

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 |
| 4F7 | Statistical signal analysis |
| 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.

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

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.

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 |
| 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 | |

4C11

Data-driven

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.

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 | |

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 | |

| | |
|------|--|
| 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

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.

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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