3.1 Overview

Core Educational Philosophy

The Science education is multidisciplinary and trains students to meet the increasingly complex needs of the future. Our degree programmes are constantly reviewed and revised to ensure that the education our students receive remains relevant. Course content is but a fraction of the education provided. Greater emphasis is placed on developing and sharpening the students' analytical and creative thinking skills, presentation skills, computer literacy, and problem solving techniques. These are the life skills that make science graduates versatile, articulate, and IT-savvy.

We offer an education that is inclusive and able to cater to a wide spectrum of student interests, aptitudes and abilities, developing and maximising the potential of each individual. In terms of undergraduate instruction, the Faculty has adopted specialised modes of delivery aimed at cultivating deeper approaches to learning. We also run various boutique programmes targeting different groups of students to stretch and enrich the educational experience of as many as possible.

(1) Modules for Freshmen

The following module designed for freshmen was launched in AY2006/07, with emphasis on honing students' analytical, creative thinking, and writing skills:

- Freshman Seminar

FMS12XXY (where X stands for a running number and Y is an alphabet denoting the Department*) Freshman Seminar provides an unparalleled opportunity for first-year students and faculty to explore a scholarly topic of mutual interest together in a small group setting. Designed with freshmen in mind, the module sparks students' intellectual curiosity as they are oriented to becoming an active member of the NUS intellectual community. Students can benefit from in-depth discussions on a specific scientific issue, and learn to present ideas clearly in oral and written form.

**Different symbols denote Departments (Y)*
B = Department of Biological Sciences
C = Department of Chemistry
M = Department of Mathematics
P = Department of Physics
S = Department of Statistics and Applied Probability

(2) Specialised Modes of Delivery

Besides the standard modes of delivery through lectures, seminars and tutorials, students are also given

ample opportunities to explore other more challenging learning options, such as independent study and research work, to stimulate their intellectual development.

- Independent Study Modules

Students who are in our Special Programme in Science, University Scholars Programme, as well as those who meet the minimum CAP criteria of at least 4.50, are allowed to register for Independent Study Modules (ISMs) in their respective major disciplines. In general, ISMs are structured upon existing modules and students are required to design their course material under the guidance of a supervisor with the objective of covering topics in greater depth and/or breadth than they will if they read the regular modules. Students are expected to benefit from the personalised instruction as well as the high-level discourses they are engaged in with their supervisors.

- Undergraduate Research Opportunities Programme in Science

The Undergraduate Research Opportunities Programme in Science (UROPS) offers many of our students the opportunity to do research in specific areas related to their discipline. The programme has been primarily designed with the aim of engaging students in the process of intellectual inquiry, problem-solving, creative thinking, and enhancing intellectual exchange and collaboration between undergraduates and Faculty members.

(3) Special Faculty-Based Programmes

Besides the specialised modes of delivery employed to stretch our students, the Faculty also hosts a suite of special boutique programmes, each having its own specific aims and objectives targeting different groups of students. The Faculty is committed to promoting these programmes as well as identifying and selecting suitable candidates for participation in these programmes.

- Special Programme in Science

Introduced in 1996, the Special Programme in Science (SPS) aims to nurture talent among budding scientists. SPS is an intense programme for a selected group of undergraduates who have a strong passion and aptitude for Science. It is directed at students who delight in the rigorous training of the mind and character. Through this programme, participants are introduced to some of the broad areas of contemporary scientific concerns through an interdisciplinary approach, a cornerstone and hallmark of SPS.

- Multidisciplinary Undergraduate Programmes

With effect from 2018, the Faculty is offering a new Bachelor of Science in Pharmaceutical Science Programme (“PHS” Programme) to be offered as a direct admission, four-year direct honours programme. This is a boutique programme with a targeted enrolment of 30 students. Hosted in

Pharmacy, the PHS programme is quintessentially a multidisciplinary partnership with Chemistry, Life Sciences, the Centre of Regulatory Excellence (CoRE) (Duke-NUS Medical School) and the industry. The PHS programme envisions to produce highly effective pharmaceutical scientists and equip them with specialized skills in jobs with high demand such as research and development, manufacturing, regulatory affairs, medical affairs, quality control and assurance, sales and marketing, clinical trial management and entrepreneurship. It is expected that graduates from this programme will be grounded with deep understanding of the drug discovery and development process, complemented with a good grasp of the regulatory and commercial environment. They will be able to function across the whole continuum of the pharmaceutical business and play a critical part in bringing bioscience products and services from discovery to market.

Since 2016, the Faculty has offered a Data Science and Analytics major, a multidisciplinary programme jointly offered by the Department of Mathematics and the Department of Statistics and Applied Probability in the Faculty of Science, with the collaboration of the School of Computing. Data science is an emerging field of study that involves statistical and computational principles, methods and systems for extracting and structuring knowledge from data. On a daily basis, large data sets are routinely generated by activities in the sciences, administration, leisure and commerce. Data scientists are constantly seeking patterns and predicting outcomes from these vast collections of data. The four-year direct Honours programme in Data Science and Analytics (DSA) is designed to prepare graduates who are ready to acquire, manage and explore data that will inspire changes around the world.

The Faculty also has a multidisciplinary Computational Biology Programme which involves the participation from 10 Departments spanning across three Faculties/School, including the Departments of Biological Sciences, Chemistry, Mathematics, Physics and Statistics and Applied Probability from the Faculty of Science, the Department of Computer Science from the School of Computing and the Departments of Biochemistry, Microbiology, Physiology and Pharmacology from the Yong Loo Ling School of Medicine. This programme is designed with the objective of paving the way to specific graduate programmes and research in hot multidisciplinary areas like Biophysics and Bioinformatics. As such, the Computational Biology programme is well suited for students who seek careers in the research-intensive track.

The growing list of challenging multidisciplinary study options also includes specially designed double degree programmes in Law and Life Sciences, Computer Science and Mathematics / Applied Mathematics, as well as a Concurrent MSc (Mgt) and BSc (Hons) programme. Additionally, academically outstanding students who want to acquire competence in two disciplines may apply to do self-designed (free structure) double degrees. Some viable combinations of double degrees include a Science degree with Operations and Supply Chain Management (offered by the School of Business), Computing (offered by the School of Computing), Psychology [offered by the Faculty of Arts and Social Sciences (FASS)], or Economics (offered by FASS).

In order for Science students to fulfil graduation requirements, they must meet the graduation requirements for at least one primary major. Students are allowed to read a maximum of two majors. Pharmacy students are allowed to read only one major. Students who relish academic challenges may take a double major programme (one primary and one second major). The second major may be offered by FoS or other Faculties in disciplines complementing the primary major of the student.

Upfront Double Majors and Major-Minor Combinations

The following upfront double majors and major-minor combinations are offered:

1. **Double Major Programmes**

Students can apply direct to the following double major programmes via the online admission application form:

FoS Major	**2nd Major (from Faculty of Science or other Faculties/Schools)**	**Admission requirements***
Applied Mathematics	Economics (FASS)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Mathematics	Economics (FASS)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Statistics	Economics (FASS)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Life Sciences	Psychology (FASS)	Two good H2 passes or equivalent in Biology or Chemistry or Mathematics/Further Mathematics or Physics
Applied Mathematics	Computer Science (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Mathematics	Computer Science (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics

Statistics	Computer Science (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Applied Mathematics	Information Security (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Mathematics	Information Security (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Statistics	Information Security	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Applied Mathematics	Business Analytics (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Mathematics	Business Analytics (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Statistics	Business Analytics (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Applied Mathematics	Management (Biz)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Mathematics	Management (Biz)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Statistics	Management (Biz)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Life Sciences	Management (Biz)	Two good H2 passes or equivalent in Biology or Chemistry or Mathematics/Further Mathematics or Physics
Chemistry	Food Science (FoS)	Good H2 pass (or equivalent) in Chemistry and a Good H2 pass (or equivalent) in Biology or Physics or Computing or Mathematics/Further Mathematics

*Applicants satisfying the admission requirements will be subjected to selection criteria before being admitted into the programme

2. Major with Minor Programmes

Students can apply direct to the following major with minor programmes via the online admission application form:

FoS Major	**Minor (from other Faculties/Schools)**	**Admission requirements***
Applied Mathematics	Information Security (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Computational Biology	Information Security (SoC)	Good H2 Passes or equivalent in Mathematics/Further Mathematics and either Biology or Chemistry
Quantitative Finance	Information Security (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Statistics	Information Security (SoC)	Good H2 Pass or equivalent in Mathematics/Further Mathematics
Life Sciences	Public Health (SSHSPH)	Two good H2 passes or equivalent in Biology or Chemistry or Mathematics/Further Mathematics or Physics
Mathematics	Entrepreneurship	Good H2 pass or equivalent in Mathematics/Further Mathematics
Applied Mathematics	Entrepreneurship	Good H2 pass or equivalent in Mathematics/Further Mathematics
Statistics	Entrepreneurship	Good H2 pass or equivalent in Mathematics/Further Mathematics
Data Science and Analytics	Entrepreneurship	Very good H2 pass or equivalent in Mathematics/Further Mathematics and a good H2 pass or equivalent in Biology or Chemistry or Physics or Computing

Life Sciences	Entrepreneurship	Two good H2 passes or equivalent in Biology or Chemistry or Mathematics/Further Mathematics or Physics
Food Science and Technology	Entrepreneurship	Good H2 pass (or equivalent) in Chemistry and a Good H2 pass (or equivalent) in Biology or Physics or Computing or Mathematics/Further Mathematics

**Applicants satisfying the admission requirements will be subject to selection criteria before being admitted into the programme.*

Legend
Biz: NUS Business School
FASS: Faculty of Arts and Social Sciences
FoS: Faculty of Science
SoC: School of Computing
SSHSPH: Saw Swee Hock School of Public Health

- Highlights of a Few Minors offered by Faculty of Science

Aquatic Ecology

The Minor in Aquatic Ecology aims to expose students to the important disciplines of marine and freshwater ecological studies while developing relevant specific skills, knowledge, and experience among them. With the increasing governmental, private, and societal interest in aquatic sciences, there is a growing demand for manpower with expertise in freshwater and/or marine ecology. This Minor complements aptly the primary disciplines of students from the Life Sciences Major and Geography Major. It will also enhance the training for students keen in related career opportunities at relevant governmental and private institutions in Singapore, including Public Utilities Board (PUB), National Environment Agency (NEA), National Parks Board (NParks), The Maritime and Port Authority of Singapore (MPA), Tropical Marine Science Institute (TMSI), DHI Group, and Singapore – Delft Water Alliance (SDWA).

Forensic Science

The minor in forensic science aims to provide students with an understanding of the fundamental concepts and principles behind the application of scientific techniques to forensic investigations and to the criminal justice system. Advances in basic scientific research have had a rapid and dramatic impact in these fields and it is only through an understanding of these fundamental scientific concepts that the

legal system may be effective in criminal investigations. A minor in forensic science would also offer a strong complement for students interested in criminal justice to major in areas of study such as biology, chemistry, physics, psychology or engineering.

Medical Physics

Medical Physics is the branch of physics that develops and applies the methods and techniques, often from Nuclear Physics, which form the basis of the advanced technologies used in medicine and healthcare today. Examples are imaging techniques such as X-ray Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET), as well as radiation therapy techniques such as Radiotherapy and Proton Therapy, relevant in cancer treatment.

The fact that life expectancy and population are increasing, and the tendency to adopt more affluent lifestyle habits, leads to an increase in the incidence of many chronic and degenerative diseases. For example, the prevalence of cancer is predicted to increase three-fold by 2030, and other aging related maladies will also be seen more frequently.

Because of the rising expectations for better quality healthcare, experts in Medical Physics are needed where specialized knowledge and skills are required in specific areas (e.g. Radiation Oncology, Proton Beam Therapy, Medical Imaging (MRI/CT) and Medical Technology).

The Medical Physics minor aims to teach the basics of Medical Physics and the constitutional knowledge that is required from Nuclear Physics as well as Biology & Life Science, in order to broaden the knowledge of some of our graduates at the interface of these fields.

Those students who aim to become professional Medical Physicists will be able to utilize the solid foundation the minor represents to carry on towards such a professional degree.

Pharmaceutical Science

The pharmaceutical industry in Singapore is undergoing a phase of expansion, as more pharmaceutical and biopharmaceutical companies set up new manufacturing and research facilities here. Along with this expansion plans, manpower with relevant knowledge and skills will be sought after by the industry. In addition to the requisite domain knowledge which may be science, engineering, law or business; the employers are also seeking to hire graduates with supplementary knowledge relevant to the pharmaceutical industry. The relevant adjunct knowledge is based on foundation in pharmaceutical sciences. Having an understanding of pharmaceutical sciences will enable these graduates to quickly immerse in the environment of the industry and may ease the initial learning phase.

With this Minor in Pharmaceutical Science, graduates may also choose to pursue further studies either in

the coursework MSc (Pharmaceutical Science and Technology) or pursue other PhD or MSc research programmes in their own majors at NUS or elsewhere. Together with a science or engineering based major, graduates will have a broader spectrum of technical knowledge and skills which will become useful in the research activities undertaken during their graduate study.

- Professional Placement Programme

The Professional Placement Programme of minimum 16 weeks is a major component of the International Union of Food Science and Technology (IUFoST) – certified Bachelor of Science (BSc) and BSc (Honours) in Food Science and Technology (FST). Students are attached to food related companies and organisations for on-the-job training and exposure. The programme seeks to give first-hand experience in the application of scientific knowledge to practical problems and is consistent with the objective of the FST BSc and BSc (Honours) Programmes, which is to serve the high quality manpower needs of the food and allied industries in Singapore. Such placements also serve to give our students a head start in their careers by enhancing their visibility within the industry.

- Undergraduate Professional Internship Programme (UPIP)

The Undergraduate Professional Internship Programme (UPIP) aims to provide Science undergraduates* the opportunity to perform structured internship in an organization during their undergraduate study. Internship helps students craft a fulfilling university journey through meaningful work experience. This programme allows students to engage in career preparation and job seeking experiences, hone their interpersonal, communications and other soft skills as they actively experience day-to-day operations in an organization's ecosystem. Students are presented with opportunities to apply their discipline-related knowledge and professionalism in an actual work setting, thus allowing them to gain experiential learning that complements their course activity. Upon successful completion of this elective internship module, students will be awarded Modular Credit (MC) that would count towards the Unrestricted Elective component of their graduation requirements.

**with the exception of Pharmacy majors*

For more information, visit
URL: https://www.science.nus.edu.sg/industry/internships/undergraduate-professional-internship-programme-upip/

- Joint Minor Programme

Leveraging the competencies of the University of Toronto (UofT), one of the world's most prestigious universities, the Faculty offers joint minor programmes in Environmental Biology and Environmental Chemistry, for which NUS students study advanced courses for one semester at UofT. Successful participants are able to transfer both credits as well as grades to satisfy their graduation requirements.

Under the terms of this partnership with UofT, NUS students need to pay their usual tuition fees to NUS only, for the duration of their studying stint at UofT. For more details, refer to http://www.nus.edu.sg/nusbulletin/faculty-of-science/undergraduate-education/study-abroad-programmes/summer-programme/

(4) Special University-Level Programmes

In support of the overarching objectives of many of the University-initiated programmes, the Faculty currently hand-picks outstanding scholars for intensive programmes like University of North Carolina at Chapel Hill Summer Lab, the Double Degree Programme with French Grandes Écoles and the NUS Overseas College Programme. Other programmes like the NUS Student Exchange Programme are also actively promoted to students as we believe that the exposure students receive outside the Singapore-NUS educational environment adds value to their undergraduate education and contributes to their personal growth.