

**FACULTY OF SCIENCE****Department of Biochemistry****BIOC1001 Basic biochemistry (6 credits)**

This course is designed to present an overview of biochemistry and to provide an understanding of the basic mechanisms underlying life processes. It is an independent course which can be taken by students from various disciplines. The course also prepares students for further studies in Biochemistry and Molecular Biology.

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**BIOC1003 Introduction to molecular genetics (6 credits)**

The objectives of this course are to provide students with basic and up-to-date knowledge on the structures and functions of nucleic acids, to give students a general picture of the molecular process of gene expressions, and to introduce students to recombinant DNA technology.

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**BIOC2601 Metabolism (6 credits)**

This course aims to provide the basic concepts of metabolism: the events and their importance in relation to the survival of living organisms. Taken together with BIOC1001 and BIOC2602, this will lay the foundation for the more advanced courses offered in the Biochemistry discipline.

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**BIOC2602 Understanding metabolic diseases (6 credits)**

To widen and deepen knowledge and understanding of metabolism. By using a problem-based learning (PBL) approach, students are trained in critical thinking and problem-solving skills. Students will be able to grasp the major effects on metabolic integration and control and they can use these concepts with greater confidence and success in approaching new problems and new areas of study.

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**BIOC2603 Principles of molecular genetics (6 credits)**

To provide basic knowledge on molecular genetics, illustrating modern concepts with current experimental approaches and computer-assisted programmes. Together with BIOC3613 and BIOC3609 taken in the second year, a comprehensive background is provided for advanced study and/or research in molecular biology.

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**BIOC2604 Essential techniques in biochemistry and molecular biology (6 credits)**

To give students a general overview of different experimental approaches and model systems, and to provide students with hands-on experience in basic biochemical and molecular techniques.

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**BIOC2616 Directed studies in biochemistry (6 credits)**

To enhance the student's knowledge of a particular topic and the student's self-directed learning and critical thinking skills.

**BIOC3608 Introduction to bioinformatics (6 credits)**

This course will examine existing programs and services available on the World Wide Web for DNA and protein sequence analysis. Students will also learn how to use the sequence analysis EMBOSS package installed locally. The underlying principles of these analysis programs and services will be presented. Students will learn how to retrieve, analyze, and compare protein and DNA sequence similarities. A basic introduction to protein modeling will also be presented.

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**BIOC3609 Molecular medicine (6 credits)**

To provide up-to-date knowledge of the molecular and genetic basis of human diseases including cancer, thereby preparing the students for a career in medical molecular biology, biotechnological, pharmaceutical and genome research.

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**BIOC3610 Advanced biochemistry I (6 credits)**

This is part of the advanced series designed to bring students to the understanding of current concepts, physicochemical bases and techniques in modern Biochemistry. The aim is to help students to develop critical thinking and analytical skills thus equipping them for beginning research projects or professional training in biomedical sciences.

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**BIOC3611 Advanced biochemistry II (6 credits)**

This is part of the advanced series designed to bring students to the understanding of current concepts, physicochemical bases and techniques in modern biochemistry. Hence to equip them for beginning research projects or professional training in biomedical sciences.

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**BIOC3613 Molecular biology of the gene (6 credits)**

To provide an up-to-date knowledge of molecular biology, especially with respect to the regulation of eukaryotic gene expression, molecular embryology.

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**BIOC3614 Biochemistry project (12 credits)**

To enable students to acquire the basic skills in scientific research: literature search, critical reasoning, communication, teamwork and time management. The course is particularly useful for those students who intend to pursue a career in life science.

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**BIOC3615 Advanced techniques in biochemistry and molecular biology (6 credits)**

This is an advanced experimental-based course for students majoring in Biochemistry and related disciplines. The aim is to provide the necessary training for students to pursuit postgraduate research education and potential employment in a scientific laboratory/industry environment.

**BIOC3988 Biochemistry internship (6 credits)**

This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 120 hours of internship work either within the University or outside the University arranged by the School/Departments.

- (1) Within the university: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.
  - (2) Outside the university: The student will work in an external agency related to the major of study. The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.
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**School of Biological Sciences****BIOL0002 Introduction to food and nutritional science (3 credits)**

The course enables students to gain an appreciation of the scope of Food Science as a discipline. This is an independent course which can be taken by students from various disciplines. It also prepares students for further studies in Food and Nutritional Science.

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**BIOL0118 Bioethics (6 credits)**

The aim is to explore the ethical implications of the latest major advances in biology and medicine.

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**BIOL0120 The gene (3 credits)**

The objective of the course is to expose students to the impacts of gene to the modern society. With the completion of the human genome in the next three years not only promises a better quality of life, it also brings lots of technical and ethical issues that the general public need to deal with. The goal of the course is designed to open up students from all backgrounds to this basic unit of inheritance called gene and its impact on various other scientific and social disciplines. Outline includes but not limited to the chemical basis of gene, gene evolution, gene chips, animal cloning, gene and disease, human genome and computer science, gene and behavior, genetic implications to law and society.

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**BIOL0126 Fundamentals of biology (6 credits)**

This course is designed to provide students a general concept of the various disciplines of experimental biology and prepare them for further intermediate and advanced courses in biology. It takes a systematic approach to look at the key principles that govern the survival of life forms.

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**BIOL0127 Contemporary nutrition: insights and controversies (3 credits)**

What you eat greatly affects your well-being, and this is especially true in recent years when nutrition has become one of the hottest topics in town for men and women of all ages. What food is good for our health? How much do we need to eat? Which dietary plan is scientifically sound and effective? Everywhere we go, we are bombarded by different messages, from vitamins to functional food products,

on how food components or treatments impact on body functions and health. How reliable is the information from the mass media? Are these facts or myths? This course aims to provide health conscious individuals with fundamental knowledge to decipher information related to nutrition and health. Such knowledge is vital to everyone not just in a trendy fashion or for a short term dietary plan, it is essential to the building of good eating habits that could promote health for a lifetime.

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**BIOL0129     Introductory microbiology (3 credits)**

To introduce students to the diversity, function and importance of microorganisms in the natural environment, disease and public health, food production and spoilage and the biotechnology industry.

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**BIOL0130     Introduction to the biotechnology industry (3 credits)**

Through an introduction to the history and technology of some of the most successful biotechnology companies, students will be able to understand the recent advances in the biotechnology industry.

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**BIOL0131     Basic medical microbiology (3 credits)**

To introduce students to the microorganisms associated with infectious diseases, response to infection, and how disease spreads and is controlled.

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**BIOL0601     Ecology of Hong Kong (3 credits)**

The aims of this course are to explore the ecology and biodiversity of terrestrial, marine and freshwater environments in Hong Kong, including its physical environments, habitats, and organisms, and the efforts being made to conserve them.

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**BIOL0602     Origins of life and astrobiology (3 credits)**

To consider the origins of life on Earth, what makes a planet suitable for life and the influence of life on Earth's biosphere. To review evidence for the existence of other planets that could support life and the concept that life can be transported across inter-planetary distances. To examine the challenges that face mankind if he is to consider life in space or on other planets.

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**BIOL0604     Evolutionary diversity (6 credits)**

To provide students with an introduction to the diversity of plant and animal life. Recent research has resulted in fundamental changes in our understanding of evolutionary history (phylogeny). Current evolutionary trees will be used as the basis for a survey of different groups in phylogenetic sequence, and for understanding how structures, processes and behaviours have changed through time.

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**BIOL0605     Ecology field course (3 credits)**

This 5-day residential field course, including lectures and briefing sessions, provides students with an opportunity to visit a variety of habitats in Hong Kong, and to observe directly the main environmental factors that prevail in each of them. Emphasis will be placed on guiding students to become familiar with common local plants and animals and their habitats.

**BIOL0625 Ecology and evolution (6 credits)**

This course explains how the ecology and behaviour of plants and animals has been shaped by evolution, and demonstrates how we can understand and explain the significance of what we see in nature using scientific methods. The **course objectives** are as follows:

- Introduce the application of scientific methods (hypotheses, experiments, comparisons) to the study of ecology and evolution.
  - Explain how the environment affects organisms in terms of their present-day ecology (determining where they live and how many can survive there) and, through natural selection acting over past generations, influences their form and adaptations.
  - Introduce the basic principles of ecology and evolution, showing how they are linked to the environment by the phenomenon of adaptation.
  - Describe the patterns of interactions among individuals (e.g. mating systems and reproduction, social behaviour, competition, and predation), and explain some of the simple principles that under their occurrence and evolution.
  - Introduce the basic principles of population growth, density dependence and regulation of population size.
  - Describe the ecological niche of early humans, and explain how their primate ancestry (and adaptations to life in trees) contributed to evolutionary and ecological success.
  - Illustrate the 'branching' pattern of the human evolutionary 'tree' by describing the main species in the human fossil record, their order of appearance, antiquity and distinguishing features.
  - Introduce the concept of biodiversity, how it is generated by adaptive radiation, how it is estimated, and its importance to humans.
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**BIOL1106 Genetics (3 credits)**

The objective of the course is to provide an introduction to the various aspects of genetics. At the end of the course students are expected to know the fundamentals of classical, population and molecular genetics.

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**BIOL1122 Functional biology (6 credits)**

The course is designed to provide an introduction to modern developments in experimental biology through an integrated approach. Life processes will be examined at the molecular, cellular and organismic level.

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**BIOL1133 Biological sciences laboratory course (6 credits)**

This course provides students a comprehensive training in experimental design and basic laboratory techniques used in modern biological studies. The course will cover a number of techniques used by molecular biologists and microbiologists to conduct scientific research. Upon completion of the course, students should have gained an understanding of how and why certain techniques or methods are used in a research setting, and be able to carry out essential experimental procedures.

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**BIOL1125 Introduction to biochemistry (6 credits)**

This course is designed to provide undergraduate (non-biochemistry major) an overview of fundamental concepts in biochemistry as well as hands-on experience in biochemical techniques.

**BIOL1514 Nutrition and metabolism (6 credits)**

This is an independent course compulsory for students in the Food & Nutritional Science programme, but also opens to students in other life sciences disciplines. The fundamental concepts in nutrition will be introduced. An integrated approach will be used in discussing the interactions between diet and intermediary metabolism.

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**BIOL1528 Food chemistry (6 credits)**

The course is designed to give students a basic understanding of chemistry of the major and minor components in food systems and practical training related to food science and nutrition.

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**BIOL2109 Economic botany (6 credits)**

To provide an understanding of the scientific principles, processes, and practices involved in the utilization of crops and other economic plants. At the end of the course students are expected to be scientifically knowledgeable on the plants and plant products they encounter everyday.

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**BIOL2111 Molecular microbiology (6 credits)**

This course is intended for biology, biotechnology and biochemistry students who would like to understand the modern fundamentals of microbiology. At the end of the course the students are expected to know the physiological, biochemical and molecular aspects of microbiology.

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**BIOL2112 Plant physiology (6 credits)**

To give an understanding of plant processes such as plant growth and development and their regulatory mechanisms.

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**BIOL2115 Cell biology & cell technology (6 credits)**

To provide a coherent understanding of the structure and function of cells, and the principles and applications of cell culture and instrumentation in biology and biotechnology.

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**BIOL2116 Genetics I (6 credits)**

This is the first of an integrated pair of courses, Genetics I and Genetics II, aiming to provide balanced coverage of many areas in genetics. The focus of Genetics I is on the basic principles of genetics. Genetics II will cover more advanced topics of modern genetics.

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**BIOL2117 Genetics II (6 credits)**

This is the second of an integrated pair of courses, Genetics I and Genetics II, aiming to provide balanced coverage of many areas in genetics. The focus of Genetics I is on the basic principles of genetics. Genetics II covers more advanced topics of genetics.

**BIOL2203      Reproduction & Reproductive Biotechnology (6 credits)**

To provide comprehensive overview on modern concepts and recent advancements in reproductive biology & biotechnology.

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**BIOL2205      Immunology (6 credits)**

To provide a broad understanding of the animal immune system. Topics will also include the application of a variety of immunological methods to research and disease diagnosis.

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**BIOL2207      Endocrinology: human physiology II (6 credits)**

To provide an advanced course on hormones and regulation of metabolism.

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**BIOL2210      Evolution (6 credits)**

Since the publication of Darwin's Origin of Species in 1859, the science of evolutionary biology and genetics have developed together during the 20<sup>th</sup> century, leading to the Modern Synthesis of Evolutionary Theory. Evolution provides a framework for understanding all the features of living things. Students will learn the origin of genetic variation in natural populations, how populations evolve, and how new species arise over time, resulting in the amazing biological diversity we see today.

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**BIOL2215      Animal physiology (6 credits)**

The course covers the major aspects of animal physiology for adaptation in different habitats. Stress will be given to the functional interactions between animals and the environment, especially on the mechanisms by which animals obtain resources for survival from the environment, detect environmental changes via sensory structures, and respond to adversities in the environment by altering their body forms and functions.

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**BIOL2217      General parasitology (3 credits)**

The course is aimed to provide students with a broad basic knowledge on major aspects of general parasitology. Students will be exposed to the general concepts of parasitology, taxonomy of parasites: from protozoa, to nematode, to Platyhelminthes. The lectures will also focus on the growth cycles of parasites, their means of infection, reproductive strategies, diagnosis of parasitic diseases and the host-parasite interactions.

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**BIOL2218      Human physiology (6 credits)**

The course covers major aspects of the physiology of the human body using an integrated approach. After completing this course, students will have acquired fundamental principles of how the body works. Students interested in nutrition and human biology will find this course most useful.

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**BIOL2301      Protein structure and function (6 credits)**

To provide students with a good understanding of protein structure, how structure subserves function, and the methods for study of both. This course provides a strong foundation for advanced courses in biochemistry and biotechnology.

**BIOL2302 Fermentation technology (6 credits)**

To introduce the key concepts and principles involved in fermentation technology, and discuss how fermentation technology is used in the food and biotechnology industries.

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**BIOL2303 Molecular biology (6 credits)**

To provide students with basic knowledge in molecular biology and gene cloning techniques with emphasis on manufacturing of cell products. This course will give Biological Sciences students a broad picture of recent developments and applications in gene technology and prepare Biotechnology students for further advanced course in genetic engineering.

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**BIOL2318 Biological sciences field course (6 credits)**

This course is offered as an experiential learning experience and will require intense study of a topic during a field course, inside or outside Hong Kong.

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**BIOL2320 Directed studies in biological sciences (6 credits)**

Students will undertake a dissertation on an agreed topic or carry out a small scale project in biological sciences. The student will develop scientific writing and presentation skills.

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**BIOL2324 Microbial physiology and biochemistry (6 credits)**

Microbial physiology and biochemistry serves as a basis for many of the sub-disciplines of microbiology, including mycology, virology, immunology, medical microbiology, and food and industrial microbiology. This course is designed for students to obtain a profound understanding of how microbial cells function in their diverse habitats and how the metabolic diversity of microbial organisms be employed in biotechnological industry and medicine. After completing this course, students will have acquired fundamental principles of microbial physiology and be able to relate the knowledge to practical application of microbes in industry and medicine. Students interested in biotechnology and medical microbiology will find this course most useful.

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**BIOL2501 Food processing and preservation (6 credits)**

An introduction to the basic principles and methodology of food processing and preservation technology with emphasis on major methods including high and low temperature processing, concentration and dehydration, and food packaging.

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**BIOL2503 Grain production & utilization (6 credits)**

To provide a broad understanding of the utilization and significance of the major grains in the food industry and in human health and nutrition.

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**BIOL2507 Meat and dairy science (6 credits)**

To provide a broad understanding on modern practice and technology of meat and dairy production, processing and marketing.

**BIOL2515 Food microbiology (6 credits)**

This course provides the key concepts and principles of food microbiology with special emphasis on the interaction between microorganisms and food. Microbial food production, microbial food spoilage and foodborne diseases will be discussed in detail.

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**BIOL2517 Food analysis (3 credits)**

To introduce the key concepts in professional food analysis in an industry context. To discuss the choice of analytical methods and the interpretation of results. Major instrumental techniques used in food analysis will be covered.

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**BIOL2518 Laboratory in nutritional science (3 credits)**

To provide students a comprehensive training on laboratory techniques, experimental approaches and the use of different model systems in nutritional sciences. This course aims to equip students with the basic skills in conducting nutritional studies.

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**BIOL2519 Essential nutrients & functional foods (6 credits)**

The course has two interrelated parts. First, the functional roles of essential micronutrients in physiologic and metabolic processes will be presented. Second, the concept of functional foods and their role in disease risk reduction will be discussed. The course would appeal to students who have interest in the science, marketing and regulatory aspects of health foods and dietary supplements.

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**BIOL2521 Food engineering (6 credits)**

This course is intended for students planning to enter the food industry. This course offers an introduction to physical and engineering principles relevant to the food industry, and an in-depth analysis of selected methods and problems in food processing and preservation.

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**BIOL2529 Food and nutritional toxicology (6 credits)**

This course will provide students basic principles of food and nutritional toxicology with primary emphasis on absorption, metabolism and excretion of food toxins, allergenic and toxic constituents in plant, animal, marine and fungal origin, the role of diet and nutrients in mutagenesis and carcinogenesis, food processing induced toxins and the procedures, laws and regulation of safety assessment of foods including food additives, environmental contaminants, pesticides and antibiotic residues.

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**BIOL2530 Molecular biology and nutrigenomics (6 credits)**

The emergence of a new science called Nutrigenomics has increased our understanding of how nutrients modulate gene expression and ultimately influence cellular metabolism. Nutrigenomics will lead to evidence-based diet intervention approach for the maintenance of health and disease prevention. The course supports two learning goals: 1) to provide students with the knowledge on the principles of molecular biology and gene regulation and 2) for students to develop an understanding of genomics with respect to diet.

**BIOL2531 Principles of Chinese medicinal diet (6 credits)**

This course aims to provide basic knowledge on Chinese medicated diet. Illustrating historical and modern concepts of Chinese Medicated diet and encourage research and development with current experimental approaches. This is a valuable course for students in the Food and Nutritional Science programme, but also opens to students in other programmes.

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**BIOL2532 Diet and disease (6 credits)**

This course aims to provide the students the knowledge on diseases associated with diet and basic dietetics.

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**BIOL2533 Nutrition and life cycle (6 credits)**

Identifying the unique nutritional differences among the various stages of aging is becoming even more important as the life span of the population increase. This course aims to provide the students the significance of nutrition during specific times of growth, development, and aging.

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**BIOL2534 Nutrition and life cycle (6 credits)**

This course aims to provide the students with the understanding of nutrition care process starting with the population in general and methods for dietary planning. The students will learn about nutrition care process, methods of nutrition support, counselling, guidelines for dietary planning, and drug-nutrient interaction. The use of herbs and photochemical in complementary therapy by the general public will also be discussed because of the rapidly growing interest and knowledge of this field.

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**BIOL2535 Food processing and engineering laboratory course (6 credits)**

To provide students with basic principles and methodology of food processing and preservation technology as well as physical and engineering principles relevant to the food industry. Students will be able to gain hand on experience with food processing and preservation techniques.

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**BIOL2536 Food and nutrients analysis laboratory course (6 credits)**

Through an introduction of some basic principles and practical training related to food and nutrient analysis, students will be able to analyze the major and minor food components as well as some food adulterants. Student will understand the principles behind analytical techniques associated with food to be able to select the appropriate methods when presented with a practical problem. These techniques are useful for students interested in food science and health industry.

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**BIOL2537 Laboratory in nutritional science (6 credits)**

To provide students a comprehensive training on laboratory techniques, experimental approaches and the use of different model systems in nutritional sciences. With emphasis on human nutrition related techniques, this course will provide students the necessary knowledge to pursuit postgraduate research education as well as potential employment as a nutritionist in public and private sectors.

**BIOL2538 Food product development (6 credits)**

To introduce the key concepts and techniques used in food product development. Students will work in small groups to design, develop and produce a new food product. Appropriate for students in Food and Nutritional Science Programme or Major.

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**BIOL2606 Environmental microbiology (6 credits)**

To familiarize students with the role of microorganisms in natural processes which affect our environment such as the recycling of chemical elements, interactions with plants and animals, and the ways in which they carry out biodegradation of environmentally important pollutants. Key concepts are illustrated with local case studies and practical classes.

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**BIOL2607 Fish biology (6 credits)**

To acquaint students with the principles governing interrelationships among fishes as well as with the biotic and abiotic aspects of their environment thereby to provide an understanding of the factors determining species population dynamics and multispecies interactions. Special emphasis will be placed on coral reef assemblages with an introduction to local reef fishes.

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**BIOL2608 Biometrics (6 credits)**

To introduce students to experimental design and statistical data analysis at an elementary to intermediate level, with an emphasis on practical applications of statistical methods to experimental and observational data in biology and ecology. A range of topics will be addressed, particularly those involving descriptions of populations and communities, biodiversity, ecophysiology and ecological impacts associated with pollution. To illustrate each statistical method, examples will be drawn from real cases, with consideration of the biological or ecological background of the problem and appropriate experimental design, statistical analysis and interpretation. Use will be made of statistical software such as SPSS, SAS and PRIMER for statistical computing. SPSS is powerful and easy to use, and available on HKU networked computers. Computer laboratories will be organised to familiarise students with statistical computation using the software.

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**BIOL2610 Biological oceanography (6 credits)**

This course provides an introduction to the physical, chemical, geological and biological processes that occur in oceans and explains the importance of the oceans to all life on earth. The emphasis is on how marine organisms interact with each other and with their environment by considering various ecosystems, as well as the adaptations of marine life to their particular habitats specific examples from South East Asia, the South China Sea and Hong Kong will be included.

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**BIOL2611 Systematics & phylogenetics (6 credits)**

To give students an understanding of the principles of systematics and phylogenetics and an appreciation of current trends and controversies. Systematics forms an invaluable grounding for many fields of biology (including anatomy, ecology, population biology and evolutionary biology), and enables the integration of a wide range of techniques (including anatomy, biochemistry, chemistry, molecular biology, cytology, palaeontology and ethology).

**BIOL2612 Conservation biology (6 credits)**

To introduce students to the theory and practice of biological conservation.

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**BIOL2614 Environmental toxicology (6 credits)**

To introduce students to the basic principles of environmental and ecological toxicology. Specific cases from the current literature will be used and analyzed. Emphasis will be on aquatic ecosystems.

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**BIOL2615 Freshwater ecology (6 credits)**

Introduce, illustrate and explain the physical and biological processes that occur in drainage basins, their importance to human populations and biodiversity, and the impacts and management of freshwater resources subject to multiple uses. Examples from the monsoonal East Asia, the Mekong River Basin and/or Hong Kong are used to illustrate to human dependence on freshwater ecosystems and the important role that they play in sustaining livelihoods.

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**BIOL2616 Plant structure and evolution (3 credits)**

To survey the form and function of the vascular plant body, with particular emphasis on the evolutionary significance of various structures. This forms a basis for understanding plant physiology, ecology, systematics and phylogeny.

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**BIOL2617 Coastal ecology (6 credits)**

To examine the communities of coastal systems: their distribution, composition and the factors which regulate them. This course will examine, using an experimental approach, patterns exhibited by a range of shores and the deterministic and stochastic processes that create and sustain them. Hong Kong shores will be used as examples but comparisons will be drawn from the coastlines of the world.

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**BIOL2619 Terrestrial ecology (6 credits)**

To enable motivated students to acquire the knowledge and skills needed to solve real problems in terrestrial ecology.

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**BIOL3214 General virology (6 credits)**

This Course provides the fundamental principles of virology so that students can understand the pathogenesis of major viral diseases that affect animal health. The course will prepare students for profession or graduate work in virology, medicine and biotechnology.

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**BIOL3219 Clinical microbiology and applied immunology (6 credits)**

The aim is to provide the knowledge on the practical applications of Immunology and Microbiology in biological research, clinical analysis and disease diagnosis.

**BIOL3307     Biotechnology industry (6 credits)**

This course provides an overview of the various fields of biotechnologies, the development of a biotechnology product, and the operation of biotechnology companies.

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**BIOL3315     Animal biotechnology (6 credits)**

This course discusses the key concepts and principles involved in animal biotechnology, and their applications in animal industry and molecular medicine.

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**BIOL3316     Plant biotechnology (6 credits)**

This course covers the principles and applications of plant biotechnology. The significance of plant biotechnology in agriculture and its emerging role in molecular farming for production of biopharmaceuticals and other high-value proteins will be discussed.

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**BIOL3317     Microbial biotechnology (6 credits)**

This course is intended for students who would like to understand the application of modern microbiology in biotechnology. The microbial systems being used include different types of viruses, bacteria, fungi and algae. At the end of the course the students are expected to know the parameters and conditions that affect the yield of production and the systems available for the expression of various types of biotechnology products.

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**BIOL3321     Biological sciences project (12 credits)**

To provide experience of biological research by planning and carrying out a project under the supervision of a member of staff.

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**BIOL3325     Molecular phylogenetics and evolution (6 credits)**

The purpose of this course is to provide a comprehensive overview of state-of-the-art molecular systematics and phylogenetic research, focusing on in depth coverage of the latest techniques in molecular systematics. The treatment of theoretical issues in formal lectures is coupled with practical workshops.

- computer based DNA sequence assembly
  - DNA sequence alignment
  - acquisition of DNA sequences from GenBank, database searches
  - phylogeny reconstruction using parsimony, distance based, and maximum likelihood approaches
  - introduction to relevant software for phylogenetics
  - statistical methods for the evaluation of phylogenetic trees
  - interpretation of phylogenies to answer biological questions in various fields is emphasized
  - the use of DNA fingerprinting techniques in population biology, conservation genetics, and forensics
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**BIOL3516     Nutrition and brain function (3 credits)**

To highlight the impact of nutrient provision on brain function and to discuss various effects of nutrition and diet on mental function and behaviour.

**BIOL3526     Advanced laboratory in nutritional science (3 credits)**

This course is a follow-up to BIOL2518. The emphasis will be on human nutrition related techniques. Taken together, the two courses will provide students the necessary knowledge to pursue postgraduate research education as well as potential employment as a nutritionist in public and private sectors.

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**BIOL3527     Food safety and quality management (6 credits)**

To provide exposure to some key management concepts used to produce safe high-quality food products that will succeed in the marketplace. To introduce students to the use of the business case-study method in individual, team and class-based learning.

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**BIOL3539     Food safety and toxicology laboratory course (6 credits)**

To introduce students to different methods used in assessing the toxicity of food contaminants, and develop their confidence in handling and interpretation of toxicological data. Students will also be introduced to the basic concepts of toxicological evaluation and criteria for setting guidance values for dietary and non-dietary exposure to chemicals. Students will understand the role of biochemical, metabolic and toxicokinetic studies in toxicological evaluation. This course aims to equip students with the basic skills in conducting food toxicological studies.

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**BIOL3540     Diet, brain function and behaviour (6 credits)**

To highlight the impact of nutrient provision on brain function and to discuss various effects of nutrition and diet on mental function and behaviour.

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**BIOL3621     Fisheries and mariculture (6 credits)**

Theoretical and practical aspects of marine fisheries and mariculture will be covered to provide an understanding of the condition of global and local fishery resources as well as the importance of biological and ecological studies to their management. The role of mariculture in global fish supply will be examined and local fishery and mariculture examples provided.

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**BIOL3622     Environmental impact assessment (6 credits)**

The basic aim of this course is to introduce students to the principles and problems of Environmental Impact Assessment (EIA). An understanding of EIA is an essential prerequisite for a job as an environmental scientist. EIA is albeit a global requirement but the principles and practices of EIA vary greatly between different parts of the world. In this course, you will acquire a general understanding of EIA, which will be useful anywhere in the world. In addition, this course - along with Conservation Biology - provides an applied synthesis of much of what you have learned in other Ecology and Biodiversity courses.

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**BIOL3624     Environmental monitoring and remediation techniques (6 credits)**

To introduce the standard parameters in environmental monitoring, and the scientific basis of practical monitoring techniques. The focus of the course will be on both the analysis and application of new environmental technology. Local examples will be used to illustrate the power of environmental monitoring and identification of pollution sources, as well as the success of implementation of treatment techniques.

**BIOL3988 Biological sciences internship (6 credits)**

This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 120 hours of internship work either within the University or outside the University arranged by the School/Departments.

- (1) Within the university: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.
  - (2) Outside the university: The student will work in an external agency related to the major of study. The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.
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**Department of Chemistry****CHEM0003 Chemistry and daily life (3 credits)**

This general education course is designed as an elective for students in all disciplines and all years without strong chemistry background. It gives an overview of some important chemical aspects that we encounter in our daily life.

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**CHEM0008 Fundamental chemistry (6 credits)**

To provide students, who are interested in Chemistry but lack the AL/AS Chemistry background or equivalent, a foundation course in general chemistry. It covers the essential knowledge of Chemistry on various topics. Students who have taken the course will have a foundation to study other chemistry courses at introductory level offered by the Department of Chemistry.

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**CHEM1002 Chemistry: principles and concepts (6 credits)**

To provide basic knowledge of modern chemistry. This course is a pre-requisite for the advanced chemistry courses.

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**CHEM1003 The molecular world (6 credits)**

To provide students with the basic principles and knowledge of inorganic and organic chemistry and to introduce their relevance to biological processes and materials science. This course provides the foundation for further studies in both inorganic and organic chemistry.

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**CHEM1004 Chemistry: an experimental science I (6 credits)**

To cover the principles and applications of basic chemical laboratory techniques. This course is required for Chemistry Majors and highly recommended for Chemistry Minors.  
Prerequisite: AL or AS Chemistry or equivalent

**CHEM1005 Introduction to materials science (6 credits)**

The course provides an introductory and coherent treatment of materials of current importance. It provides physical and chemistry basis for the diverse properties of materials. Materials of the course will be delivered by instructors from both the Physics and Chemistry Departments.

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**CHEM1006 Introduction to forensic science (3 credits)**

This course is designed as an elective course to provide a basic foundation in the field of forensic science for students with general science or equivalent background. Without having to be major in chemistry, the students are allowed to learn and experience the various methods used in investigating crimes.

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**CHEM1009 Basic chemistry (6 credits)**

This course is designed for non-chemistry major students covering basic principles of chemistry.

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**CHEM1401 Fundamentals of organic chemistry (6 credits)**

To introduce the basic concepts of organic chemistry for students who have chosen to not major in chemistry.

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**CHEM2003 Introductory instrumental chemical analysis (6 credits)**

This course is designed for non-chemistry major students covering basic principles of separation and spectroscopy for chemical analysis. This course provides a general foundation for further studies in pharmacology, life and environmental sciences.

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**CHEM2102 Environmental chemistry (6 credits)**

This course introduces students to Environmental Chemistry and enables them to understand the chemical principles involved in various environmental phenomena and processes.

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**CHEM2103 Chemical process industries and analysis (6 credits)**

To familiarize with typical chemical industries important in local and global economy. To understand the technology of chemicals manufacturing and chemical processes in general industry.

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**CHEM2109 Introduction to materials chemistry (6 credits)**

This course provides an introduction to materials chemistry. Some basic material characterization techniques will also be introduced. This course is essential for students who wish to take advanced materials course.

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**CHEM2111 Directed studies in chemistry (6 credits)**

This course is designed for second year students who would like to take an early experience on research. It offers students an opportunity to carry out small scale chemical projects by themselves.

**CHEM2202 Chemical instrumentation (6 credits)**

To cover the basic principles and applications of chemical instrumentation. This course aims to provide a good working knowledge, in addition to the principles, of instruments that are commonly used in a chemical laboratory.

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**CHEM2207 Food and water analysis (6 credits)**

To cover areas in the application and new methodology development in Analytical Chemistry with focus on food and water analysis.

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**CHEM2302 Intermediate inorganic chemistry (9 credits)**

This course aims to provide a more detailed treatment of general inorganic chemistry suited to the needs of those intending to extend their studies in chemistry.

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**CHEM2402 Intermediate organic chemistry (9 credits)**

This course is a continuation from Basic Organic Chemistry. Together they provide a solid foundation of organic chemistry.

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**CHEM2503 Intermediate physical chemistry (9 credits)**

This course presents a more detailed treatment of general physical chemistry topics in order to provide a solid foundation for those students intending to extend their studies in chemistry further. This course would stand on its own.

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**CHEM2509 Principles of chemical biology (6 credits)**

To understand how to use chemical approaches to emulate biological system to study natural molecules and generate new functional molecules. Useful as an introduction to research in areas of chemical biology, medicinal chemistry and biotechnology.

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**CHEM2510 Principles and applications of spectroscopic techniques (6 credits)**

To cover the principles and applications of modern practical spectroscopic and analytical techniques. This course is a pre-requisite for the advanced chemistry courses.

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**CHEM2512 Chemistry: An experimental science II (6 credits)**

To cover some major techniques in chemical synthesis and characterization, and chemical instrumentation. This course is strongly recommended for chemistry major students and students in any other science disciplines who want to be equipped with essential laboratory skills for future development.

**CHEM3105 Chemistry project (12 credits)**

To provide experience of research techniques by working on a short project under the direct supervision of a member of staff. This course would prepare students for graduate school work in chemistry.

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**CHEM3106 Symmetry, group theory and applications (6 credits)**

To introduce the concepts of symmetry and group theory and to apply them in solving chemical problems. This course also provides an introductory treatment of bonding theories, inorganic electronic and vibrational spectroscopy. This course is essential for students who wish to take advanced courses in inorganic chemistry and all types of spectroscopy.

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**CHEM3107 Interfacial science and technology (6 credits)**

To understand the science and technology of interfacial phenomena and processes often appeared in high value added products and modern technologies.

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**CHEM3110 Advanced materials (6 credits)**

This course is a continuation from Introduction to Materials Chemistry. It provides a more comprehensive overview on materials chemistry and application of materials in advanced technology. The most recent development in materials chemistry will also be introduced.

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**CHEM3203 Analytical chemistry (9 credits)**

To cover the principles and methodologies of Analytical Chemistry and its use in the analysis of gas, liquid and solid samples.

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**CHEM3204 Modern chemical instrumentation and applications (6 credits)**

The aim of the course is to provide an understanding of modern instrumentation, covering both fundamental principles and practical aspects of instrument design. The course will be of particular benefit to those pursuing a higher research degree or a career in technical sales/service.

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**CHEM3303 Advanced inorganic chemistry (9 credits)**

To give further, more detailed, treatment to topics mentioned in Intermediate Inorganic Chemistry and to develop new areas of interest. The course also aims to prepare students for graduate work in inorganic chemistry.

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**CHEM3304 Organometallic chemistry (6 credits)**

To give further, more detailed, treatment to organometallic chemistry mentioned in Intermediate Inorganic Chemistry. The course also aims to introduce and familiarize students with advanced laboratory techniques, and to prepare students for graduate work in inorganic and organometallic chemistry.

**CHEM3403 Integrated Organic synthesis (9 credits)**

This course covers aspects of modern synthetic methods, develops the concept of synthetic planning, with relevance and in the context of drug synthesis, medicinal chemistry, and bioorganic chemistry, so as to provide an integrated approach to this subject.

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**CHEM3404 Advanced organic chemistry (6 credits)**

To provide students with knowledge in organic chemistry reaction mechanisms and organic compound structure determination.

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**CHEM3405 Organic chemistry of life (6 credits)**

To understand molecules and reactions of life sciences. Useful as an introduction to research in areas of bioorganic chemistry, bioinorganic chemistry, medicinal chemistry, and biotechnology.

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**CHEM3407 Medicinal chemistry (6 credits)**

This course covers the chemical principles of drug design and drug action. Useful as an introduction to research in areas of bioorganic chemistry, bioinorganic chemistry, medicinal chemistry, pharmaceutical chemistry, and biotechnology.

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**CHEM3505 Molecular spectroscopy (6 credits)**

This course provides a unifying treatment of the theories and applications of some important types of spectroscopy. Essential for graduate work in all branches of chemistry.

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**CHEM3506 Computational chemistry (6 credits)**

This course covers topics in computational chemistry including first-principles methods and molecular dynamics methods. It is offered to undergraduate and postgraduate students interested in computational chemistry, computational physics and computational biology.

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**CHEM3513 Advanced physical chemistry (6 credits)**

This course covers advanced topics in physical chemistry. It is offered for students majoring in physical chemistry and for students who are interested in postgraduate studies.

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**CHEM3988 Chemistry internship (6 credits)**

This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 120 hours of internship work either within the University or outside the University arranged by the School/Departments.

- (1) Within the university: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.

- (2) Outside the university: The student will work in an external agency related to the major of study. The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.
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## **Department of Earth Sciences**

### **EASC0002 Peaceful use of nuclear technologies (3 credits)**

To provide students with the basic knowledge on application of nuclear technologies in daily life and to invoke an awareness of current applications of nuclear sciences by case studies.

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### **EASC0003 Natural hazards and geological risk (6 credits)**

In many parts of Asia natural hazards such as volcanoes, earthquakes, tsunamis, typhoons, floods, droughts, wildfires and landslides pose potential threats to increasing human populations. Climate changes influences the impact of some of these risks. The course aims to develop an awareness and understanding of the scale of these and other geological risks and their driving forces in order to develop risk mitigation strategies.

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### **EASC0105 Earth through time (6 credits)**

To introduce the concepts of geological time and uniformitarianism. To provide an understanding of the fossil record, and the integration of Earth Systems and plate tectonics. To gain an appreciation of our place in the Universe, an understanding of the evolution of Earth and life on Earth through time.

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### **EASC0116 Introduction to physical geology (6 credits)**

The course, intended for students taking their first course in earth science, provides a basic overview of the earth's structure, material and internal and external processes.

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### **EASC0117 Geological heritage of Hong Kong (3 credits)**

To give an overview of the geology of Hong Kong, potential geological resources for tourism and the role of geology in the development of Hong Kong's infrastructure.

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### **EASC0118 Blue planet (6 credits)**

The aim is to provide those students who are taking a first course in Earth Sciences with a fundamental knowledge of how our diverse and living planet Earth works with weaving together an understanding of the dynamic and interactive processes in the Earth's lithosphere, hydrosphere, biosphere and atmosphere. In addition, students should become familiar with the way the study of Earth Sciences blends observation, information, hypothesis, communication and decision making for a better understanding of the future of our planet.

**EASC0120 Earth, environment and society (6 credits)**

This course provides an introduction to how the Earth's environment affects the well-being of human society and major issues of human impacts on the environment.

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**EASC0121 Earth's climate past and future (3 credits)**

This course provides an introduction to the study of global climate change by investigating the histories of past climates preserved in the geological record. We look at modern research methods that are used in paleoclimatic and paleoenvironmental reconstructions and discuss how this information can be used to model possible climatic trends, such as global warming.

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**EASC0135 Introduction to atmosphere and oceans (3 credits)**

An understanding of the interaction between the ocean and atmosphere is fundamental to even the basic understanding of how weather systems work. This course will explain the interaction of the ocean and atmospheric system.

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**EASC0136 Introduction to climatology (3 credits)**

The course provides a basic overview of the earth's global weather system, processes that control the temporal and spatial variations in earth's climate.

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**EASC1123 Planetary geology (6 credits)**

This course provides students with an introduction to the origin, evolution, structure, composition and distribution of matter in the Solar System condensed in the form of planets, satellites, comets, asteroids and rings with particular emphasis on surface features, internal structures and histories from a geological point of view. The course incorporates the findings from recent space investigations, planetary imagery, remote sensing and Earth analogues to extraterrestrial features into a fascinating portrayal of the geological activities and histories in our Solar System.

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**EASC2004 Geophysics (6 credits)**

An overview of the geophysical characteristics and processes of the solid earth, the atmosphere and the oceans, as well as the methodologies for studying geophysical data.

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**EASC2005 Meteorology (6 credits)**

The course is a survey of the earth's atmospheric structure and behaviour, instrument of observation, application of remote sensing to meteorological studies, weather elements and weather systems.

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**EASC2108 Structural geology (6 credits)**

The course covers the mechanical properties of rocks and how they are deformed, geological maps and their use in interpreting structure.

**EASC2109 Igneous and metamorphic petrology (6 credits)**

To provide a comprehensive coverage of the principles and techniques used in the study of igneous and metamorphic rocks and rock-forming processes.

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**EASC2112 Earth systems (6 credits)**

To provide students who have a fundamental background of Earth Sciences with a more in depth appreciation of the Earth System and the interfaces between its component parts, in order that they might appreciate how informed decisions can be made on the future exploitation and preservation of the planet. To provide a forum for discussion of global issues facing earth scientists.

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**EASC2113 Sedimentology (6 credits)**

The course deals with sedimentary rocks and processes, and facies models pertaining to various depositional environments.

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**EASC2124 Geological maps and air photographs (6 credits)**

This course is a hands-on field and class-based course that introduces basic geological field and mapping techniques and the use of geological equipment and air photographs as well as presenting an overview of the geology of Hong Kong.

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**EASC2125 Global tectonics (6 credits)**

This course is intended to provide students with an understanding of the driving forces of Earth processes and the global outcome of these processes through an examination of direct and indirect observations, the evolution of hypotheses, and critical thinking.

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**EASC2126 Mineralogy and geochemistry (6 credits)**

To provide the fundamentals and principles of geochemistry and mineralogy. It gives the basis for understanding the petrography of igneous, sedimentary and metamorphic rocks. To introduce geochemical principles, including trace elements and isotopes.

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**EASC2127 Global change: anthropogenic impact (6 credits)**

This course will explore the role of humans in global change and the environmental responses to such changes. It will also take a look at human evolution and migration from a paleoenvironmental perspective.

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**EASC2128 Earth-ocean-atmosphere interactions (6 credits)**

To examine the complex interactions between geosphere, hydrosphere and atmosphere.

**EASC2129 Physical oceanography (6 credits)**

To investigate oceans and their dynamics and the processes, which have shaped them. Ocean composition and movement, waves, tides, beaches, interactions with the atmosphere and human exploitation of the non-living resources. To demonstrate how various physical elements of the marine environment interrelate to help form the complex system we know as the world's oceans.

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**EASC2130 Earth observation and remote sensing (6 credits)**

This course will provide an introduction to the theory and techniques of remote sensing and GIS in Earth and Planetary Observation.

This course introduces the theory and techniques of remote sensing and their application to environmental analysis. Remote sensing deals with the acquisition of information using techniques that do not require actual contact with the object or area being observed. Examples of remotely sensed data include aerial photography, infrared thermometry, and passive microwave sensing.

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**EASC2131 A cool world: ice ages and climate change (6 credits)**

This course set out to provide students with an understanding of how dynamics Earth is and how it has changed over the past 2.5 million years.

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**EASC2201 Hydrogeology (6 credits)**

To study the role of ground water in subsurface geological process and its environmental and geotechnical importance.

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**EASC2301 Field camps (6 credits)**

The aims of a geological field camp are to provide 1) essential training and experience in geological mapping techniques and 2) opportunities to study at first-hand areas of particular geological interest and importance, especially outside Hong Kong.

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**EASC2307 Directed studies in earth sciences (6 credits)**

To enhance the student's knowledge of a particular topic and the student's self-directed learning and critical thinking skills.

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**EASC3132 Earth resources (6 credits)**

To provide students with knowledge about the classification of mineral deposits and their basic features; to understand the processes that lead to their formation; to gain hand on experience with mining procedures.

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**EASC3133 Applied geochemistry (6 credits)**

To present key concepts of geochemistry and their application to environmental and earth science problems.

**EASC3134 Regional geology (6 credits)**

To cover the tectonic evolution of mainland East Asia and SE Asia, with a specific focus on the geology of Hong Kong.

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**EASC3202 Soil and rock mechanics (6 credits)**

To provide a basic knowledge of soil and rock mechanics for those wishing to consider further studies on a career in engineering geology/geotechnics.

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**EASC3203 Engineering geology (6 credits)**

To present some of the concepts and skills of importance in the profession of Engineering Geology and illustrate their use by case histories.

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**EASC3302 Advanced topics in geosciences (6 credits)**

To provide students with insights into current issues in geosciences, and options to specialize in particular subject areas.

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**EASC3308 Earth sciences project (12 credits)**

To enhance the student's knowledge, ability and interest in advanced studies in the Earth Sciences by providing the student with an opportunity to be engaged in an advanced research project.

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**EASC3988 Earth sciences internship (6 credits)**

This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 120 hours of internship work either within the University or outside the University arranged by the School/Departments.

- (1) Within the university: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.
  - (2) Outside the university: The student will work in an external agency related to the major of study. The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.
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**Department of Mathematics****MATH0011 Numbers and patterns in nature and life (3 credits)**

To explore the underlying mathematical structure in various topics in life and environmental sciences. Students from all disciplines will gain appreciation of mathematics as a potent tool for investigating and understanding nature and life.

**MATH0201 Basic calculus (6 credits)**

To provide students with a basic background of calculus that can be applied in various disciplines, aiming at students not having done much mathematics beyond HKCEE mathematics. It can be followed by MATH1804 (University Mathematics A). Students with good grades in this course can also consider taking MATH1805 (University Mathematics B) or MATH1211 (Multivariable Calculus) as follow up.

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**MATH0211 Basic applicable mathematics (6 credits)**

This course aims at students not having done much mathematics beyond HKCEE mathematics, and provides them with a basic background of mathematics that is essential for concentrating in various disciplines which require moderate level mathematical tools. It can be followed by MATH1804 (University Mathematics A). Students with good grades in this course can also consider taking MATH1805 (University Mathematics B) or MATH1211 (Multivariable Calculus) as follow up.

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**MATH1001 Fundamental concepts of mathematics (6 credits)**

To provide students with solid background on fundamental concepts of mathematics and methods of mathematical proofs. Such concepts and methods are important for subsequent studies in all higher level courses in mathematics. This course can be followed by (or taken concurrently with) MATH1111, MATH1211 and other more advanced courses.

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**MATH1111 Linear algebra (6 credits)**

Linear algebra has wide applications to diverse areas in natural science, engineering, management, and social science. This course provides students an introduction to the theory and techniques of linear algebra. It is a foundation course for all mathematics students, to be followed by other more advanced courses in mathematics such as MATH2301, MATH 2303.

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**MATH1211 Multivariable calculus (6 credits)**

Students of this course will learn the theory of multivariable calculus in a rather rigorous manner, and learn how to apply the theory to solve practical problems. This is a foundation course for all mathematics students, to be followed by other more advanced courses in mathematics.

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**MATH1611 Mathematical laboratory and modeling (6 credits)**

This course introduces a powerful and free computer software Scilab for scientific research. The programming language will be taught via a number of mathematical models in Physics, Chemistry, Biology, Ecology, Statistics and Management. Some basic and important techniques in Calculus and Linear Algebra will also be covered.

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**MATH1804 University mathematics A (6 credits)**

To provide students with a more solid background of calculus of one variable and an introduction to calculus of several variables and matrices that can be applied in various disciplines, aiming at students having taken an elementary calculus course. It can be followed by MATH1211 (Multivariable Calculus).

**MATH1805 University mathematics B (6 credits)**

To provide students with a solid background of calculus of several variables and matrix algebra and an introduction to ordinary differential equations that can be applied in various disciplines. This course can be followed by other more advanced courses in mathematics.

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**MATH1813 Mathematics methods for actuarial science (6 credits)**

To provide students with a background of calculus of several variables and matrix algebra and an introduction to ordinary differential equations that can be applied in actuarial science.

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**MATH2001 Development of mathematical ideas (6 credits)**

- (1) To acquaint the students with the origin and growth of basic mathematical concepts.
  - (2) To assist the students to gain a deeper insight and broader view of mathematics as a discipline and human endeavour.
  - (3) To provide the students with an opportunity to write on and talk about mathematics, and to engage in independent study.
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**MATH2002 Mathematics seminar (6 credits)**

This is a seminar style course intended for those who have very strong interests and good ability in mathematics. Students will be given book chapters and elementary research articles for private study and then make presentations in front of the whole class. Individual meetings with the instructors will be arranged prior to their presentations. Active participation in all the discussions is expected. The aim of the course is to let students learn how to initiate self/independent study in mathematics.

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**MATH2201 Introduction to mathematical analysis (6 credits)**

To introduce students to the basic ideas and techniques of mathematical analysis.

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**MATH2301 Algebra I (6 credits)**

This course aims to present those fundamental topics and techniques of algebra that are finding wide applications in mathematics and the applied sciences. It is complete in itself, and may also be followed by Algebra II and Topics in Applied Discrete Mathematics.

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**MATH2303 Matrix theory and its applications (6 credits)**

Matrix theory has a close connection with other mathematical subjects such as linear algebra, functional analysis, and combinatorics. It also plays an important role in the development of many subjects in science, engineering, and social sciences. In this course, students will be taught the fundamentals of matrix analysis and its application to various kinds of practical problems. Mathematical software will be used in the course, so that students can learn how to use the computer to solve matrix problems.

**MATH2304 Introduction to number theory (6 credits)**

This course introduces students to the basic knowledge and techniques in number theory. It is hoped that it will stimulate interested students to delve into the rich literature associated with this historically important subject of mathematics.

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**MATH2401 Analysis I (6 credits)**

This course extends to more general situations some of the results covered in the first year Mathematics courses, and introduces some further basic concepts which are essential for more advanced studies in mathematical analysis.

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**MATH2402 Analysis II (6 credits)**

This course gives a modern treatment of calculus in several variables which is essential for more advanced studies in analysis.

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**MATH2403 Functions of a complex variable (6 credits)**

This course is indispensable for studies in higher mathematical analysis and the more theoretical aspects of physics. In this course, the students are introduced to the fundamental concepts and properties of analytic functions and are shown how to look at analyticity from different points of view. At the same time, the techniques of solving problems without losing sight of the geometric picture are emphasized.

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**MATH2405 Differential equations (6 credits)**

The standard topics in the wide field of differential equations included in this course are of importance to students of mathematics and physical sciences as well. Our emphasis is on principles rather than routine calculations and our approach is a compromise between diversity and depth.

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**MATH2408 Computational methods and differential equations with applications (6 credits)**

This course covers topics in the fields of differential equations and numerical analysis which are of importance to sciences students. The emphasis is practical applications of basic principles.

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**MATH2600 Discrete mathematics (6 credits)**

To introduce students to the basic ideas and techniques of discrete mathematics.

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**MATH2601 Numerical analysis (6 credits)**

This course covers both the theoretical and practical aspects of Numerical Analysis. Emphasis will be on basic principles and practical methods of solution, using high speed computers.

**MATH2603 Probability theory (6 credits)**

The emphasis of this course will be on probability models and their applications. The primary aim is to elucidate the fundamental principles of probability theory through examples and to develop the ability of the students to apply what they have learned from this course to widely divergent concrete problems.

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**MATH2901 Operations research I (6 credits)**

The objective is to provide a fundamental account of the basic results and techniques of Linear Programming and its related topics in Operations Research. There is an equal emphasis on all three aspects of understanding, algorithms and applications. The course serves, together with a course on network models, as essential concept and background for more advanced studies in Operations Research.

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**MATH2904 Introduction to optimization (6 credits)**

This course introduces students to the theory and techniques of optimization, aiming at preparing them for further studies in Operations Research, Mathematical Economics and related subject areas.

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**MATH2905 Queuing theory and simulation (6 credits)**

This course introduces students to the models and theory of queueing system, as well as the technique of simulation as a practical tool of analysis.

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**MATH2906 Financial calculus (6 credits)**

This course gives an elementary treatment of the modeling of financial derivatives, asset pricing and market risks from an applied mathematician's viewpoint. Stochastic calculus and numerical methods will be introduced.

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**MATH2907 Numerical methods for financial calculus (6 credits)**

This course is aimed at providing effective numerical methods as well as their theoretical aspect for solving problems arisen from financial derivatives and asset pricing.

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**MATH2911 Game theory and strategy (6 credits)**

Game theory is the logical analysis of situations of conflict and cooperation. This course will introduce the students to the basic ideas and techniques of mathematical game theory in an interdisciplinary context.

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**MATH2999 Directed studies in mathematics (6 credits)**

This course is designed for a student who would like to take an early experience on independent study. It provides the student with the opportunity to do a small mathematics project close to research in nature independently.

**MATH3000 Mathematics project (6 credits)**

The object is to provide a student with an opportunity to formulate and investigate, in depth, a problem of practical interest and/or have a foretaste of mathematical research. The work, to be done on an individual basis, is considered a highly desirable part of the training of a mathematician.

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**MATH3302 Algebra II (6 credits)**

This course is an extension of Algebra I and goes deeper into the various topics treated in that course. Together, the two courses are complete in themselves, and may be followed by Topics in Algebra and Topics in Applied Discrete Mathematics.

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**MATH3404 Functional analysis (6 credits)**

This course introduces students to the basic knowledge of linear functional analysis, an important branch of modern analysis.

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**MATH3406 Introduction to partial differential equations (6 credits)**

This course introduces students to the basic techniques for solving partial differential equations as well as the underlying theories.

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**MATH3501 Geometry (6 credits)**

As geometric forms often appear in nature, the study of geometry helps us to understand better the universe in which we live. Moreover, geometry has much intrinsic beauty and the study of it is an excellent training in intuitive thinking. In this course we study the differential geometry of curves and surfaces in 3-space. In the study of regular surfaces in 3-space we exhibit geometric notions that are definable in terms of metrical properties of these surfaces alone, leading to the intrinsic geometry of surfaces.

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**MATH3511 Introduction to differentiable manifolds (6 credits)**

Differentiable manifolds are fundamental objects of study in many subject areas in Mathematics such as Differential Topology, Differential Geometry, Lie Theory and Complex Geometry. The course aims at introducing students to the notion of differentiable manifolds and basic concepts and tools for their study, such as differential forms, exterior differentiation and integration; vector fields, distributions, and integrability; and covariant differentiation through affine connections. The course also aims at presenting a variety of concrete examples of differentiable manifolds of importance to fields of further study such as those mentioned in the above. Especially, it introduces Lie groups through the use of matrix groups.

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**MATH3602 Scientific computing (6 credits)**

This course introduces mathematical theories and computational techniques for solving various kinds of matrix computation problems that are often encountered in scientific or industrial applications.

**MATH3902 Operations research II (6 credits)**

The objective is to provide a fundamental account of the basic results and techniques of Integer Programming (IP), Dynamic Programming (DP) and Markov Decision Processes (MDP) in Operations Research. There is emphasis on aspects of algorithms as well as applications. The course serves, together with courses on linear programming and network models, to provide essential optimization concept and algorithms for more advanced studies in Operations Research.

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**MATH3903 Network models in operations research (6 credits)**

The objective is to provide a fundamental account of the basic results and techniques of network models in Operations Research. There is an equal emphasis on all three aspects of understanding, algorithms and applications. The course serves, together with a course on linear programming, to provide essential concept and background for more advanced studies in Operations Research.

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**MATH3988 Mathematics internship (6 credits)**

This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 120 hours of internship work either within the University or outside the University arranged by the School/Departments.

- (1) Within the university: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.
  - (2) Outside the university: The student will work in an external agency related to the major of study. The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.
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**MATH3999 Mathematics project (12 credits)**

The object is to provide a student with an opportunity to formulate and investigate, in depth, a problem of practical interest and/or have a foretaste of mathematical research. The work, to be done on an individual basis, is considered a highly desirable part of the training of a mathematician.

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**MATH6501 Topics in algebra (6 credits)**

To provide students specializing in mathematics with the opportunity to study some topics in algebra in greater depth.

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**MATH6502 Topics in applied discrete mathematics (6 credits)**

To provide students with the opportunity to study some further topics in applied discrete mathematics.

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**MATH6503 Topics in mathematical programming and optimization (6 credits)**

A study in greater depth of some special topics in mathematical programming or optimization. It is mainly intended for students in Operations Research or related subject areas.

**MATH6504 Geometric topology (6 credits)**

This course gives a geometric introduction to some of the methods of algebraic topology. The emphasis throughout will be on the geometric motivations and applications of the theory.

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**Department of Physics****PHYS0001 Nature of the universe I: introduction to observational astronomy and the solar system (3 credits)**

This general education course is designed as an elective for students in all disciplines and all years. No prior knowledge in astronomy, physics, and higher mathematics is required.

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**PHYS0002 Nature of the universe II: stars, galaxies and cosmology for beginners (3 credits)**

This general education course is designed as an elective for students in all disciplines and all years. It focuses on the theoretical aspect of astronomy. No prior knowledge in astronomy, physics, or higher mathematics is required.

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**PHYS0114 Fundamental physics I (6 credits)**

This course, together with *Fundamental Physics II*, aims at providing students who are interested in physics, which is a first course in general physics. It covers the essential knowledge of physics on various topics (with minimum descriptions in integral and differential calculus).

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**PHYS0115 Fundamental physics II (6 credits)**

This course, together with *Fundamental Physics I*, aims at providing students who are interested in physics, which is a first course in general physics. It covers the essential knowledge of physics various topics (with minimum descriptions in integral and differential calculus).

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**PHYS0605 Nuclear energy and the environment (3 credits)**

To introduce the use of nuclear power and its impact to our environment; and to arouse an awareness of the safety use of nuclear energy.

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**PHYS0607 Revealing the magic in everyday life (3 credits)**

The course is designed for students who are curious about science in daily life. Students taking this course should have basic training in physics in the certificate level. The course covers the working principles and mechanisms of the things and phenomena around us. Logical thinking and appreciation of science are emphasized with mathematics kept at a minimum. Students are trained to develop scientific intuition and to appreciate that many things in everyday life are not purely magical but can also be predictable.

**PHYS0608 Kitchen science: kitchen mysteries revealed (3 credits)**

The course aims to develop students' critical thinking skills and broaden their basic science knowledge by exploring the science behind the common daily life activity of cooking. Basic physical and chemical concepts necessary to understand food preparation, as illustrated by recipes from cuisines from different regions, will be introduced.

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**PHYS0610 Weather today (3 credits)**

To introduce the phenomena and mechanisms of the atmosphere, including typhoons, tornadoes, El Nino and La Nina. This course is designed to be an elementary introduction of weather and climate. It is suitable for any students with interest in the subject.

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**PHYS0611 Magic of flight (3 credits)**

The course aims to provide introduction of the basic principles of flight and encourage integration of knowledge from different disciplines by comparing the biological and technological achievements of flight.

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**PHYS0625 Physics by Inquiry (6 credits)**

This course aims at providing students a solid background and knowledge in physics as well as its connection with our daily life phenomena and activities.

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**PHYS0628 Renewable energy (3 credits)**

In this course, the students will learn about principles of operation of different energy sources, such as solar, biomass, wind, geothermal, hydroelectric, and tidal energy, as well as fuel cells. By discussing different renewable energy sources, their advantages and disadvantages, factors affecting their wide implementation and their impact on environment, the course aims to foster interest in science and critical thinking, as well as improved understanding and informed decision making concerning the energy crisis and sustainable development.

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**PHYS1303 Special relativity I (3 credits)**

This course is designed as an elective for students in all disciplines and all years with science background.

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**PHYS1315 Methods in physics I (6 credits)**

This course provides students with experience in using mathematical tools and techniques to solve problems in physics. It is complete in itself, or may also be followed by Methods in Physics II.

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**PHYS1316 Methods in physics II (6 credits)**

This course provides students with experience in using mathematical tools and techniques to solve problems in physics. It is complete in itself, or may also be taken after Methods in Physics I.

**PHYS1413    Physics in a nutshell (6 credits)**

This course covers the essential topics in physics in one semester. It serves as a first course to students who are interested in physics or those who are planning to take physics as a minor. The conceptual ideas are emphasized and the mathematical treatment is moderate.

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**PHYS1414    General physics I (6 credits)**

This course is the first of a two-course series designed to offer a comprehensive training of physics covering all the major building blocks of the physical laws governing nature, including mechanics, oscillation and waves, thermal physics, electricity and magnetism, optics, and atomic physics.

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**PHYS1415    General physics II (6 credits)**

This course is the second of a two-course series designed to offer a comprehensive training of physics covering all the major building blocks of the physical laws governing nature, including mechanics, oscillation and waves, thermal physics, electricity and magnetism, optics, and atomic physics.

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**PHYS1417    Basic physics (6 credits)**

This course covers the essential topics in physics in one semester. It serves as a first course to students who are interested in physics or those who are planning to take physics as a minor. The conceptual ideas are emphasized and the mathematical treatment is moderate.

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**PHYS2021    The physical universe (6 credits)**

To appreciate the underlying physical principles of astronomy. This course is designed as an elective for second or third year students with some basic science knowledge.

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**PHYS2022    Observational astronomy (6 credits)**

To introduce the students to the techniques and methods of contemporary astronomy, with emphasis on the data reduction and analysis.

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**PHYS2039    Principles of astronomy (6 credits)**

This course is designed to discuss the physics principles necessary to understand more difficult topics in astronomy. Students are assumed to only have basic knowledge in physics. After taking the course, students should be able to manage other astronomy courses offered by the Department.

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**PHYS2221    Introductory solid state physics (6 credits)**

To provide a broad introduction to modern theories of the behaviour and properties of the solid state of matter. It is designed as a self-contained course which at the same time will serve as a basis for more advanced courses and projects in solid state physics.

**PHYS2222 Waves and optics (6 credits)**

To give a coherent introduction to the development of modern physical optics, with particular attention to the wave properties and quantum theories of light.

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**PHYS2227 Laser & spectroscopy (6 credits)**

The aim of this course is to provide a broad introduction to modern laser spectroscopic techniques and selected applications.

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**PHYS2229 Thin film physics (6 credits)**

This course is intended for the advanced students, covering the basic theories and techniques of physical deposition processes and topics related to a very rapidly growing area - thin film application in material science.

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**PHYS2235 Physics of nanomaterials (6 credits)**

Physics of Nanomaterials is a course for advanced undergraduate and beginning postgraduate students at HKU. The course is designed to introduce important concepts such as quantum size effect and fundamental physics of nanomaterials.

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**PHYS2236 Device physics (6 credits)**

This course aims at providing introduction to semiconductor electronic and optoelectronic devices.

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**PHYS2321 Introductory electromagnetism (6 credits)**

Introduces the physical concepts required for an understanding of electricity and magnetism. A foundation course for students majoring in physics.

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**PHYS2322 Statistical mechanics and thermodynamics (6 credits)**

An introduction to Statistical Mechanics and elementary Thermodynamics with reference to related phenomena in Physics. This course is taught as a basic and essential subject for students majoring in Physics.

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**PHYS2323 Introductory quantum mechanics (6 credits)**

This course aims at a rigorous introduction to the concepts and methods of non-relativistic quantum mechanics. It is a prerequisite for several advanced physics courses.

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**PHYS2325 Theoretical physics (6 credits)**

The aim of this course is to provide students with the conceptual skills and analytical tools necessary for solving real problems in all major areas of physics.

**PHYS2523 Directed studies in physics (6 credits)**

This course is designed for second year students who would like to take an early experience on research. It provides students with the opportunity to do small physics projects by themselves, either theoretical or experimental. These projects are close to research in nature and, usually, without lectures.

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**PHYS2626 Introductory classical mechanics (6 credits)**

This course aims at providing students a solid foundation in classical Newtonian mechanics with rigorous mathematical treatments. Students are expected to have good working knowledge of calculus and vectors.

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**PHYS2627 Introductory quantum physics (6 credits)**

This course is designed to provide students with a comprehensive introduction to the concepts and ideas related to study of physics in the microscopic scale — which revolutionize our understanding of the properties of light and matter in the universe.

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**PHYS3031 Astrophysics (6 credits)**

To introduce students to current theories in astrophysics. It may be taken as a self-contained course or as background to research work in astrophysics.

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**PHYS3033 General relativity (6 credits)**

To introduce students to the field of general relativity and to provide conceptual skills and analytical tools necessary for astrophysical and cosmological applications of the theory

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**PHYS3034 Cosmology (6 credits)**

The aim of the course is to offer an advanced introduction to cosmology, to familiarize students with mathematical formulation used to model the evolution and dynamics of the universe, and to provide an up to date discussion of the big bang theory and structure and galaxy formation.

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**PHYS3035 Stellar atmospheres (6 credits)**

This course is designed to provide students with the basic understanding of the interaction between radiation and matter, and the physics required to interpret modern astronomical observations.

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**PHYS3036 Interstellar medium (6 credits)**

This course is designed to provide students with the fundamentals of gas dynamics, molecular and solid-state physics with applications to the structure of the interstellar medium.

**PHYS3037 Selected topics in astrophysics (6 credits)**

To introduce students some current topics in astrophysics. It may be taken as a self-contained course or as background to research work in astrophysics.

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**PHYS3038 Planetary science (6 credits)**

This course is designed to provide students with a modern understanding of the structure of the solar system and their effects on the evolution of the Earth.

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**PHYS3040 Stellar physics (6 credits)**

This course introduces the basic theory of stellar structure and evolution. It follows a vigorous mathematical treatment that stress on the underlying physical processes. Knowledge in quantum mechanics and statistical mechanics will be advantageous.

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**PHYS3231 Computational physics (6 credits)**

The aim of the course is to show how the power of computers enables a computational approach to solving physics problems to be adopted, which is distinct from, and complimentary to, traditional experimental and theoretical approaches. The material covered will be found useful in any project or problem solving work that contains a strong computational or data analysis element. This course aims to give the student a thorough grounding in the main computational techniques used in modern physics. It is particularly important in this course that the students learn by doing. The course is therefore designed such that a significant fraction of the students' time is spent actually programming specific physical problems rather than learning abstract techniques.

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**PHYS3321 Nuclear and particle physics (6 credits)**

The aim of the course is to describe nuclear structure in an elementary way as a field of application of quantum mechanics and electromagnetism, and to study the fundamental interactions of subnuclear particles.

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**PHYS3331 Electromagnetic field theory (6 credits)**

We study the electromagnetic properties of simple physical systems, and the relations between electromagnetism and special relativity.

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**PHYS3332 Quantum mechanics (6 credits)**

Introduces more advanced concepts of quantum mechanics. Together with PHYS2323, these will provide the basic knowledge of quantum mechanics to an undergraduate student.

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**PHYS3336 Classical mechanics (6 credits)**

The aim of this course is to introduce general methods of studying the dynamics of particle systems, through which students can acquire experience in using mathematical techniques for solving practical problems.

**PHYS3431    Advanced experimental physics (6 credits)**

This course aims to introduce the student to some of the more advanced techniques in modern physics, while at the same time illustrating some of the important experiments discussed in course text books.

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**PHYS3531    Physics project (12 credits)**

This course is designed for students who are considering doing research in the future. It provides students with the opportunity to study special physics projects by themselves, either theoretical or experimental. These projects are close to research in nature and are designed for prospective research students.

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**PHYS3988    Physics internship (6 credits)**

This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 120 hours of internship work either within the University or outside the University arranged by the School/Departments.

- (1) Within the university: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.
  - (2) Outside the university: The student will work in an external agency related to the major of study. The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.
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**PHYS6501    Computer controlled measurements in physics (6 credits)**

The aim of this course is to provide students with practical skills for designing and operating computer controlled measurement systems. In addition to measurement software development skills, the students will learn principles of operation of commonly used components in measurement systems for experimental condensed matter research.

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**PHYS6502    Advanced statistical mechanics (6 credits)**

This course intends to introduce some topics in the field of equilibrium statistical physics.

Prerequisite:    PHYS2321 and PHYS2322 and PHYS2323

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**PHYS6503    Advanced electromagnetic field theory (6 credits)**

This is a standard course in electromagnetic field theory which provides essential background for postgraduate and advanced undergraduate students intend to do research in physics.

Prerequisite:    PHYS2321 and PHYS3331

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**PHYS6504    Advanced quantum mechanics (6 credits)**

This course introduces postgraduate and advanced undergraduate students to advanced techniques in quantum mechanics and their applications to selected topics in physics.

Prerequisite:    PHYS2323 and PHYS3332

**PHYS6505 Solid state physics (6 credits)**

To provide students with an understanding of more advanced topics in selected areas of solid state physics.

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**Department of Statistics and Actuarial Science****STAT0301 Elementary statistical methods (6 credits)**

Research findings are often fully or partly supported by data. Data, which are often concerned with situations involving variability and uncertainty, are collected from an experiment or a survey. They are used to estimate the true value of a certain quantity or to test the acceptability of a certain new hypothesis. Valid methods of analysing the data are thus essential to any successful investigation. The course presents the fundamentals of statistical methods widely used by researchers. There is no demand of sophisticated technical mathematics.

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**STAT0302 Business statistics (6 credits)**

The discipline of statistics is concerned with situations involving uncertainty and variability. Variability greatly affects the interpretation of data. Thus statistics forms an important descriptive and analytical tool. This elementary course, which is taught without any technical mathematics, presents many standard situations of data interpretation with emphases on business examples. The statistical tests for these situations are presented. Microsoft Excel might be used to carry out some statistical analysis.

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**STAT1301 Probability & statistics I (6 credits)**

The discipline of statistics is concerned with situations in which uncertainty and variability play an essential role and forms an important descriptive and analytical tool in many practical problems. Against a background of motivating problems this course develops relevant probability models for the description of such uncertainty and variability.

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**STAT1302 Probability & statistics II (6 credits)**

This course builds on STAT1301, introducing further the concepts and methods of statistics. Emphasis is on the two major areas of statistical analysis: estimation and hypothesis testing. Through the disciplines of statistical modelling, inference and decision making, students will be equipped with both quantitative skills and qualitative perceptions essential for making rigorous statistical analysis of real-life data.

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**STAT1303 Data management (6 credits)**

This course is designed for students who want to learn a statistical software (SAS or SPSS) for data management and elementary data analysis. This course focuses on using SAS or SPSS to manage data set input and output, work with different data types, manipulate and transform data, perform random sampling and descriptive data analysis, and create summary reports.

**STAT1304     Design and analysis of sample surveys (6 credits)**

The course focuses on the design, implementation and analysis of sample surveys. The use of sample surveys as a means to collect raw data for the compilation of statistics has become very popular both in the public and private sectors. The conducting of sample surveys involves a range of activities, from overall survey design, the design of sampling schemes, the design of questionnaires, the planning of fieldwork and logistical matters and the setting of analysis schedules all the way to the actual implementation of the surveys. There are many theoretical and practical aspects to be learned. In particular, survey sampling is an area which involves a lot of important statistical concepts and its proper and skilful use determines to a large extent the validity and reliability of the findings and the efficiency of the surveys. Similarly, analysis of the data is another very important area and has to be integrated with the entire survey process rather than being taken in isolation.

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**STAT1306     Introductory statistics (6 credits)**

The discipline of statistics is concerned with situations involving uncertainty and variability. The interpretation of data needs special techniques when variability plays a role, as it usually does. Thus statistics forms an important descriptive and analytical tool of many scientific disciplines. Candidates with a mathematical background will find this course suitable, because the language of mathematics allows the subject of statistics to be presented with economy and clarity.

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**STAT1323     Introduction to demographic and socio-economics statistics (6 credits)**

The course is intended as an introduction to the basic methods and data on demography and social & economic statistics. The study of demography covers the composition and development of a population through the processes of fertility, mortality, marriage and migration. Social and economic statistics provide quantitative information on all major areas of citizens' lives, such as economic and social development, employment, prices, housing condition, health, education and social welfare. Intended learning outcomes are the acquisition of 1) basic knowledge in demographic methods and statistics 2) an understanding of methods of social and economic statistics, with emphasis on those compiled by government agencies and 3) skills in the statistical description of a territory and their application to planning, public policy-making and commercial endeavours. The course introduces major statistical indicators; principles in data collection, quality control and best practices in data dissemination as well as the pertinent statistical techniques.

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**STAT1801     Probability and statistics: foundations of actuarial science (6 credits)**

The purpose of this course is to develop knowledge of the fundamental tools in probability and statistics for quantitatively assessing risk. Applications of these tools to actuarial science problems will be emphasized. Students will have a thorough command of probability topics and the supporting calculations.

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**STAT1802     Financial mathematics (6 credits)**

This course introduces the fundamental concepts of financial mathematics which plays an important role in the development of basic actuarial techniques. Practical applications of these concepts are also covered.

**STAT2301     Linear statistical analysis (6 credits)**

The analysis of variability is mainly concerned with locating the sources of the variability. Many statistical techniques investigate these sources through the use of 'linear' models. This course presents the theory and practice of these models.

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**STAT2302     Statistical inference (6 credits)**

This course covers the advanced theory of point estimation, interval estimation and hypothesis testing. Using a mathematically-oriented approach, the course provides a solid and rigorous treatment of inferential problems, statistical methodologies and the underlying concepts and theory. It is suitable in particular for students intending to further their studies or to develop a career in statistical research.

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**STAT2303     Probability modelling (6 credits)**

This is an introductory course in probability modelling. A range of important topics in stochastic processes will be discussed.

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**STAT2304     Design and analysis of experiments (6 credits)**

In this course the basic theory of experimental design is introduced. Basic principles and guidelines for designing experiments will be introduced. Analysis for experiments with a single factor, Randomised block, Latin squares and related designs will be covered. The notions of crossed and nested factorial structure, balanced incomplete factorial experiments and fixed/random effects will be discussed.

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**STAT2305     Quality control and management (6 credits)**

The successful control of quality in production is a matter of primary importance to a company's prosperity and good-will. This course provides an overview of quality compromise which involves both the producer and the consumer. It presents a variety of statistical solutions including control charts, acceptance sampling plans, sequential sampling procedures, analysis of measurement errors, reliability, and life-testing. Contemporary quality management systems such as total quality control, quality control circle, zero defects, six-sigma, and ISO-9000 will be introduced. The student is brought to the frontier of today's quality control and management ideas.

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**STAT2306     Business logistics (6 credits)**

Originally, the word 'logistics' described the strategic aspects involved in moving and supplying armies and navies. Usage grew to include games of strategy, such as chess. Modern business corporations are increasingly using logistics as a management tool, for example, in capital budgeting problems, production planning, scheduling, transportation or in deciding a location for a new factory. This course addresses the business applications of logistics.

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**STAT2307     Statistics in clinical medicine and bio-medical research (6 credits)**

In clinical medicine doctors observe features (such as blood pressure, hormone level, presence/absence of a symptom, degree of infection, etc.) which are subject to natural variation between individual patients and between groups of patients with different disease types. This variability motivates the application of statistical methodology to the clinical observational and decision-making process. Part of the course deals with these applications.

The other part deals with statistical problems which come from biological and medical research, for example the controlled clinical drug trial. No knowledge in biology or medicine is assumed; the course provides all of the necessary bio-medical background when the statistical problems are introduced.

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**STAT2308     Statistical genetics (6 credits)**

This course covers background on genetics, Mendelian Genetics; Hardy-Weinberg equilibrium; linkage equilibrium; exact test; likelihood ratio test; chi-square test; population structure; linkage analysis; non-parametric linkage analysis; association studies; forensic genetics; relatedness; kinship analysis; mixed samples.

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**STAT2309     The statistics of investment risk (6 credits)**

Most investments involve some risk. The decision to invest or not is usually made against a background of uncertainty. Whilst prediction of the future is difficult, there are statistical modelling techniques which provide a rational framework for investment decisions, particularly those relating to stock markets and the markets for interest rates, commodities and currencies. Building upon research, both in Hong Kong and abroad, this course presents the prevailing statistical theories for investment decisions in these vital markets. Particular issues include the concept of an efficient market, portfolio construction and analysis, asset pricing, portfolio performance and management, and behavioural finance.

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**STAT2310     Risk management and insurance (6 credits)**

The course introduces the statistical, financial and legal principles underlying the techniques for managing the insurable risks faced by organizations and individuals. It is aimed at students who have minimal background in quantitative methods and is not available to students majoring in Actuarial Science. The course emphasizes basic risk management and financial planning, and students will be able to apply these concepts immediately to their own lives.

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**STAT2311     Computer-aided data analysis (6 credits)**

A wide range of statistical analyses and methods are presented using data sets generated from social sciences research and scientific studies. These analyses deal with designed experiments in the laboratory or field-work setting together with data from less-rigorously planned observational studies. Measuring uncertainty, describing patterns of variability, and describing the inter-relationship between several variables are therefore essential aspects of social science and scientific investigations. These aspects require a good understanding of statistics. This computer-oriented but non-mathematical course develops the important concepts and methods of statistics. Although no knowledge of a programming language is required, the course makes extensive use of computers. This is made possible by high-quality, but user friendly statistical software like JMP or SPSS.

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**STAT2312     Data mining (6 credits)**

With an explosion in information technology in the past decade, vast amounts of data appear in a variety of fields such as finance, marketing research, customer relations management, medicine and healthcare. The challenge of understanding these data with the aim of creating new knowledge and finding new relationships among data attributes has led to the innovative usage of statistical methodologies and development of new ones. In this process, a new area called data mining is spawned. This course provides a comprehensive and practical coverage of essential data mining concepts and statistical models for data mining.

**STAT2313     Marketing engineering (6 credits)**

This course is designed to provide an overview and practical application of trends, technology and methodology used in the marketing survey process including problem formulation, survey design, data collection and analysis, and report writing. Special emphasis will be put on statistical techniques particularly for analysing marketing data including market segmentation, market response models, consumer preference analysis and conjoint analysis. Students will analyse a variety of marketing case studies.

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**STAT2314     Business forecasting (6 credits)**

In daily business operations, forecasts are routinely required on different aspects of the economy, the market and individual companies. Numerous statistical techniques have been developed in the past decades to provide forecasts for the business decision-maker. This course considers a wide range of such techniques that have proven useful to practitioners. The course will involve the use of computer software, EXCEL, in the teaching process.

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**STAT2315     Practical mathematics for investment (6 credits)**

The main focus of this course will be on financial mathematics of compound interest and financial derivatives. Introduction to risk management and practical applications of the actuarial functions are also considered.

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**STAT2318     Directed studies in statistics (6 credits)**

To enhance the student's knowledge of a particular topic and the student's self-directed learning and critical thinking skills.

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**STAT2320     Risk management and Basel II in banking and finance (6 credits)**

The course provides a comprehensive knowledge and in-depth understanding of risk management in the banking and finance industry, particularly for credit, market and operational risks and their treatments under the current Basel II framework. It covers a wide range of issues, including the importance of risk management; risk nature and types; design and establishment of risk management framework; the importance of people and corporate culture; the complete risk measurement cycle; measurement and management of credit, market and operational risks; Basel II and its capital treatments for credit, market and operation risks; key recent developments (e.g. Know-Your-Customers, Anti-Money laundering, Sarbanes-Oxley) and critical issues; the importance of business continuity, design and implementation of a business continuity plan. Only minimal background in quantitative methods will be required.

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**STAT2801     Life contingencies (6 credits)**

The major objectives of this course are to integrate life contingencies into a full probabilistic framework and to demonstrate the wide variety of constructs which are then possible to build from basic models at the foundation of actuarial science. The time-until-death random variable will be the basic building block by which models for life insurances, designed to reduce the financial impact of the random event of untimely death, will be developed. Techniques for calculation benefit premiums and benefit reserves of various types of life annuity and insurance will be discussed.

**STAT2805      Credibility theory and loss distributions (6 credits)**

Credibility is an example of a statistical estimate. The idea of credibility is very useful in premium calculation. Insurance loss varies according to the business nature, what distribution should be used to fit a particular loss is both of theoretical interest and practical importance. This course covers important actuarial and statistical methods.

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**STAT2807      Corporate finance for actuarial science (6 credits)**

This course is designed for actuarial science students to receive VEE-Corporate Finance from Society of Actuaries. The objective of this course is to introduce students to the fundamental principles of corporate finance. The course will provide students with a systematic framework within which to evaluate investment and financing decisions for corporations.

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**STAT2812      Financial economics I (6 credits)**

This course is a basic course on the derivative market. The course covers discrete-time models, including volatility estimation, and Black-Scholes formula and its variations. The course also includes some basic risk management ideas and methods. This course and STAT3812 will cover all the concepts, principles and techniques needed for SoA Exam MFE.

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**STAT3301      Time-series analysis (6 credits)**

A time series consists of a set of observations on a random variable taken over time. Time series arise naturally in climatology, economics, environment studies, finance and many other disciplines. The observations in a time series are usually correlated; the course establishes a framework to discuss this. This course distinguishes different type of time series, investigates various representations for the processes and studies the relative merits of different forecasting procedures. Students will analyse real time-series data on the computer.

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**STAT3302      Multivariate data analysis (6 credits)**

In many designed experiments or observational studies the researchers are dealing with multivariate data, where each observation is a set of measurements taken on the same individual. These measurements are often correlated. The correlation prevents the use of univariate statistics to draw inferences. This course develops the statistical methods for analysing multivariate data through examples in various fields of application and hands-on experience with the statistical software SAS.

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**STAT3304      Computer-aided statistical modelling (6 credits)**

This is a computer-aided course of statistical modelling designed for the students who have taken STAT2301 Linear Statistical Analysis and like to see theory illustrated by practical computation. Numerous real data sets will be presented for modelling and analysis using statistical software, such as SAS, for gaining hands-on experience. The course also aims to develop skills of model selection and hypotheses formulation for testing, so that questions of interest can be properly formulated and answered. An important element deals with model review and improvement, when one's first attempt does not adequately fit the data. Modern computer software such as SAS makes this interactive approach easier.

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**STAT3322      Market risk analysis (6 credits)**

Financial risk management has experienced a revolution in the last decade thanks to the introduction of new methods for measuring risk, particularly Value-at-Risk (VaR). This course introduces modern risk management techniques covering the measurement of market risk using VaR models and financial time series models, and stress testing.

**STAT3306 Selected topics in statistics (6 credits)**

This course introduces some statistical concepts and methods which potential graduate students will find useful in preparing for work on a research degree in statistics. Focus is on applications of state-of-the-art statistical techniques and their underlying theory.

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**STAT3307 Project in statistics (6 credits)**

Each year a few projects suitable for Statistics or Actuarial Science major students will be offered. These projects, under the supervision of individual staff members involve the application of statistics and/or probability in interesting situations. They provide students with practical experience in approaching a real problem, in report writing and in oral presentation.

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**STAT3308 Financial engineering (6 credits)**

This course aims at demonstrating the practical use of financial derivative products to analyse various problems arisen in financial engineering. Emphases are on the various option pricing formulae, hedging techniques and interest rate models.

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**STAT3316 Advanced probability (6 credits)**

This course provides an introduction to measure theory and probability. The course will focus on some basic concepts in theoretical probability which are essential for students to read research papers in actuarial science, probability and statistics.

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**STAT3317 Computational statistics (6 credits)**

This course aims to give undergraduate and postgraduate students in statistics a background in modern computationally-intensive methods in statistics. It emphasizes the role of computation as a fundamental tool of discovery in data analysis, of statistical inference, and for development of statistical theory and methods.

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**STAT3319 Statistics project (6 credits)**

Each year a few projects suitable for Statistics or Actuarial Science major students will be offered. These projects, under the supervision of individual staff members involve the application of statistics and/or probability in interesting situations. They provide students with practical experience in approaching a real problem, in report writing and in oral presentation.

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**STAT3321 Credit risk analysis (6 credits)**

For a commercial bank, credit risk has always been the most significant. It is the risk of default on debt, swap, or other counterparty instruments. Credit risk may also result from a change in the value of an asset resulting from a change in the counterparty's creditworthiness. This course will introduce students to quantitative models for measuring and managing credit risk. It also aims to provide students with an understanding of the credit risk methodology used in the financial industry and the regulatory framework in which the credit risk models operate.

**STAT3810 Risk theory (6 credits)**

Risk theory is one of the main topics in actuarial science. Risk theory is the applications of statistical models and stochastic processes to insurance problems such as the premium calculation, policy modifications, ruin probability, etc.

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**STAT3811 Survival analysis (6 credits)**

This course is concerned with how models which predict the survival pattern of humans or other entities are established. This exercise is sometimes referred to as survival-model construction.

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**STAT3821 Financial economics II (6 credits)**

This course is an advanced course on the option pricing theory. The course covers Black-Scholes equation and stochastic calculus, and interest models. This course and STAT2812/STAT2806 will cover all the concepts, principles and techniques needed for SoA Exam MFE.

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**STAT3988 Statistics internship (6 credits)**

This course is offered to students majoring in Statistics or Risk Management who take on a minimum of 120 hours of internship work. Upon completion of the internship, each student is required to submit a written report and to give a presentation on his/her internship experience. The report should emphasize important working/educational experiences encountered by the student during his/her internship. In many situations, this would mean a report of the project(s) that the student has been involved in during his/her internship.

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**STAT3989 Essential IT skills for statistical and risk analysts (Non-credit bearing)**

This course is offered to students majoring in Statistics or Risk Management. It aims to enhance students' IT knowledge and skills which are not covered in the current curriculum but are essential for career development of statistical and risk analysts. The course may contain a variety of activities including computer hand-on workshops on VBA programming, MS-office and SPSS, group projects, and company visits.

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**Faculty-level courses****ENVS0001 Introduction to environmental science (6 credits)**

To provide students with an inter-disciplinary introduction to Environmental Science with key questions to highlight the interconnections between biological, geological and chemical processes.

To convey the basic science behind environmental interactions and place it within the context of human impacts and dependence on the natural world.

To better understand how humans interact, manage and sustain the environment within the context of our economies, governments and individual choices.

Upon completion, students should be able to explain and describe connections between the physical and biological stresses in the environment, discuss the impact of human society on the environment, explain the concept of environmental sustainability, give examples of how society can adapt behavior to achieve sustainability and compare different approaches to resolving specific problems presented in class.

**ENVS1002 Environmental life science (6 credits)**

This is an introductory course intended for students who wish to understand the fundamentals of environmental biology/life science. Here you will learn about the various biological/ecological principles and concepts of environmental science which are needed for critical discussion and evaluation of current global environmental issues including human population growth and climate change.

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**ENVS2003 Demographic principles in population and evolutionary biology (6 credits)**

Demography is what determines the interplay between populations and environments. The balance between births and deaths drives not just the dynamics of populations but also their evolution. This course aims to lay the foundations for thinking in terms of demography, focusing mainly on simpler demographic processes under constant conditions. It outlines not only how populations increase, decrease, stabilize, destabilize or die out - it explains how the life histories themselves can adapt, emphasizing the conceptual similarities and common demographic principles involved in both population dynamics and evolutionary change.

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**ENVS2004 Environment and society (6 credits)**

This course introduces students the interface between human society and the earth systems, and helps students examine the relationship between them. The course emphasizes knowledge and understanding of how human society has interacted with the natural environment in the past and present, and the environmental problems that have arisen from human exploitation of the natural environment. Students will explore ways human society can deal with environmental problems and develop sustainable economies.

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**ENVS2005 Environmental policies and planning (6 credits)**

This course will address questions such as: what is environmental policy?, why has environmental policy emerged as a special policy area?, what makes environmental policy different from other policy areas?, how is environmental policy made and planned and what tools are at the disposal of decision-makers. The issues associated with these questions will be examined in detail through case studies from Asia.

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**ENVS2006 Environmental radiation (6 credits)**

In this course, the students will learn about various kinds of radiations in the environment, the experimental techniques to detect them, the methods to trace them and to assess their hazard to the environment, and the ways to reduce the hazard in the events of nuclear accidents or incidents.

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**ENVS2007 Natural hazards and mitigation (6 credits)**

This course introduces students the mechanisms of major natural hazards including earthquake, storm and flood, landslide and tsunami. The teaching emphasizes the fundamental concepts: natural hazards are not entirely natural, and understanding the frequency and processes of these hazards is essential in developing prevention, protection and mitigation measures. With case studies, the course will help students explore the political, economical and engineering means of dealing with natural hazards.

**ENVS2008 Pollution (6 credits)**

To introduce students to the principles of chemical and biological processes of pollution development and the impacts of pollution on environmental health. The course provides the basics for advanced courses on environmental toxicology, environmental monitoring and testing, environmental impact assessment, biodiversity, waste treatment and technologies, and environmental remediation.

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**ENVS2009 Remediation (6 credits)**

To introduce students with the environmental fate information of different pollutants/contaminants in the environment.

To understand the technologies available for environmental remediation of pollutants in soils and water, and the characteristics of each techniques relevant to the pollutants of concern.

To learn the fundamental physical, chemical and biochemical reactions involved in the remediation process.

To obtain skills for critical analysis of the recent technological development and the proposed applications.

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**ENVS2010 Sustainable energy and environment (6 credits)**

In this course, the students will learn about sustainability and environmental impact of different energy technologies, including conventional energy sources as well as renewable and/or clean energy sources. The technological challenges, potential for future development, and environmental impacts (community, regional, and global) will be discussed.

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**ENVS2011 Directed studies in environmental science (6 credits)**

To enhance students' knowledge on a particular topic in environmental science and students' self-directed learning and critical thinking skills.

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**ENVS3012 Business, economics and the environment (6 credits)**

To introduce students to current debates and effective tools that highlight the role of the private sector in the delivery of sustainable development.

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**ENVS3013 Ecological demography in changing environments (6 credits)**

Environments are changing; in some cases rapidly and unpredictably. By studying the dynamic interplay between births and deaths, the modern science of biodemography gives us new ways to diagnose environmental problems and understand how populations respond and adapt under changing conditions. This course is designed for second and third year science students and will go beyond the simple case of demography under constant conditions. The course explicitly covers the more advanced treatment of population and evolutionary demography in fluctuating environments. The course will outline the principles of integrated population models, looking not just at how population size responds to environmental fluctuations, but at how rates of mortality and fertility change can adapt in different ages or different sections of the population, and at how this can contribute to unexpected dynamic properties.

**ENVS3014 Environmental risk assessment and management (6 credits)**

Environments Risks are not only associated with natural disasters (e.g. earthquake, tsunami, flooding and extreme thermal conditions), but also related to anthropogenic mishaps (e.g. releases of toxic chemicals to the environment and an explosion and fire at the Chernobyl nuclear power plant). This course will introduce how we can assess and manage environmental risks with an emphasis on those that associated with anthropogenic activities. Environmental risk assessments (ERAs) are useful scientific tools for determining the likelihood that human activities such as contaminant releases, either in the past, current, or future, pose an unacceptable risk to human health or the environment of concern. Currently ERAs are required under various regulations in many developed countries so as to help problem formulation, enable objective assessment and characterization of the environmental risk, support decision-making and risk management, and promote transparent and effective risk communication.

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**ENVS3015 Environmental science project (12 credits)**

To enhance students' knowledge and research skills in advanced level of environmental science.

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**ENVS3016 Environmental science in practice (6 credits)**

To provide students experiential learning experience in the field of environmental science. The course is primarily based on an array of relevant field studies covering four essential areas as shown below. Invited guest lectures delivered by environmental practitioners may be held.

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**ENVS3988 Environmental science internship (6 credits)**

To offer students the opportunities to gain work experience in applying knowledge and skills gained in the study of the major to the real work environment.

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**SCNC2005 Career development for science students (Non-credit bearing)**

The course is specially designed for second and third year Science students who wish to enhance their personal and career preparation skills through a variety of activities including lectures, practical workshops, small group discussion, role play and company visits, all of which aim to facilitate students in making informed career choices, provide training to enhance communication, presentation, time management skills, and enhance the students' employability.

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**Language courses offered to BSc students****School of Chinese****CSCI0001 Practical Chinese language course for science students (3 credits)**

- (1) Practical Chinese Writing Skills
  - (a) Classical and modern Chinese
  - (b) The Chinese language: characteristics and usage
  - (c) Basic grammar of modern Chinese
- (2) Chinese Characters
  - (a) Traditional characters
  - (b) Simplified characters
  - (c) Variant forms

- (3) Letter-writing
    - (a) Business letter writing techniques
    - (b) Official letter writing techniques
  - (4) Office Documents
    - (a) Notices and announcements
    - (b) Proposals
    - (c) Minutes and reports of meetings
  - (5) Chinese for Special Purposes
    - (a) Reader-based scientific/technical writings
    - (b) Styles and rhetoric of scientific/technical writings
  - (6) Presentation and Communication Techniques
    - (a) Communication and presentation techniques
    - (b) Discussion and the art of persuasion
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**CSCI0002 Putonghua course for science students (no credit)**

1. To learn the basic characteristics of Putonghua.
  2. To learn the terms and phrases commonly used in everyday situations.
  3. To learn the glossary in the specific field.
  4. To have a better understanding of Chinese culture and people.
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**CSCI2002 Advanced language studies in Chinese (3 credits)**

- (1) To hone students' communicative skills in Chinese. This course aims to improve their reading, listening, writing and speaking abilities in Chinese.
  - (2) To expose students to different aspects of the language. This course covers a wide range of both linguistic and extra-linguistic subject matters, the knowledge of which would enable the students to use the language in an efficacious way.
  - (3) To give pre-service language training to students. This course equips the students with language proficiency to get and secure a job.
  - (4) To promote deeper understanding of Chinese culture. This course identifies areas of Chinese culture that are essential for the students to understand their society better.
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**Centre for Applied English Studies**

**ECEN1801 Academic English for science students (3 credits)**

To build confidence in the use of English for writing and speaking about science. The focus is on:

- (1) Writing an essay which meets the requirements of good academic writing, in particular making appropriate use of published sources and avoiding plagiarism.
  - (2) Speaking in an organized and coherent manner.
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**ECEN2802 Advanced English for science students (3 credits)**

To develop a sense of audience awareness in writing, to develop spontaneous speaking skills and to individualise language learning. The focus is on:

- (1) Writing a short article for one of a range of web journals each with a different audience and topic focus (individual choice).
- (2) Spontaneous (i.e. unrehearsed) discussion through participation in speaking workshops and one-to-one discussions.
- (3) Developing independent language learning skills to help students address their individual language problems and focus on their future language needs.