The Faculty of Science offers a flexible, broad-based admission scheme that allows students to explore their interests in 11 science Major programmes during their first year of study before declaring a Major. The 11 participating Major programmes are:

- Biochemistry
- Biology
- Cell and Molecular Biology
- Chemistry
- Earth System Science
- Environmental Science
- Food and Nutritional Sciences
- Mathematics
- Molecular Biotechnology
- Physics
- Statistics

Students admitted to SCIENCE can declare any one of these programmes as their Major. The characteristics of the SCIENCE broad-based admission scheme are as follows:

- The scheme offers extensive academic advice to assist students in the selection of their Major.
- There is no quota for specific Majors, and students are guaranteed admission to their programme of choice.
- Depending on their preparation, students may declare their Major at the time of entry or at the end of Year 1 or 2.

To better prepare students to select a Major, a flexible first-year curriculum and Faculty Package of courses have been designed to equip them with the following skills:

- A broader view and better appreciation of various science subjects
- Better preparation for studies in a science Major programme
- The ability to tackle problems in a comprehensive and integrative manner

In their first year, students take courses from the Faculty Package, which contains five subject groups, including Chemistry, Life Sciences, Mathematics, Physics and Statistics. Each group consists of several courses that are available to students with different science backgrounds and interests. Students generally study at least three 3-unit courses from the Faculty Package, the first of which is typically chosen from their desired Major programme. The second course is chosen from a relevant subject area and the third from one of the remaining groups.

Undergraduate research has been an integral part of our curriculum. The Science Technology and Research Stream (STARS) is a research-oriented stream designed for students with strong academic ability and interest to gain wider exposure and research experience during their undergraduate studies. Students in STARS are offered research and training opportunities starting from their junior year, under the supervision of our professors. Students can obtain broader exposure to relevant topics by joining international conferences, seminars and outgoing exchange. The STARS designation will be officially recorded on the
academic transcripts of those who successfully complete all of the requirements.

Other Major programmes in the Faculty, i.e., Earth System Science (Atmospheric Science/Geophysics), Enrichment Mathematics, Enrichment Stream in Theoretical Physics, Quantitative Finance and Risk Management Science, Risk Management Science, and Natural Sciences, admit students via a programme-based admission scheme.

**Science**

**Biochemistry**

Biochemistry is a branch of science that investigates, at the molecular level, the chemical compounds and processes that occur in living organisms. The curriculum encompasses the study of the metabolism of biomolecules and its regulation, life processes, molecular biology, enzymes and proteins, biochemistry for sport and exercise, forensic science, cancer development, clinical biochemistry, endocrinology, immunology, neuroscience, and the management and accreditation of biochemical laboratories. The knowledge procured from research in these areas has extensive applications in medicine, the biotechnology industry and our daily lives. The curriculum is also designed to enhance students’ research and experimental skills, and provides them with internship and research opportunities through local and overseas summer research programmes and training in team research skills.

**Biology**

Biology is the main engine driving economic and social developments in the 21st century. The programme’s mission is to generate and transfer knowledge, nurture future star scientists, and train open-minded and well-informed citizens for our society. The curriculum provides students with a broad foundation of knowledge across all major areas of biology, including cell biology, genetics, ecology, marine biology, evolutionary biology, physiology and biotechnology. Students study the fundamental life processes of microbes, plants and animals at various levels, from molecules, cells and tissues to whole organisms and ecosystems, and are encouraged to enrol in supervised research projects and to participate in internships and/or field studies. Undergraduate training in biology prepares students for further studies in all major areas of the life sciences and/or careers in teaching, business and government.

**Cell and Molecular Biology**

Cell and Molecular Biology is an interdisciplinary field that represents the frontiers of biomedicine. Advances in sequencing and microscopic techniques have shifted the focus of modern biology to understanding the functions of genes at the molecular, cellular and organismic levels. As the region’s only programme focusing on cell and molecular biology, the Cell and Molecular Biology (CMB) programme seeks to become an internationally recognised education centre and a regional hub for cutting-edge research. CMB offers students intensive training in laboratory skills and an integrated programme of study in areas such as stem cell biology, cancer biology, genomics, and protein folding and trafficking with the mission of preparing students for future research works in CMB and beyond. Upon graduation, CMB graduates are equipped with a wide range of generic skills and capabilities, in addition to the professional knowledge required for success in the professions they choose to pursue.

**Chemistry**

Chemistry is a central science situated between physics, mathematics and earth science on the one hand, and the life sciences and medicine on the other. Chemistry has traditionally encompassed five major areas: analytical,
inorganic, organic, physical and theoretical. The integration of two or more of these areas has given rise to more specialised chemistry fields such as bioinorganic, organometallic, material and polymer chemistry.

We offer three streams to cater students’ career prospects: the Main Stream, Enrichment Stream and Testing & Accreditation Stream. The Main Stream allows students to take course offerings from other programmes. Its great flexibility broadens the scope of the programme and prepares the students for various career paths. The Enrichment Stream is specifically designed for students who wish to further their studies in graduate studies or a higher degree in related fields. The experience gained through problem-solving and research helps to cultivate independent thinking and critical judgement, which prepare students for further studies in chemistry. The Testing & Accreditation Stream targets for students who wish to join the testing and accreditation industry after graduation. Students are required to do related internships in testing laboratories so that they can apply their knowledge learned from the stream.

Earth System Science

Global environmental change, air and water pollution, natural hazards, energy resources and nuclear waste disposal are all critical issues of public concern. In recent decades, the scientific community has realized that tackling these complex scientific issues requires a fundamental understanding of both the dynamics of the earth as an interrelated system comprising the atmosphere, biosphere, geosphere and hydrosphere, and the human impacts on that system. Such an understanding hinges on scientific research that integrates traditional disciplines such as geology, meteorology and oceanography. It also requires the development of a curriculum designed to educate and prepare a new generation of students in the interdisciplinary framework of Earth System Science (ESSC).

Our curriculum emphasizes the basic science of the earth system. It provides motivated students with the necessary knowledge, analytical and quantitative skills, and research experience to tackle one of the major challenges of the 21st century: ensuring sustainable existence on our planet via the balanced and rational management of the environment and the earth’s energy resources. Internships and field trips are integral components of the curriculum, as they broaden the student’s experience beyond the campus setting. Students who graduate with an ESSC degree are well qualified for postgraduate work in any of the sub-disciplines of the earth and atmospheric sciences or in any of the many ESSC programmes emerging at institutions worldwide. The interdisciplinary nature of the ESSC Major programme makes it excellent preparation for employment in one of the many environmental, energy resource and geotechnical careers available in the private and public sectors.

Environmental Science

Environmental Science is an integrated science that involves the application of the knowledge and skills of applied biochemistry, biology and chemistry to test, assess and resolve environmental problems. The programme’s basic courses cover the fundamentals of biochemistry, biology and chemistry. In addition, subjects such as environmental pollution and toxicology, environmental instrumentation techniques, environmental impact assessment, and the principles of environmental management and pollution control are taught during students’ senior years to provide comprehensive training in the environmental sciences. The curriculum prepares students for further study and careers in environmental chemistry and instrumentation techniques, environmental impact assessment, pollution monitoring, toxicology and environmental health, and conservation biology in business, government and the environmental nongovernmental sector. Students can also choose to conduct supervised research in a specialized area of their choice, from renewable energy research to pollution control or monitoring studies, thereby strengthening both their knowledge of environmental sciences and ability to write research reports. Summer internships and various field trip opportunities are also available to extend learning beyond the classroom.

Food and Nutritional Sciences

The curriculum covers a wide array of topics such as food and nutrition, food safety, food microbiology, food preservation, food product development, food analysis, and food quality assurance. The two integrated components of the programme, food and nutritional science, systematically familiarise students with professional and practical knowledge in both fields. In addition to introductory food and nutritional science courses, students initially take fundamental courses in human physiology, genetics, microbiology, the cellular basis of biochemistry and the fundamentals of biochemistry to prepare for subsequent, in-depth studies. They can then choose from a range of specialized food and nutritional science courses and conduct directed research on a relevant topic under the supervision of an academic staff member.

Mathematics

The topics offered in the area of pure mathematics include number theory, abstract algebra, real and complex analysis, functional analysis, differential geometry, topology, and differential equations. Those offered in the area of applied mathematics include probability, financial mathematics, operations research and logistics, optimization theory, game theory, coding theory and cryptography, and numerical analysis. Because there is no limit to the number of students admitted into each Major subject, students are afforded flexibility in choosing a Major. The Mathematics Major programme provides students with transcendent, crossdisciplinary knowledge that allows them to master the
relationships among and the practical applications of a variety of subjects.

The curriculum is highly flexible and provides students with the freedom to enrol in a minor programme. Our undergraduates can also enrich their learning experience in many ways, including through such activities as short-term research programmes, exchange programmes and internship training.

**Molecular Biotechnology**

Molecular biotechnology is an interdisciplinary field that has had a profound influence on global issues related to medicine, agriculture, environment and energy, among other areas. The Molecular Biotechnology programme equips students with fundamental knowledge of the field and cultivates their visions for translating findings within the basic sciences into important applications. Our curriculum builds on a solid foundation of biochemistry, cell biology, genetics and genetic engineering, and hands-on skills in DNA and protein technologies are acquired through two tailor-made laboratory courses. The core curriculum requires students to develop a holistic view of animal, microbial and plant biotechnologies, and also covers the social and economic aspects of biotechnology. In addition, students are offered a large array of elective courses that foster the deep exploration of special topics of interest. Exchange and internship programmes are also available for qualified students.

Final-year students are required to complete an experimental or literature project. Those who have conducted experimental research projects have an opportunity to perform research in the laboratory of a professor from the School of Life Sciences, Faculty of Medicine or Biomedical Engineering programme. The goal is to help students develop independent learning abilities and the skills necessary to put their knowledge into practice.

One indication of the programme’s excellence is that most Molecular Biotechnology faculty members are core members of the State Key Laboratory of Agrobiotechnology (a CUHK Partnership Laboratory). State Key Laboratory status is accorded to national-level research teams. Since the programme’s establishment in 1998, many of our alumni have chosen to continue their academic science careers in prestigious overseas and local institutes. Some have become faculty members of tertiary institutions after completing their training. Graduates who choose a profession outside academe have a wide spectrum of career paths, ranging from working in government offices and laboratories to pharmaceutical companies, patent law firms, commercial companies, and even investment banks.

**Physics**

Physics is the study of the basic regularities behind the various complex phenomena in the physical world. Its scope ranges from the tiniest phenomena, like quarks in a proton, to the largest, like the universe. Building upon a tradition of excellence in teaching and research, the physics curriculum aims to provide students with a good grasp of the fundamentals of physics, a range of analytical, experimental, numerical, research, communication and other generic skills, and an appreciation and understanding of the applications of physics in modern society.

The core of the Physics curriculum builds a solid foundation. It consists of a calculus-based introductory physics series and courses in classical mechanics, electromagnetic theory, thermal and statistical physics, quantum mechanics and its relevance to the understanding of the behaviour and structure of matter at various levels, quantitative methods, experimental physics, student-centred learning, seminars, and capstone courses including projects. In addition, the programme offers a full range of elective courses, among which are courses in computational physics and simulations, astrophysics, meteorology, optics, nanoscience and technology, instrumentation, relativity, nuclear and particle physics, solid state physics, electronics and advanced courses that enrich the fundamental core courses, projects, and postgraduate courses. Depending on the student’s interests and career plans, they may use the elective courses to focus on the following Streams: (i) Astrophysics and Particle Physics, (ii) Computational and Data Physics, and (iii) Quantum Science and Technology.

Learning in Physics at CUHK is further supported by a number of special academic and extracurricular enhancement programmes. These programmes include mentoring, summer research in the department, research exchanges with overseas and mainland universities, study tours, and internships at the Hong Kong Observatory, the Hong Kong Space Museum, secondary schools and various companies. The Department of Physics also offers higher degree programmes leading to MSc, MPhil and PhD degrees.

**Statistics**

Statistics is a scientific discipline that focuses on the collection, analysis and interpretation of data. It is thus fundamental to the natural sciences, medical sciences, social sciences, business and engineering, all of which require the quantitative analysis of data. To meet the rising demand for well-trained statistics graduates in the Information Age, the programme’s curriculum covers the core of the subject, while maintaining a balance between theory and practice. Topics covered include the foundations of statistics, computing and data management, statistical theories and methods, and statistical applications in business, finance, medicine, actuarial science, quality control, and risk management science. Three statistics streams are offered: (a) Data Science and Business Statistics, (b) Statistical Science, and (c) Data Analytics. Students have the freedom to choose any stream, according to their personal interests and career objectives.
Students majoring in Statistics are required to engage in workshops, case studies and projects under the supervision of teaching staff to broaden their statistical knowledge base, hone their practical skills and gain experience in handling real-life problems. After satisfactory completion of their second year of study, students are eligible to apply for a transfer to the Risk Management Science programme.

Earth System Science
(Atmospheric Science/Geophysics)

Global environmental change, air and water pollution, natural hazards, energy resources and nuclear waste disposal are all critical issues of public concern. In recent decades, the scientific community has realised that tackling these complex scientific issues requires a fundamental understanding of both the dynamics of the Earth as an interrelated system, comprising the atmosphere, biosphere, geosphere and hydrosphere, and the human impacts on that system. Such an understanding hinges on scientific research that integrates traditional disciplines such as geology, meteorology and oceanography. It also requires the development of a curriculum designed to educate and prepare a new generation of students in the interdisciplinary framework of Earth System Science (ESSC).

The Earth System Science (Atmospheric Science/Geophysics) curriculum provides in-depth study and training to students wishing to understand the basics of and quantitative tools useful to either Atmospheric Science or Geophysics, the two sub-disciplines in Earth System Science. The programme prepares students well for careers in academic or applied research in these fields. Under this programme, students have early exposure to some of the scientific issues, including the latest research topics, related to the Earth System, and are given opportunities to gain valuable quantitative and analytical skills and build their research and career capacities through laboratory work, field trips, numerical modelling and programming experience, seminars, workshops and research projects. Further enhancing these are exchange opportunities at overseas universities, and summer research and internships in the Hong Kong observatory and geotechnical firms. Advanced undergraduate/graduate level courses in numerical methods, statistics, geophysics, atmospheric dynamics and chemistry are also available. On graduation, students are well prepared for jobs in government and industries, including but not limited to geotechnical survey and engineering, the meteorological service, as well as climate, energy and environmental consulting. They may also pursue postgraduate studies in Atmospheric Science or Geophysics.

Enrichment Mathematics

The Enrichment Mathematics programme admits students via the programme-based admission scheme. This newly established elite Major programme is designed for students who wish to develop a deeper understanding of mathematical theories. It also equips students with a strong mathematics foundation from which to pursue academic research or further study. The programme gives students an opportunity to complete the required foundation subjects earlier and spend more time on more sophisticated mathematical topics. In the area of pure mathematics, the topics on offer include number theory, abstract algebra, real and complex analysis, functional analysis, differential geometry, topology, and differential equations. In the area of applied mathematics, they include probability, financial mathematics, operations research and logistics, optimisation theory, game theory, coding theory and cryptography, and numerical analysis. Upon graduation, students will have gained broad and deep mathematical knowledge and be able to confidently pursue jobs requiring strong mathematical knowledge and abilities. The Enrichment Mathematics programme is also suitable for students intending to proceed with postgraduate studies.

The curriculum is highly flexible and provides students with the freedom to enrol in minor programmes. Summer courses and summer internship programmes are also available to prepare students for their future careers. After finishing their first year of study, students who demonstrate satisfactory performance can switch to the Mathematics and Information Engineering programme.

Every Enrichment Mathematics student obtains a Department Admission Scholarship in the first year. Also according to the students’ academic performance, we offer internship/summer exchanges at the end of the second year.

Mathematics and Information Engineering

Mathematics and Information Engineering is a four-year, Double-Major, single-degree programme intended for students with a strong interest in both mathematics and information technology. Upon graduation, students are qualified to work in areas related to mathematics or information engineering such as quantitative analysis in the finance and banking industry, information management and network systems, or security protection and systems management. Students can also choose to embark upon further study or research in any of these areas. This is an interdisciplinary programme offered by the Department of Information Engineering and Department of Mathematics. Students can enter the programme in one of two ways: (1) after applying to and finishing the first year of the Enrichment Mathematics programme, they may switch to Mathematics and Information Engineering in their second year; or (2) after applying to and finishing the first year of the Broad-based Admission Scheme under the Faculty of Engineering, they...
may choose Mathematics and Information Engineering as their Major in their second year.

**Enrichment Stream in Theoretical Physics**

The Enrichment Stream in Theoretical Physics is designed for students who have a good foundation in secondary school physics and mathematics. The core part of the curriculum, while overlapping much with that of the physics major programme, has additional emphasis on early small-group discussion classes with an academic advisor and on research component. The pool of electives is defined by a stronger flavour towards courses in theoretical physics and mathematics. Students would have better opportunities to engage in research at an earlier stage and build up their research capabilities gradually. The Stream is meant to help students explore their research potential and bridge the gap from undergraduate physics to postgraduate studies at the master’s or doctoral level. Depending on the students’ interests and career plans, students have the option to declare an additional stream by completing stream-specific electives from: (i) Astrophysics and Particle Physics, (ii) Computational and Data Physics, or (iii) Quantum Science and Technology.

Learning in Physics at CUHK is further supported by a number of special academic and extracurricular enhancement programmes. These programmes include mentoring, summer research in the department, research exchanges with overseas and mainland universities, study tours, and internships at the Hong Kong Observatory, the Hong Kong Space Museum, secondary schools and various companies. The Department of Physics also offers higher degree programmes leading to MSc, MPhil and PhD degrees, with postgraduate courses open to undergraduate students.

**Risk Management Science**

Recent financial crises have not only stimulated public interest in risk management, they have also raised awareness of its importance in today’s investment environment. A good understanding of risk management is vital to companies in many industries. Risk Management Science is a highly quantified, scientific and methodological subject, designed to fulfil the growing demand for expertise in this area. Administered by the Department of Statistics, the programme is intended for students seeking a career in financial and insurance institutions, with a strong interest in scientific methodologies. Statistics constitutes an indispensable component of risk management because it provides the theoretical and practical underpinnings of risk management models. As an interdisciplinary subject, students enrolled in this programme receive not only solid training in advanced mathematics and statistics, but also comprehensive exposure to finance, economics, accounting and computer science. The core programme comprises pragmatic courses in numerical methods, portfolio management, financial economics, data structures and accounting principles, which equip students with essential techniques for highly quantitative applications in the financial industry.

To meet the increasing demand for talent in data science, the programme launches a new study stream of risk analytics from the academic year of 2017-18 onwards. The new study stream is tailored for students pursuing frontier knowledge in big data technologies in the financial industry. Students admitted to this stream may pursue Statistics as their second major subject, in order to strengthen their professional background in data science and data analytics.

With strong partnerships with the financial industry and an extensive alumni network, we offer practicum courses, practical workshops and a guest speaker series that connect students to the professional practices in the financial community. With such solid practical and analytical training, our graduates are fully prepared to take up professional positions in the banking and financial sectors, and to pursue higher studies in risk management, statistics or operations research, at both the master’s and doctorate levels.

**Quantitative Finance and Risk Management Science**

Please refer to P.30.

**Natural Sciences**

(A 2-year programme for articulation of local Associate Degree/Higher Diploma Holders)

The BSc in Natural Sciences programme is designed for local Associate Degree/Higher Diploma Holders. Supported by 12 programmes housed in the Faculty of Science, this flexible quality articulation programme meets the growing needs and interests of these students for further study.

The normative study period is two years, during which students must complete at least 51 units of science courses, including 32 units from one of the seven concentration areas: Biological Sciences, Biotechnology, Environmental Studies, Food and Nutrition, Data Science, Analytical and Testing Sciences, and Physical Sciences. Programme graduates can look forward to career opportunities similar to those available to graduates of the Faculty’s four-year science programmes. Those who demonstrate good academic performance also have opportunities for postgraduate study.