1. **开设课程**

第一期（2020年7月20日～2020年7月31日）

学生可从以下八门课程中每周选一门：

* Cryogenic Engineering: Cryocoolers for Space 低温工程：用于空间的低温冷却器
* Quantum Computing 量子计算
* Microelectronics Circuits and Analogue Devices 微电子电路与模拟设备
* Numerical Computing in C++ C++的数值计算
* European Competition Law 欧洲竞争法
* Legal Theory & Intellectual Property Right 法理学与知识产权
* Entrepreneurship: Evaluation, Creation, and Funding of New Ventures 企业家精神：新企业的评估，创建和融资
* Monetary Policy and Central Banking 货币政策与中央银行

第二期（2020年8月3日～2020年8月14日）

学生可从以下八门课程中每周选一门：

* Dynamic Behaviour of Materials 材料的动态行为
* Introduction to Nanomaterial 纳米材料学
* The Health of Nations: Current Challenge and Future Possibilities 全球健康：当前的挑战和未来的可能性
* Stem Cell Biology 干细胞生物学
* International Governance of the Future: Managing digitalization, environmental degradation and depleting resources 未来的国际治理：管理数字化，环境恶化和资源枯竭
* Contemporary PPE: Ethics and Logic 当代政治哲学经济学：伦理与逻辑
* British History: the Tudor History 英国历史：都铎时代
* An Actor’s Approach to Shakespeare 演员视角下的莎士比亚研究

1. **课程介绍**

* **Cryogenic Engineering: Cryocoolers for Space 低温工程：用于空间的低温冷却器**

Cryocoolers are low temperature (below 120 K) refrigerators that provide cooling for electronic devices such as infra-red detectors and superconducting devices. The operation of cryocoolers involve complex thermodynamics which are not always intuitively understood. In this course we will start by going over the first and second laws of thermodynamics and then explore a number of relevant thermodynamic cycles in detail. We will cover the basic principles behind the Stirling, Pulse Tube, Gifford-McMahon and Joule-Thomson cryocoolers with a focus on space applications. The performance and the advantages and disadvantages of the cryocoolers will be discussed and current research areas will be presented.

* **Quantum Computing 量子计算**

Quantum computation is a new model of computation. The theory of quantum computing is well understood but a quantum computer still has not been built. Such a computer will be able to factorize numbers quickly and thus make many of our cryptography systems useless. In this course we will study what is quantum computation and we will cover several quantum algorithms..

* **Microelectronics Circuits and Analogue Devices 微电子电路与模拟设备**

This course provides a brief yet comprehensive description of standard electronic devices and circuits. It starts with a look at the electrical properties of semi-conductors, highlighting the difference with insulator and metals and how these properties can be exploited to create active devices. The focus will then shift to the most common device used for consumable electronics: the MOSFET, looking at its transfer characteristic and its properties as a controllable switch as well as the problems induced by the size reduction achieved throughout the years. The second half of the course will then look at how the MOSFET can be used to create the building blocks of a combinatorial circuit able to perform logic and binary operations. Starting from the simplest logic circuit – an inverter - more articulated configurations will be analysed throughout the lessons reaching a full adder to perform binary summation on an arbitrary number of bits. Finally, the course will also briefly discuss the memory elements required to achieve a sequential circuit with memory of its previous state. Every calculator can be seen as a collection of sequential and combinatorial circuits interacting with each other, so understanding them is a first important milestone towards a deeper comprehension of more complex configurations e.g. CPUs and GPUs.

* **Numerical Computing in C++ C++的数值计算**

C++ is one of the most common programming languages for high-performance computing, and it underpins much of academic research and industry. This course introduces the student to C++ as a language for numerical computing in a scientific context. The course begins with the fundamentals of types, variables and control flow, and builds up through pointers, references, functions, classes and the standard template library to an understanding of how C++ can be used to solve real-world problems. With these fundamentals mastered and practised through a range of in-class exercises, the student will undertake a short project utilising the skills they have learned, which will be assessed by means of a short oral presentation.

* **European Competition Law 欧洲竞争法**

This course aims to introduce students to the subject of European Competition Law. These lectures are designed to allow general understanding of the core economic concepts of competition in the market economy system within the European Union (EU). As competition law is always connected to consumer protection this important aspect of European law is also covered as part of this lecture series.

* **Legal Theory & Intellectual Property Right 法理学与知识产权**

The course will provide an in-depth knowledge of the functions of the rule of law in Common law jurisdictions, as well as to consider law in a practical manner. These lectures analyse the nature and importance of rules in legal systems and examine some of the main difficulties associated with the implementation of laws, rules, and regulations.

* **Entrepreneurship: Evaluation, Creation, and Funding of New Ventures 企业家精神：新企业的评估，创建和融资**

Entrepreneurship can be defined as the “the pursuit of opportunity without regard to resources currently owned or controlled”. In recent years it has received increasing attention both in the media and an alternative career choice. This course provides a comprehensive introduction to entrepreneurship and the realities of new venture creation. This is a growing and ever-changing field and this course will balance insights from famous cases and research into the field with the overall aim to provide a foundational knowledge on the practicalities of entrepreneurship. Subjects will include: • Entrepreneurial behaviour and understand if entrepreneurship is right for you. • The Cambridge Technology Cluster • An introduction to entrepreneurship theory – what is it? • Understanding entrepreneurial opportunities – how do you spot and create high potential opportunities. • How to harness opportunities – including business models and entrepreneurial finance. • How do you set up a venture. • The importance of the team and other ways to mitigate risk. The students will be expected to apply this knowledge to the development of their own entrepreneurial idea, which they will work on in teams throughout the week and present to the rest of the group at the end of the week. This 10 minute presentation will count as their final assessment.

* **Monetary Policy and Central Banking 货币政策与中央银行**

The course explores current macroeconomic issues from mainly a monetary perspective. The course covers research topics in the area of international finance and aims to provide a framework to think about a wide variety of issues in international finance: exchange rate regimes, their choices and consequences; capital flows and international investment; payments imbalances and sovereign debt; financial crisis models, crises’ transmission and contagion; the scope for international policy coordination; issues related to the recent credit crisis of 2008, and policy making under uncertainty.

* **Dynamic Behaviour of Materials 材料的动态行为**

This course of lectures will introduce students to the effect of rapidly applied loads to different categories of solid materials. The course will focus on direct industrial applications, providing the required tools to fully understand the dynamic behaviour of materials, and how it can be used within the design process of real-life components.

The first part of the course will introduce the concept of dynamic behaviour and wave propagation within solid materials. The different types of elastic waves will be defined, and the analytical representations of the single waves and their interaction with the domain boundaries will be derived. Examples of practical applications of wave propagation mechanics will be shown, from earthquake location to high rate characterisation of materials.

The second part of the course will expand the range of deformation mechanisms by including plastic and shock waves. The different characteristics of elastic and plastic waves, and the effect of permanent deformation of the material will be analysed.

The third and final part of the course will focus on the techniques used to characterise solid materials at different loading rates. Examples of testing techniques using different methods to deliver the load, from gravity (i.e. drop tower) to explosives (e.g. ring expansion tests), will be described to cover an extremely wide range of strain-rates.

* **Introduction to Nanomaterial 纳米材料学**

The course provides essential knowledge on the fundamentals of nanomaterials and their applications in making today’s and future devices. The course will define what low-dimensionality is and how the nanomaterials can take various forms. The students will also be able to develop knowledge on the changes in the physical and chemical properties of materials as they go to the nanoscale. The students will explore some examples of nanomaterials such as carbon nanotubes and graphene. The course also provides knowledge on the nanomaterials fabrications and assembly in 3D to produce novel structures that can be used to change the world. The students will also learn about some real-life applications of nanomaterials and the basic science behind them.

* **The Health of Nations: Current Challenge and Future Possibilities 全球健康：当前的挑战和未来的可能性**

This course will discuss and analyse the state of health in the world and the challenges of the next 20-50 years. In addition, delegates will learn how health financing will need to adapt to the challenges of an aging population. Case studies analysing pandemics, such as SARS, flu, and Ebola, will be looked at in detail. New technologies and health innovations will be explored.

* **Stem Cell Biology 干细胞生物学**

The course is composed in two parts and serves to give delegates a comprehensive overview of the field of stem cell biology. The first course looks at aspects of the development of both embryonic stem cells and adult stem cells, while the second part of the course explores the discovery and biology of induced pluripotent stem cells, and the significance of its applications in revolutionising the future of medicine. Delegates are also introduced to cell trans-differentiation, the programming of one cell type into another such as the conversion of a skin cell into neuron.

* **International Governance of the Future: Managing digitalization, environmental degradation and depleting resources 未来的国际治理：管理数字化，环境恶化和资源枯竭**

The main purpose of this course is to expose students to emerging topics in International Governance, topics that their generation will have to engage with and address effectively. As many of our students aim to become practitioners working in the field of International Affairs and Public Policy, this course is preparing them for their careers by exposing them to a wide range of emerging International Governance issues: the digitalisation of society and international affairs; the effects of artificial intelligence on the international job market and international migration; environmental degradation and effective management of depleting natural resources. These are issues that are not only considered by scholars and policy experts as due to grow in importance, but also issues that are of interest and currently cause concern to students and young people. This year we saw massive mobilisation of students and youngsters around the world demanding international and firm action on climate change. The reading list exposes students to both academic literature and to policy studies, published by well-established policy institutions. The course includes a series of lectures (that introduce students to the emerging issues in International Governance mentioned above) and a wide range of class activities that will allow students to gain a better understanding on the subjects covered and develop a wide range of skills (analysing qualitative and quantitative data, cooperating with others, working as part of a team/ group, communicating effectively, etc.). The course aims to help develop the students’ negotiation skills and, in this regard, it will include several micro and macro simulations. During these simulations, students will play the role of diplomats, policymakers and various stakeholders that are called to find and negotiate solutions and international agreements addressing e-commerce, the rise of artificial intelligence, new forms of migration, the need for sustainable energy, climate change, etc. Students attending the Cambridge Summer Institute have greatly enjoyed in past years participating in simulations and playing roles that require them to engage directly with International Affairs.

* **Contemporary PPE: Ethics and Logic 当代政治哲学经济学：伦理与逻辑**

Since its beginnings in ancient Greece, the Western philosophical reflection on how we should conduct our lives, ethics, has been closely intertwined with the inquiry into logos, ‘reason’ or ‘reason-ing’, practical and theoretical, human or divine. While ethics and logic have developed into two distinct sub-disciplines of philosophy, different philosophical approaches to normative ethics and meta-ethics are often best understood as springing forth from different conceptions of the role that reason and argument (ought to) play in human morality, and from different assessments of the validity of certain key arguments (or alleged ‘fallacies’) in ethics, and of the force and implications of certain ‘dilemmas’ or ‘paradoxes’. Competing ethical theories are typically construed dialectically: they argue for the deficiency of the rival theories, and defend themselves by denouncing the shortcomings in the logic of their critics. 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, Mackie), this course will offer a perspective on how ethical discourse and debate were and remain deeply informed by the language and tools of logic.

* **An Actor’s Approach to Shakespeare 演员视角下的莎士比亚研究**

This course of lectures will introduce students to a range of Shakespeare's plays and poems from the point of view of actors and directors approaching this material in preparation for performance. In this respect it will differ from more conventional academic and contextual approaches. The focus will range from production history (taking in the diaries, memoirs and accounts of notable performers during the last 400 years) to dramatic technique and dramaturgy. Students will learn about how styles of performance have changed – from the highly prescribed and mannered style of the early modern period to the more cinematic renderings of the modern day. They will also discover how the plays have been recontextualised in line with social and historical change – such as when Janet Suzman directed a colour-blind production of 'Othello' in South Africa at the height of Apartheid. They will develop a 'toolbox' of dramatic techniques which can be applied to the texts in order to draw out many of their more subtle nuances. Finally, they will consider the future for Shakespeare's plays and how modern styles, conventions and convictions continue to alter and affect the ways in which they are performed.