and processing of signals and systems. It extends from the theory of signals and systems, through to the manipulation of data via computer programs. In addition to all of the information modules, this professional area includes modules from the Computer Science Tripos.

Candidates with a strong interest in control should also consider 'Instrumentation and Control' as an alternative.

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the [IIA Information and Computer Engineering Area](#) website

**Part IIB Engineering Area requirements: Electrical and Information Sciences**

Students intending to qualify in this Engineering Area in Part IIB must include at least **six** of the modules listed.

Number	Title	Notes
4B2	Power micro electronics	
4B5	Quantum and Nano-technologies	
4B11	Photonic systems	
4B13	Electronic sensors and instrumentation	
4B19	Renewable electrical power	
4B23	Optical Fibre Communication	
4B24	Radio Frequency Systems	

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4B25	Embedded Systems for the Internet of Things
4B27	Internet of Everything
4C3	Advanced Functional Materials and Devices
4F1	Control system design
4F2	Robust and non-linear control
4F3	An Optimisation Based Approach to Control
4F5	Advanced Information Theory and Coding
4F8	Image processing and image coding
4F10	Deep Learning and Structured data
4F12	Computer vision
4F13	Probabilistic Machine learning
4F14	Computer systems
4G10	Brain Machine Interfaces
4M12	Partial differential equations and variational methods
4M17	Practical optimization
4M21	Software Engineering and Design
4M26	Algorithms and data structures

### Advice

Electrical and Information Sciences covers a very broad area. The B modules cover a wide range of electronic circuits and devices, while the F modules cover the digital representation and processing of signals, and the manipulation of data in computers.

A student in this area will be seeking to gain a broad overview of systems from the signals that flow through them to the hardware platforms that implement them. Although many students will choose to do mostly B modules or mostly F modules depending on their inclination towards the electrical or information side, students who prefer to specialise exclusively in one or the other should consider one of the other B/F engineering areas.

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the [IIA Electrical and Information Sciences Engineering Area](#) webpage

## Part IIB Engineering Area requirements: Instrumentation and Control

Students intending to qualify in this Engineering Area in Part IIB must include at least **four** of the modules listed.

Number	Title	Notes
4A4	Aircraft stability and control	
4B11	Photonic systems	
4B13	Electronic sensors and instrumentation	
4B24	Radio Frequency Systems	
4B25	Embedded Systems for the Internet of Things	
4B27	Internet of Everything	
4C6	Advanced linear vibrations	
4C7	Random and non-linear vibrations	
4F1	Control system design	
4F2	Robust and non-linear control	
4F3	An Optimisation Based Approach to Control	
4F5	Advanced Information Theory and Coding	
4F8	Image processing and image coding	
4F10	Deep Learning and Structured data	
4F12	Computer vision	
4F13	Probabilistic Machine learning	
4G10	Brain Machine Interfaces	
4M21	Software Engineering and Design	

### Advice

Instrumentation and Control covers a range of topics which are important to the monitoring and control of modern systems. The B modules cover basic circuits and device technology and the F modules cover the representation, capture and manipulation of signals. The C modules cover the relevant engineering aspects of mechanical systems.

Students intending to qualify in this Engineering Area in Part IIB must include at least **four** of the modules listed.

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the [IIA Instrumentation and Control Engineering Area](#) website

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### Part IIB Engineering Area requirements: Bioengineering

Students intending to qualify in this Engineering Area must include at least **four** of the modules listed **of which at least two must be G modules or 4I14**.

Number	Title	Notes
4B13	Electronic Sensors and Instrumentation	
4C4	Design Methods	
4C5	Design Case Studies	
4C9	Continuum Mechanics	
4F8	Image Processing and Image Coding	
4F12	Computer Vision	
4F13	Probabilistic Machine Learning	
4G1	Mathematical Biology of the Cell	
4G3	Computational Neuroscience	
4G5	Materials and Molecules: Modelling, Simulation and Machine Learning	
4G6	Cellular and Molecular Biomechanics	
4G7	Control and Molecular Biomechanics	
4G9	Biomedical Engineering	
4G10	Brain Machine Interfaces	
4I8	Medical Physics	
4I14	Biosensors and Bioelectronics	

#### Advice

Bioengineering is a rapidly growing field encompassing the use of engineering tools to solve problems in medicine and biology as well as new quantitative approaches to biological systems based on engineering principles.

Specialist advice on this Engineering Area can be obtained from the Coordinator whose details can be found on the IIA [Bioengineering Engineering Area](#) webpage.

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### Part IIB Engineering Area requirements: Engineering

Students intending to qualify in this Engineering Area in Part IIB may choose any set of modules subject to the restrictions given in COMET.

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