



Oriel College
UNIVERSITY OF OXFORD



MAGDALENE COLLEGE
UNIVERSITY OF CAMBRIDGE

**Oriel College,
Oxford**

**Magdalene College,
Cambridge**

Summer Institute

Cambridge Summer Institute

www.oxfordsummerabroad.com

www.cambridgesummerinstitute.com

Course Options 2018

Medicine
Engineering
Natural Science – Biochemistry
Earth Science
Science & Technology

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Medicine

The Medicine Programme, offered by the Cambridge Summer Institute, is designed for students currently studying medicine or professionals in the Healthcare field. The programme offers its participants the opportunity to attend lectures and workshops delivered by esteemed Professionals and Academics in the field of Medicine. There are a number of courses available within the programme each targeted toward students with differing levels of experience.

Discovery Level: These courses are targeted towards students in the first or second year of their medical education. The lectures will introduce delegates to new concepts, practices and principles in medicine.

Exploratory Level: These courses are targeted towards students who have already completed a number of years of medical education and are looking to deepen their existing knowledge and explore alternative perspectives and approaches.

Course Title: **The UK Healthcare System - (*Discovery Level*)**
Location: Cambridge
Track: Medicine

During this course, delegates will explore the UK Health System with a focus on the National Health Service as it celebrates its 70th birthday. Comparisons will be drawn to other health systems around the world.

Topics may include:

- The pathway to the medical profession in the UK
- Introduction to the National Health Service
- Medical & Surgical Specialties

Course Title: **Practicing medicine in the UK – (*Exploratory Level*)**
Location: Cambridge
Track: Medicine

This course targeted toward experienced medical students and professionals, takes a deeper look at the practice of medicine in the UK. Delegates will explore the strengths and weaknesses of the National Health Service and how it copes with the various challenges it faces in the modern world. There will also be an opportunity to practise clinical skills such as Patient History Taking & Physical examination.

Topics may include:

- The Highs & Lows of the National Health Service
- Major incident response – how the NHS expects the unexpected
- Clinical Skills – Patient History Taking & Physical Examination



Course Title: **Medical Ethics – An exploration of the big issues in medical ethics -**
(Discovery Level)

Location: Cambridge

Track: Medicine

The study of Medical Ethics is a crucial part of medical education. This course gives delegates the opportunity to explore the big issues in medical ethics and the similarities and differences between attitudes and practices in the UK and other countries and cultures.

Topics may include:

- Organ Donation – Opt in vs Opt out
- ‘A Health Service for All’ – Care and Treatment for Sexual, Cultural and Religious Minorities.
- Euthanasia – Attitudes, Perspectives & Practices

Course Title: **Exploring the ethics and practice of Palliative Care –** *(Exploratory Level)*

Location: Cambridge

Track: Medicine

Caring for those facing the end of their life is challenging for the most seasoned medical practitioners. This course will explore the principles and practice of palliative care in the UK while considering some of the ethical questions surrounding the palliative approach.

Topics may include:

- End of life care in the UK – Nursing Homes, Hospices & Hospitals
- The principles and practice of palliative care
- Palliative care communication skills workshop



Engineering

Engineering is the application of science and technology to modern innovations. It encompasses a variety of branches, each making use of different sciences and technologies. The Engineering programme offered by the Summer Institute at Oriel College, explores how engineering principles are applied to different types of challenges in the modern world. Delegates will be exposed to different engineering branches during the following courses.

Course Title: **Thinking big: The rise and rise of the modern superstructure**
Location: Oxford
Track: Engineering

Superstructures are modern day engineering masterpieces that require the application of a variety of Engineering disciplines. This course will focus on the structural and mechanical engineering concepts required to build superstructures and explore recent innovations in this field.

Course Title: **Thinking small: Introduction to Nanotechnology**
Location: Oxford
Track: Engineering

Nanotechnology is becoming an essential tool in many of the developments in modern engineering. This course will explore some of the tools and techniques that enables the application of Nanotechnology and how the technology is applied to many everyday products and engineering projects.

Course Title: **Making Electricity: Shining a light on Photovoltaics**
Location: Oxford
Track: Engineering

As the world attempts to move toward renewable sources of energy to tackle global warming, using sunlight to generate electricity is very much a priority. This course introduces solar energy as an alternative to conventional energy sources. Delegates will explore the characteristics of sunlight as well as the properties and behaviour of silicon solar cells.

Course Title: **The road to a sustainable future: The growing popularity of electric vehicles.**
Location: Oxford
Track: Engineering

The market for electric vehicles is ever growing with supply and demand both on the rise. This course will explore the engineering behind the production and use of Electric and Hybrid Electric vehicles including the development of fuel cells and the drivability of such vehicles.

Natural Science - Biochemistry

The Natural Science programme offered by the Cambridge Summer Institute, is designed for students and young professionals with an interest in Science. The programme offers its participants the opportunity to attend lectures and workshops delivered by esteemed Academics in the field of Science. The programme complements the Medicine programme also offered at the Cambridge Summer institute, and the Natural Science programme offered at the Summer Institute at Oriel College in Oxford. The focus of the programme is on Biochemistry – the study of how molecules assemble to make living cells and organisms. It forms the basis of studies in biology and medicine.

Course Title: **Biophysical Chemistry**
Location: Cambridge
Track: Natural Science - Biochemistry

This course introduces delegates to a variety of the biophysical techniques used to investigate how the structure, properties and functions of molecules enables specific biological functions. Topics may include:

- Microscopy & Imaging
- Spectroscopy
- Electrophysiology

Course Title: **Biological Chemistry**
Location: Cambridge
Track: Natural Science - Biochemistry

The Biological Chemistry course explores the four main types of molecules in Biochemistry – carbohydrates, lipids, proteins and nucleic acid. Topics may include:

- Chemical structure of DNA
- Amino acids and Polypeptides
- Carbohydrates & Metabolism

Course Title: **Molecular Cell Biology**
Location: Cambridge
Track: Natural Science - Biochemistry

This course will focus on the molecular mechanisms behind immunology and infectious diseases. Topics may include:

- Human immune system
- Autoimmunity & Allergies
- Viruses & Diseases

Course Title: **Big Data Biology**
Location: Cambridge
Track: Natural Science - Biochemistry

Biologists face many opportunities and challenges with the use 'big data' to solve biological problems. This course will explore some of these opportunities and challenges and the techniques employed by biologists to aid their research. Topics may include:

- Analytics & data mining
- Genomic and clinical applications
- Bioethics and privacy

Science & Technology

The Science & Technology programme offered by the Summer Institute at Oriel College Oxford encompasses a broad range of subjects designed to give delegates the opportunity to explore subjects they are familiar with and also those they may not be. Courses in Earth Science, Computing, Physics, Mathematics and Cosmology are delivered by faculty at the forefront of these fields.

Course Title: **Sedimentary Petrology: The benefits and threats of fracking**
Location: Oxford
Track: Science & Technology

Fracking is a controversial new method of extracting natural gas from deep within the ground. This course will explore the geological science behind the fracking process as well as address the short-term benefits and long-term threats.

Course Title: **Igneous Petrology: The predictability of volcanic eruptions**
Location: Oxford
Track: Science & Technology

This course will explore the wide variety of ways scientists monitor volcanic activity to minimize the impact of an eruption. Focusing on the geological science behind the structure of volcanoes and how eruptions occur, delegates will also gain an insight into the impact of eruptions on the environment.

Course Title: **Artificial Intelligence**
Location: Oxford
Track: Science & Technology

Delegates will gain foundational knowledge of the concepts and questions related to knowledge representation and artificial intelligence including Classical Logic, Theorem Proving, and Computational Complexity. The student will learn specialised logic-based languages and how they are implemented in modern applications.

Course Title: **Quantum Computing**
Location: Oxford
Track: Science & Technology

Students will survey quantum groups and their relations to the above-mentioned areas of mathematics and mathematical physics. They will learn about the Yang-Baxter equation, knot theory, the universal R-matrix and basic concepts in quantum computing. As the aim of the course is to give an overview of active areas of research, a knowledge of linear algebra is required. Some knowledge of basic representation theory and ring theory will also be useful.

Course Title: **Image Processing & Surface Computing**
Location: Oxford
Track: Science & Technology

Delegates will develop their understanding of image processing and surface computing through using image processing methods such as diffusion processes and working with edges. In addition, students will work closely with Partial Differential Equations (PDEs) and the methods associated with them so that they can solve PDEs on intricate surfaces by the end of the course.



Course Title: **Theoretical Physics: Symmetries and Field Theories**
Location: Oxford
Track: Science & Technology

This short course will focus on one of the primary guides to our understanding of modern day physics: symmetries. In particular, how symmetries can be used to construct gauge theories, the Higgs mechanism and gravity as a gauge theory. Topics covered include Symmetries and field theories, The Higgs mechanism and gravity as a gauge theory, Shift and Galilean symmetries in the early and late universe.

Course Title: **Numerical Analysis**
Location: Oxford
Track: Science & Technology

Differential equations are one of the most fundamental tools in almost all areas of science. The aim of this course is to give an introduction to the numerical solution of differential equations. Starting with the representation and approximation of functions (continuous objects) by vectors (discrete data), delegates discuss how the basic calculus tasks (differentiation, integration) are done on a computer and move on to solving differential equations. The course will be a combination of lectures and practical computing work.

Course Title: **Cosmology: Structure and Evolution of the Universe**
Location: Oxford
Track: Science & Technology

The aim of this course is to present the most relevant theoretical and observational results on which modern cosmology are based. The course covers the basic mathematical framework of the standard cosmological model, its observational motivations and its most important shortcomings. At the end of the course students should be able to understand the main open questions in cosmology, as well as the current and future observational and computational tools used to tackle them.



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Logic

Course Title: **Contemporary Political and Economic Philosophy: Ethics & Logic**
Location: Oxford
Track: Politics, Philosophy & Economics

Through a selection of texts and case studies drawn from the history of Western philosophical ethics (including Plato, Aristotle, the Stoics, Hume, Kant, Mill, Moore), students will gain a perspective on how ethical discourse and debate were and remain deeply informed by the language and tools of logic.