Engineering Science

The Engineering Science course at Oxford is usually described as a general engineering course, but this mislead as to the depth of specialities in later years. Undergraduates study engineering fundamentals across the range of disciplines in their first two years grouped into four papers, Mathematics, Electronic and Information Engineering, Structures and Mechanics, and Energy. Students learn through lectures and laboratories given in the Department, along with tightly linked tutorials and classes in College involving, respectively, two students or six students. There is emphasis on the commonality of modelling and analysis across what might seem disparate areas of engineering, and a high level of mathematical sophistication is assumed.

In the third and fourth years, students specialize progressively, taking, say, 5 from 18 "B" options and 6 from 26 "C" options. The fourth year is at a taught Masters level (perhaps a mix of 400 and 500 courses in the US system). Learning again occurs through lectures and laboratories, but tutorials in college are replaced by more specialist small group teaching in the Department. The third and fourth years also involve a major group design project and individual research project.

Visiting students have the option of joining, say, the second year in its entirity, and have done so. More often, because of the breadth and depth of the course, students will wish to pursue 3rd and 4th year options in their "home" specialities, and use 2nd and perhaps 1st and 3rd year courses to learn more about new area. (For example, a biomedical engineer might want to learn more about thermo-and fluid-dynamics.) Visiting students may (and have), after permissions are granted, taken courses ofference in cognate disciplines. A typical load for an Oxford students is 10 lectures, 2.5 tutorials and 5 hours of labs per week, but a visitin student may wish to reduce this to take on a more varied diet of subject matter.

The following is a summary of the content. The fiull syllabus, essential to understand the content of the 3rd and 4th year papers) extends to some 116 pages, and can be supplied on request.

1st year

(Each run of 4 lectures gives rise to one tutorial in college)

P1 Mathematics

Calculus of a single variable (4 lectures); Calculus of multiple variables (4); Complex Algebra & Fourier Series (8); Modelling of Physical Systems (4); Ordinary Differential Equations (8); Vectors and Matrices (8).

P2: Electronic and Information Engineering

DC and AC Circuit Analysis (12 lectures); Digital Electronics (8); Active Devices (diodes, opamps, BJTs) (16).

P3: Structures and Mechanics

Statics (8); Bending and Torsion (4); Dynamics (8); Materials and Solid Mechanics (12).

P4: Energy

Electricity and Magnetism (8); Fluid Mechanics (12); Thermodynamics (12); Dimensional Analysis (4).

P5: Laboratory Coursework

Computing (5 Labs); Drawing and Design (2); Electrical (5); Mechanical (5); Thermodynamics (2)

2nd year

(Each run of 4 lectures gives rise to one tutorial in college)

A1: Mathematics

Linear algebra (4 lectures); Partial differential equations (8); Statistics & Probability (4); Time/Frequency Analysis (8); Vector calculus (8).

A2: Electronic and Information Engineering

Introduction to Control Theory (8); Signal Conditioning (4); Microcontroller Systems (4); Discrete Control Systems (4); Electromagnetism and Communication (12).

A3: Structures, Materials and Dynamics

Elastic Analysis of Structures (4); Structural Failure (8); Mechanics of Materials (8); Dynamics of Machines (8); Mechanical Vibrations (4).

A4: Energy Systems

Electrical Machines (8); Applied Fluid Mechanics (8); Heat and Mass Transfer (8); Thermodynamics (8).

B2: Engineering in Society

Technical Writing and Communication Skills (2); Engineering Ethics (4); Safety and Risk (8); Engineering Sustainability and the Environment (4).

P5: Laboratory Coursework

Electrical Machines and Heat Transfer Laboratory; Structures and Materials Laboratory; Dynamics Laboratory; Communications Laboratory; Thermofluids Laboratory; Instrumentation and Control Laboratory

3rd year

(Each B paper involves 16 lectures and 4 Departmental tutorials/classes, and may have associated laboratory work)

Paper B1: Engineering Computation (computation project)
Paper B2: Engineering in Society
Paper B3: Design Project
Paper B5: Solid Mechanics
Paper B6: Equilibrium Thermodyamics
Paper B7: Fluid Flow, Heat & Mass Transfer
Paper B8: Materials
Paper B9: Structures and Hydraulics
Paper B10: Soil Mechanics
Paper B11: Chemical Processes
Paper B12: Electronic Devices
Paper B13: Circuits and Communications
Paper B14: Information Engineering Systems
Paper B15: Control SystemsB16: Software Engineering
Paper B17: Biomechanics
Paper B18: Biomedical Modelling and Monitoring
Paper B19: Fluid Mechanics: Turbulence, Compressible Flow and Turbomachinery

4th year

(Each C paper involves 16 lectures and 4 Departmental tutorials/classes, and may have associated laboratory work)

Paper C1: Automotive Engineering
Paper C2: Aerothermal Engineering
Paper C3: Micromechanics and Materials Modelling
Paper C4: Mechanical Performance and Integrity
Paper C5: Advanced Structures
Paper C6: Geotechnics
Paper C7: Hydraulics
Paper C8: Sustainable EnergyPaper C10: Bioprocess Engineering
Paper C9: Environmental Engineering
Paper C10: Bioprocess Engineering
Paper C11: Chemical Engineering I
Paper C12: Chemical Engineering II
Paper C13: Production Engineering
Paper C14: Optoelectronics
Paper C15: Microelectronics
Paper C16: Advanced Communications
Paper C17: Power Electronics
Paper C18: Machine Vision and Robotics
Paper C19: Machine Learning
Paper C20: Multivariable Control
Paper C21: Nonlinear and Predictive Control
Paper C22: Medical Imaging and Informatics
Paper C23: Cellular Engineering and Therapy
Paper C24: Probability, Systems and Perturbation Methods
Paper C25: Mathematical Techniques
Paper C26: Electrochemical Energy Technology