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# NUS FACULTY OF SCIENCE

## AN OVERVIEW

### Distinguished Record

*NUS is one of the prime movers in shaping Singapore's scientific landscape in education and research.*

- More than 90 years of experience in providing quality science education
- One of the largest faculties in NUS with seven departments: Biological Sciences, Chemistry, Food Science and Technology, Mathematics, Pharmacy, Physics, and Statistics and Applied Probability
- One of the best universities in the world for science education
- Ranked by Quacquarelli Symonds as the top university in Asia for many science subjects

### Holistic Learning

*You will experience an enriching educational journey, both in and outside the classroom.*

- Home to about 4,700 undergraduates and 1,200 postgraduate students
- Opportunities to engage award-winning professors in cutting-edge research
- Vibrant campus and student life

### Diverse Learning Choices

*You have the flexibility to plan your learning pathways based on your interests and career aspirations.*

- 13 primary majors, seven second majors, 16 minors, several concurrent degree programmes as well as double majors, double degrees, joint degrees, multidisciplinary and cross-faculty programmes
- Enhancement programmes to broaden your academic horizons, like undergraduate research programmes, local and overseas internships, and inter- and multidisciplinary boutique programmes in Mathematics and Science

### Global Outlook

*Study abroad programmes open the door to a global learning experience, broadening your intellectual and global outlook.*

- More than 800 students gained overseas experience in Academic Year 2018/2019
- Collaborations with over 300 overseas partner universities offer exposure to different cultures overseas and academic environments

### Career Prospects

*Our graduates are employed in high-growth and high-impact industries.*

- Career opportunities for graduates in key industries that drive Singapore's economic growth, such as biomedical sciences, consumer businesses, data analytics, education, financial services, healthcare, infocommunication technologies, safety and security, research and development, and urban solutions and sustainability
- Training in specialised domain knowledge and life skills such as critical thinking, problem-solving and interpersonal skills, which enhance employability and career mobility

## NEW! ACADEMIC PROGRAMMES

The Faculty of Science continues to increase our suite of academic programmes to provide students with the breadth and depth of educational training to face an increasingly complex future and to be prepared for careers in today's globalised workplace.

### Bachelor of Pharmacy (Hons)

The current four-year flagship programme will be transformed into a fully integrated curriculum - its signature feature - in Academic Year 2020/2021. The overhauled curriculum combines with modern pedagogy to develop healthcare practitioners who are competent in navigating the dynamic health system and are prepared for the challenges of contemporary practice. You will be trained as care providers, health advocates, communicators, collaborators, scholar-innovators, leader-managers and professionals (see page 10).

### Minor in Bioinformatics

This programme provides broad coverage of theory and applications of bioinformatics, in fields related to the life sciences and medicine, as well as programming skills and practice in applying them. It equips students from multiple disciplines to become bioinformatics professionals, a growing area of expertise, upon graduation. This programme will be launched in Academic Year 2021/2022.

### Master of Science in Forensic Science

This multidisciplinary programme, synergising law and science, covers the fundamental concepts of scientific techniques used in forensic investigations, and knowledge in various branches of forensic science to equip students with skills in the profession (see page 6).

### Master of Science in Data Science and Machine Learning

This interdisciplinary programme, designed to nurture data science professionals, incorporates learning from fields such as computer science, mathematics and statistics, as well as data analytics and machine learning. The programme is supported by leading NUS researchers and data scientists from industry, and offers multiple data science specialisations (see pages 9, 12).

# RESEARCH OPPORTUNITIES FOR STUDENTS

## Overview

The Faculty of Science is home to different clusters of research excellence, both in fundamental research to create knowledge, and applied research to spur innovation.

Apart from the final year project which you are required to, or may undertake, during your Honours year, we have various research programmes which offer you opportunities to pursue independent research projects.

Through these programmes, you will develop valuable research skills, cultivate critical thinking and problem-solving skills, as well as sharpen communication and presentation skills. Some of these programmes are:

- **Undergraduate Research Opportunities Programme in Science (UROPS):** 2nd or 3rd year undergraduate students can experience scientific research and discovery by participating in research projects (see page 18).
- **Special Programme in Science (SPS):** You can undertake an integrative research project in a team on areas of contemporary science to understand an interdisciplinary approach to science (see page 17).
- **Overseas Summer Research Programmes:** You will go abroad to conduct research in the laboratories of partner universities during the NUS vacation period (see page 19).

The Data Analytics Consulting Centre has a programme where you can be involved in consulting projects with industry. Under this programme, you will get to prepare for a career in data science by learning how to handle complex datasets and solve real-world problems.

Faculty members are collaborating with other academic institutions and partners to establish national research clusters in microscopy (SingaScope) and in mass spectrometry (SingMass, or Singapore National Laboratory for Mass Spectrometry). You will have the opportunity to access key microscopy resources and mass spectrometry tools for your research.

## Research Institutes and Centres

You may also have opportunities to participate in the research work of some of the research institutes and centres in NUS. These include:

- Centre for Advanced 2D Materials
- Centre for Bioluminescence Sciences
- Centre for Ion Beam Applications
- Centre for Quantitative Finance
- Centre for Quantum Technologies
- Centre for Wavelets, Approximation and Information Processing
- Chemical, Molecular and Materials Analysis Centre
- Data Analytics Consulting Centre
- Institute for Mathematical Sciences
- Institute of Data Science
- Life Sciences Institute
- Mechanobiology Institute
- NUS Environmental Research Institute
- Pharmaceutical Innovation and Research Centre
- Protein and Proteomics Centre
- Risk Management Institute
- Singapore Centre on Environmental Life Sciences Engineering
- Singapore Synchrotron Light Source
- Solar Energy Research Institute of Singapore
- Tropical Marine Science Institute

## Research Areas within Faculty of Science

### BIOLOGICAL SCIENCES

- **Molecular Cell and Developmental Biology:** Agro and Aqua Biology; Disease Models (Plant and Animal); Infection Science; Molecular and Cellular Dynamics; Protein Dynamics and Drug Design
- **Biophysical Sciences:** Bioimaging Sciences; Computational Biology; Mechanobiology; Protein Science and Proteomics; Structural Biology
- **Ecology, Evolution and Biodiversity:** Animal Behaviour; Community Ecology; Conservation Biology; Darwin and Wallace; Environmental Biology; Phylogeny and Biogeography Systematics

## CHEMISTRY

- **Advanced Materials:** Two Dimensional (2D) Materials; Energy Materials; Graphene and Nanocarbons; Luminescent Biomarkers; Nanomaterials; Organic Optoelectronic Materials
- **Organic Chemistry:** Asymmetric Synthesis; Organic Catalysis; Transition Metal Catalysis
- **Chemical Biology and Medicinal Chemistry:** Development of Therapeutic Agents; Synthesis of Bioactive Molecules; Synthetic Biology
- **Computational Chemistry and Simulation:** Molecular Dynamics; Nanoscale Modelling
- **Environmental Chemistry:** Carbon Dioxide Fixation; Green Chemistry; Sensors; Water Eco-Efficiency

## FOOD SCIENCE AND TECHNOLOGY

Flavour and Sensory Science; Food Chemistry and Analysis; Food Fermentation; Food Microbiology and Safety; Food Preference and Consumer Studies; Food Processing and Engineering; Functional Foods; Human Nutrition; Plant-Based and Alternative Proteins; Sustainable Food Production

## LEE KONG CHIAN NATURAL HISTORY MUSEUM

- **Biodiversity Research:** Species Discovery with Next-Generation Sequencing; Environmental DNA; Taxonomy; Systematics; Conservation of Southeast Asia's Fauna

## MATHEMATICS

- **Pure Mathematics:** Algebra and Number Theory; Combinatorics and Graph Theory; Dynamical Systems; Geometry and Topology; Mathematical Logic and Theoretical Computer Science; Partial Differential Equations and Geometric Analysis; Probability; Real, Functional and Harmonic Analysis; Representation Theory and Automorphic Forms
- **Applied and Computational Mathematics:** Computational Biology and Bioinformatics; Data Science; Imaging and Vision Science; Mathematical Finance and Mathematical Economics; Numerical Analysis and Scientific Computing; Optimisation

## PHARMACY

- **Drug Discovery and Design:** Computational Modelling and Informatics; Natural Products and Traditional Chinese Medicine; Rational Drug Discovery
- **Health Services Research:** Clinical Pharmacy and Pharmacy Practice; Disease Control and Management; Pharmacoeconomics
- **Pharmaceutical Biology and Drug Disposition:** Disease Etiology, Biomarkers and Targets; Pharmacokinetics and Pharmacodynamics
- **Pharmaceutical Technology and Innovative Therapeutics:** Formulation and Processing; Innovative Nano-Therapeutics; Smart Drug Delivery and Novel Biosystems

## PHYSICS

- **Advanced Materials:** Two Dimensional (2D) Materials; Nanostructures and Energy; Organic Semiconductors; Oxides; Spectroscopies; Nonlinear Optics; Surface Science
- **Biological and Soft Matter Physics:** Biopolymers; Mechanics of Biomolecules; Single-Molecule Manipulation and Imaging
- **Ion Beam Science and Technology:** Proton Beam Writing; Proton Microscopy; Radiobiology
- **Theoretical and Computational Physics:** Astrophysics and Cosmology; Condensed Matter Physics; Electromagnetics and Acoustics; Quantum Control; Nonlinear Dynamics and Complex Systems; String Theory
- **Quantum Information Technologies:** Cold Atoms and Molecules; Atom and Ion Trapping; Cryptography; Quantum Entanglement and Information Theory; Quantum Optics and Atom-Photon Interaction

## STATISTICS AND APPLIED PROBABILITY

- **Applications:** Ageing Population; Biostatistics; Clinical Trials; Computational Biology; Environmental Statistics; Epidemiology; Eye Disease Modelling; Financial and Business Statistics; Genetics and Genomics; Infectious Disease Modelling; Medical Diagnostic Imaging; Networks; Neural Science; Nutritional Science; Pharmaceutical Data; Psychiatry Data
- **Statistical Methodology and Probability Theory:** Artificial Intelligence; Bayesian Inference; Big Data; Classification; Change Point; Computational Statistics; Deep Learning; Dimension Reduction; Distributional Approximation; Empirical Likelihood; Functional Data Analysis; High Dimensional Data Analysis; Longitudinal and Panel Data Analysis; Machine Learning; Manifold and Non-Euclidean Data; Monte-Carlo Methods; Prediction and Forecasting; Random Matrix; Smoothing Methods and Nonparametric Statistics; Spatial Data Analysis; Sequential Analysis; Stein's Methods; Survival Analysis; Variable Selection and Screening

# DEPARTMENT OF BIOLOGICAL SCIENCES

## Possible Careers

Biotechnologist  
Clinical analyst  
Clinical trial coordinator  
Conservation biologist  
DNA profiling scientist  
Educator  
Environmental sustainability specialist  
Forensic scientist  
Lawyer  
Medical technologist  
Parks manager  
Process engineer  
Prosecutor  
Public health officer  
Quality control specialist  
Senior crime scene specialist

## Examples of Industries/Sectors

Agriculture  
Biomedical sciences  
Biotechnology  
Conservation and sustainability  
Education  
Environmental technology  
Food production  
Government agencies  
Healthcare  
Horticulture-related agencies  
Law enforcement  
Pharmaceuticals  
Research and development  
Scientific services

## Undergraduate Programmes

### B.SC. (HONS) AND B.SC. IN LIFE SCIENCES

This undergraduate course in biological and biomedical sciences provides foundational knowledge vital to all areas of life sciences in the first year of study. Selection of relevant advanced-level modules paves the way to one of three specialisations and the many diverse disciplines in life sciences.

Honours students can either pursue a general Honours degree or one of these specialisations:

- **Biomedical Science:** This focuses on human health and diseases, and its goal of clinical solutions.
- **Molecular and Cell Biology:** This emphasises the fundamental physical, chemical and biological mechanisms of living organisms.
- **Environmental Biology:** This affirms the importance and relevance of biodiversity and ecology, and their applications towards evolutionary understanding and environmental conservation.

### JOINT DEGREE PROGRAMME NUS B.SC. (HONS) IN LIFE SCIENCES WITH UNIVERSITY OF DUNDEE B.SC. (HONS) IN BIOLOGICAL SCIENCES/BIOMEDICAL SCIENCES

This special programme for Life Sciences Majors includes the unique opportunity for the final Honours year and research project to be conducted in the partner university.

There are three areas of focus to choose from - Drug Design and Discovery; Developmental Biology; and Plant Science (see page 16).

*For information on the department's Second Major and Minor courses, please refer to "Admissions Information".*

## Graduate Programmes

### M.SC./PH.D. BY RESEARCH

Possible research areas include: Biophysical Sciences; Cell, Molecular and Developmental Biology; and Ecology, Evolution and Biodiversity.

### **NEW!** M.SC. IN FORENSIC SCIENCE BY COURSEWORK

The M.Sc. in Forensic Science (see page 3) aims to equip you with the key knowledge and capabilities to:

- Understand the fundamental concepts and principles behind the application of scientific techniques to forensic investigations and the criminal justice system.
- Explore the different basic and advanced techniques used in forensic investigation.
- Enhance hands-on advanced problem-solving skills by applying knowledge gained to come up with innovative solutions to forensic science-related problems.

# DEPARTMENT OF CHEMISTRY

## Undergraduate Programmes

### B.SC. (HONS) AND B.SC. IN CHEMISTRY

NUS' B.Sc. (Hons) in Chemistry programme is accredited by the Royal Society of Chemistry.

In Years 1 and 2, you will focus on the fundamental principles and applications of chemistry, divided into Inorganic, Organic and Physical Chemistry.

Honours students can either pursue a general Honours degree or one of these specialisations:

- **Materials Chemistry:** This covers the synthesis, characterisations and applications of polymers, inorganic and organic solids and devices.
- **Medicinal Chemistry:** This covers the design and synthesis of compounds as potential drugs, the identification of their functional groups and interactions with targets, as well as the methods used to assay the compounds.
- **Environment and Energy:** This covers the techniques used for environmental sampling and analysis, the chemistry and physics of energy generation and conversion processes, and their impact on energy policies.

You will also have a choice of pursuing a Final Year Internship or Project in your fourth year of study.

### DOUBLE MAJOR IN CHEMISTRY AND FOOD SCIENCE

**(Jointly offered with the Department of Food Science and Technology)**

You will gain understanding on important aspects of food beyond its physical and chemical properties, in this direct admission course (see page 8).

*For information on the department's Second Major and Minor courses, please refer to "Admissions Information".*

## Graduate Programmes

### M.SC./PH.D. BY RESEARCH

Possible research areas include: Analytical Sciences; Catalysis; Computation, Modelling and Spectroscopy; Inorganic and Organic Chemistry; Materials Science; Medicinal Chemistry; Chemical Biology; and Surface Science.

### M.SC. IN CHEMISTRY FOR ENERGY AND ENVIRONMENT BY COURSEWORK

You will acquire knowledge of the latest energy and environmental technologies, and modern materials design, synthesis strategies, advanced characterisation and analytical techniques.

### M.SC. IN CHEMISTRY BY COURSEWORK

This one-year programme provides a broad scientific foundation in chemistry for advanced positions in the chemical industries and degree programmes such as the Ph.D. in Chemistry.

### JOINT M.SC. IN INDUSTRIAL CHEMISTRY BY COURSEWORK

**(Jointly offered with the Technical University of Munich)**

You will gain specialised knowledge in selected areas of technology in the pharmaceutical and chemical industries.

## Possible Careers

Chemical scientist  
Educator  
Forensic scientist  
Materials scientist  
Patent specialist  
Quality control scientist  
Researcher  
Water treatment scientist

## Examples of Industries/Sectors

Biochemicals  
Chemicals  
Education  
Energy  
Engineering  
Government agencies  
Manufacturing  
Pharmaceuticals  
Research and development  
Specialty chemicals



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### Department of Chemistry

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# DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

## Possible Careers

Educator  
Flavourist  
Food scientist  
Food specialist  
Food technologist  
Nutritionist  
Regulatory affairs officer  
Researcher

## Examples of Industries/Sectors

Consumer insights  
Consumer products  
Education  
Flavours and fragrances  
Food ingredients  
Food production and processing  
Food testing laboratories  
Government agencies  
Healthcare  
Pharmaceuticals  
Quality control  
Research and development

## Undergraduate Programmes

### **B.SC. (HONS) AND B.SC. IN FOOD SCIENCE AND TECHNOLOGY**

The degree programmes cover the full educational spectrum of food science and technology, with emphasis on four themes: Food Quality and Safety; New Food Product Innovation; Food Processing; and Nutrition.

It is the only International Union of Food Science and Technology (IUFoST) accredited degree in Singapore, certified by IUFoST for meeting international standards and guidelines.

All undergraduate students are guaranteed entry into the Professional Placement Programme, which enables you to put learning into practice through workplace experience.

### **DOUBLE MAJOR IN CHEMISTRY AND FOOD SCIENCE**

**(Jointly offered with the Primary Major in Chemistry)**

You will gain understanding on important aspects of food beyond its physical and chemical properties, in this direct admission course (see page 7).

*For information on the department's Double Major in Chemistry and Food Science, please refer to "Admissions Information".*

## Graduate Programmes

### **M.SC. IN FOOD SCIENCE AND HUMAN NUTRITION BY COURSEWORK**

This covers advanced topics including Food Bioscience (Microbiology and Safety, Fermentation); Evidence-based Functional Foods; Human Nutrition; Modern Analytical Science; and Modern Food Processing Technology.

### **M.SC./PH.D. IN FOOD SCIENCE AND TECHNOLOGY BY RESEARCH**

Possible research areas include: Food Biotechnology; Food Chemistry and Analysis; Food Microbiology and Safety; Food Processing and Engineering; and Human Nutrition.

# DEPARTMENT OF MATHEMATICS

## Undergraduate Programmes

### **B.SC. (HONS) AND B.SC. IN MATHEMATICS**

You will learn fundamental mathematical concepts in areas including Algebra; Differential Equations; Geometry and Topology; Logic; Number Theory and Combinatorics; and Real and Complex Analysis, with a focus on mathematical foundations and fundamental techniques.

### **B.SC. (HONS) AND B.SC. IN APPLIED MATHEMATICS**

You will study mathematical methods and problem-solving techniques that are applied in science, engineering and computer science.

Honours students can either pursue a general Honours degree or one of these specialisations:

- **Operations Research and Financial Mathematics:** This covers the application of analytical methods and mathematical models to solve problems in areas like industrial engineering, operations management and finance.
- **Mathematical Modelling and Data Analytics:** This covers the use of mathematical models and numerical analysis to manage and analyse massive datasets.

### **B.SC. (HONS) AND B.SC. IN QUANTITATIVE FINANCE**

This multidisciplinary course covers mathematical theory and applications, statistical tools, computing theory and techniques, financial theory and principles, and core financial products.

### **B.SC. (HONS) IN DATA SCIENCE AND ANALYTICS**

This four-year direct Honours programme is designed with sufficient technical depth to equip graduates with the ability to develop novel analytical tools for new scientific applications and industry problems. It is jointly offered by the Department of Statistics and Applied Probability and the Department of Mathematics, in conjunction with the Department of Computer Science in the School of Computing (see page 13).

### **SPECIAL PROGRAMME IN MATHEMATICS**

This specially designed programme for selected students with a strong passion and aptitude for

mathematical sciences comprises modules in foundational mathematics. This prepares you for graduate programmes and careers in the mathematical sciences (see page 17).

*For information on the department's Second Major and Minor courses, please refer to "Admissions Information".*

## Graduate Programmes

### **M.SC. IN MATHEMATICS BY COURSEWORK**

This programme for mathematics teachers and professionals enables them to upgrade their professional skills and qualifications through advanced training.

### **M.SC. IN QUANTITATIVE FINANCE BY COURSEWORK**

This programme, jointly offered by the Department of Mathematics and the Department of Statistics and Applied Probability, with the Department of Economics in the Faculty of Arts and Social Sciences, equips you with advanced knowledge in quantitative finance, and its use in the financial industry.

### **NEW! M.SC. IN DATA SCIENCE AND MACHINE LEARNING BY COURSEWORK**

This one-year full-time programme will help meet the growing demand for Big Data professionals by transforming graduates with Bachelor degrees in quantitative science (e.g. mathematics, applied mathematics, statistics and physics) into practitioners. The M.Sc. in Data Science and Machine Learning is offered jointly by the Department of Mathematics, the Department of Statistics and Applied Probability, and the Department of Computer Science in the School of Computing, with support from the Faculty of Engineering, and the Saw Swee Hock School of Public Health (see pages 3, 12).

### **M.SC./PH.D. BY RESEARCH**

Possible research areas include: Pure Mathematics; Applied Mathematics; and Financial Mathematics.

## Possible Careers

Actuary  
Blockchain developer  
Business analyst  
Computer programmer  
Cryptanalyst  
Data analyst  
Data scientist  
Educator  
Financial analyst  
Financial engineer  
Fund manager  
Operations research analyst  
Quantitative modelling analyst  
Researcher  
Risk management analyst  
Software engineer

## Examples of Industries/Sectors

Education  
Financial services  
Government agencies  
Healthcare  
Infocommunication technologies  
Insurance  
Operations management  
Research and development  
Safety and security  
Transportation  
Wealth management



### Department of Food Science and Technology

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### Department of Mathematics

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# DEPARTMENT OF PHARMACY

## Possible Careers

### B. Pharm. (Hons)

#### Patient-Care Practice

Registered pharmacist  
Community pharmacies  
Healthcare services  
Hospitals  
Polyclinics  
Leadership positions within public healthcare institutions

#### Non Patient-Care Areas

Clinical research coordinator  
Regulatory specialist  
Research associate

*(Some positions in non Patient-Care areas may also require you to be a registered pharmacist with the Singapore Pharmacy Council)*

### B.Sc. (Hons) in Pharmaceutical Science

Leadership positions in pharmaceutical industry  
Pharmaceutical scientist  
Medical affairs specialist  
Quality assurance scientist  
Quality control scientist  
Research associate  
Regulatory specialist  
Supply chain and logistics manager

## Typical Sectors of Employment

Pharmaceuticals  
Biomedical  
Consumer healthcare  
Medical devices

## Examples of Industries/Sectors

Basic sciences research  
Clinical trials  
Government agencies  
Health product research, discovery and development, and regulation  
Pharmaceutical manufacturing  
Sales and marketing

## Examples of Industries/Sectors

Clinical research  
Clinical trials  
Government agencies  
Product regulation  
Healthcare informatics  
Pharmacovigilance  
Sales and marketing

## Undergraduate Programmes Graduate Programmes

### **NEW!** B.PHARM. (HONS) AND B.PHARM.

This four-year flagship programme educates graduates who, upon registration as pharmacists, may use their medication therapy expertise to benefit patients. To support our future healthcare focus, the current programme will be transformed into a fully integrated curriculum in Academic Year 2020/2021.

The programme integrates the roles of care provider, communicator, collaborator, leader-manager, health advocate and scholar-innovator. You can provide care collaboratively, improve health quality and patient safety, and innovate with health information technology.

The programme develops the professional identity of a pharmacist through experiential and classroom learning.

This is the only degree in Singapore recognised by the Singapore Pharmacy Council (SPC) for registration as a pharmacist (see page 3).

### B.SC. (HONS) IN PHARMACEUTICAL SCIENCE

This four-year programme focuses on the pharmaceutical sciences, culminating in an understanding of drug discovery and development, and appreciation of the regulatory and commercial environment in the pharmaceutical industries.

You will be equipped to address complex pharmaceutical problems through integrated knowledge of pharmaceutical chemistry, biology, formulation science, technology and regulatory sciences.

There are wide-ranging experiential learning opportunities that enhance your readiness for the real world, such as industry internships, research attachments and overseas exchange programmes.

*For information on the department's Minor in Pharmaceutical Science, please refer to "Admissions Information".*

### M.SC. IN (PHARMACEUTICAL SCIENCE AND TECHNOLOGY) BY COURSEWORK

This part-time programme is designed for those who are already working in, or aspiring to enter the pharmaceutical industry.

You will acquire in-depth knowledge and practical skills for the formulation and process manufacturing of chemical and biological drugs into various dosage forms, and gain understanding of regulatory and quality compliance in the process of drug development and manufacturing.

### M.SC./PH.D. BY RESEARCH

This programme is suitable for those with a good basic degree in science, engineering or health-related disciplines who wish to enhance competencies in independent research in a specialised area relevant to pharmaceutical sciences.

### PHARM.D. (DOCTOR OF PHARMACY) BY COURSEWORK AND CLINICAL CLERKSHIP

This two-year full-time programme (also available part-time), comprising both active learning and clerkship components, equips pharmacists with additional clinical knowledge, as well as clinical skills and attitudes to deliver quality and safe medication therapies to patients in collaboration with other health professionals.

It builds on the undergraduate programme foundations and focuses on pharmacotherapy topics in greater depth.

This programme contributes to the development of Specialist Clinical Pharmacists in Singapore.

# DEPARTMENT OF PHYSICS

## Undergraduate Programmes

### B.SC. (HONS) AND B.SC. IN PHYSICS

You will learn theoretical and experimental skills for solving complex problems, by studying Classical and Quantum Mechanics; Electromagnetism; Thermodynamics; Atomic and Nuclear Physics; Nanophysics; and Relativity.

Honours students can either pursue a general Honours degree or one of these specialisations:

- **Astrophysics:** This focuses on celestial physics and cosmology, and is suitable for aspiring physics teachers.
- **Nanophysics:** This focuses on the scientific principles behind the technological and industrial developments of nanoscale materials with advanced functionalities.
- **Quantum Technologies:** This focuses on the foundations of quantum mechanics and its applications to sensing, communication, computation and cryptography.

*For information on the department's Second Major and Minor courses, please refer to "Admissions Information".*

## Graduate Programmes

### M.SC. BY COURSEWORK

This programme leads to an M.Sc. degree in either physics or applied physics, enabling educators and professionals to further upgrade their professional skills and qualifications.

Applied physics focuses on advanced training in areas such as semiconductor manufacturing, photonics and biophysics. It is suitable for physics graduates and professionals who wish to upgrade their professional skills and qualifications, or to switch to the high technology industry.

### M.SC./PH.D. BY RESEARCH

Possible research areas include: Acoustics and Computer Simulations; Astrophysics; Atomic Physics; Condensed Matter Physics; High Energy Physics; Infrared Spectroscopy; Ionics; Ion Beam Applications; Laser Optics; Materials Science; Optics; Quantum Technologies; Solid-State X-Ray Fluorescence; Superconductors; and Surface Physics.

## Possible Careers

Computer architecture designer  
Data scientist  
Educator  
Engineer  
Geophysicist  
Industrial design planner  
Instrumentation specialist  
Materials scientist  
Medical and radiation physicist  
Medical technologist  
Meteorologist  
Renewable energy expert  
Researcher  
Science journalist  
Solar energy physicist  
Structural engineer

## Examples of Industries/Sectors

Defence  
Education  
Energy  
Engineering  
Environment and climate  
Financial services  
Government agencies  
Healthcare  
Infocommunication technologies  
Materials  
Microelectronics  
Physical sciences  
Research and development  
Scientific consultation  
Semiconductors  
Service industries



### Department of Pharmacy

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# DEPARTMENT OF STATISTICS AND APPLIED PROBABILITY

## Possible Careers

Actuary  
Biostatistician  
Business analyst  
Consumer intelligence analyst  
Consumer risk analyst  
Data scientist  
Educator  
Financial analyst  
Pharmaceutical engineer  
Pricing analyst  
Quality assurance officer  
Researcher  
Statistician

## Examples of Industries/Sectors

Biomedical sciences  
Chemicals  
Consumer businesses  
Education  
Electronics  
Financial services  
Government agencies  
Healthcare  
Infocommunication technologies  
Insurance  
Manufacturing  
Pharmaceuticals  
Research and development  
Telecommunications  
Transportation

## Undergraduate Programmes

### B.SC. (HONS) AND B.SC. IN STATISTICS

You will learn about the scientific application of mathematical principles to the collection, analysis and presentation of data, to gain insights which enable data-drive decisions.

Honours students can either pursue a general Honours degree or one of these specialisations:

- **Data Science:** This covers computing concepts and skills, enabling you to manage the collection, storage and analysis of large amounts of data in virtually every field.
- **Finance and Business Statistics:** This covers the application of statistics to the areas of investment and financial analysis, insurance, marketing research and management.

### B.SC. (HONS) IN DATA SCIENCE AND ANALYTICS

This four-year direct Honours programme is designed with sufficient technical depth to equip graduates with the ability to develop novel analytical tools for new scientific applications and industry problems. It is jointly offered by the Department of Statistics and Applied Probability and the Department of Mathematics, in conjunction with the Department of Computer Science in the School of Computing (see page 13).

*For information on the department's Second Major and Minor courses, please refer to "Admissions Information".*

## Graduate Programmes

### M.SC. IN STATISTICS BY COURSEWORK

This is designed for students from statistics, mathematics or related fields.

You will acquire practical skills to solve real-world industry problems, and knowledge of statistical principles and methods required in the application of statistics.

### **NEW!** M.SC. IN DATA SCIENCE AND MACHINE LEARNING BY COURSEWORK

This one-year full-time programme will help to meet the growing demand for Big Data professionals by transforming graduates with Bachelor degrees in quantitative science (e.g. mathematics, applied mathematics, statistics and physics) into practitioners. The M.Sc. in Data Science and Machine Learning is offered jointly by the Department of Mathematics, the Department of Statistics and Applied Probability, and the Department of Computer Science in the School of Computing, with support from the Faculty of Engineering, and the Saw Swee Hock School of Public Health (see pages 3, 9).

### M.SC. IN STATISTICS BY RESEARCH

You will acquire advanced knowledge of theoretical and applied statistics.

Possible research areas include: Biostatistics; Computational Statistics; Financial Statistics; High Dimensional Data Analysis; and Probability Theory and Applications.

### PH.D. IN STATISTICS BY RESEARCH

You will acquire skills to produce high-quality statistical research, for careers in research and development, and academia.

Possible research areas include: Bayesian Inference; Biostatistics; Functional Data Analysis; High Dimensional Data Analysis; and Probability Theory and Applications.

# DATA SCIENCE AND ANALYTICS PROGRAMME

## Undergraduate Programme

The **B.Sc. (Hons) in Data Science and Analytics** is a four-year direct Honours programme which equips you with the ability to develop novel analytical tools to address data-driven problems in businesses and new scientific applications. This programme is jointly offered by the Department of Statistics and Applied Probability and the Department of Mathematics, in conjunction with the Department of Computer Science in the School of Computing (see pages 9, 12).

In this interdisciplinary programme, you will read modules in mathematics, statistics and computer science, and be exposed to the interplay among these three key areas in the practice of data science.

In Years 3 and 4, you will delve in-depth into analytics methods such as artificial intelligence; computation and optimisation; computer algorithms; database and data processing; data mining and machine learning; and high dimensional statistics; as well as applications of analytics to various domains.

## Programme highlights

**Capstone module:** The industry-driven module enables you to work on research and projects that are related to real-life data and workplace challenges.

**NUS Co-Operative Education Programme:** You may gain extensive workplace experience by spending 18 months (five consecutive semesters and terms) with reputable employers.

This programme will enhance your employability upon graduation for careers in diverse industries and businesses that require insights from Big Data which will enable them to be smarter, more productive and more competitive.

### SECOND MAJOR IN DATA ANALYTICS

This programme enables you to apply computing and statistical methods to analyse and model complex data in your respective domains.

*For information on the department's Second Major in Data Analytics, please refer to "Admissions Information".*

## Possible Careers

Actuary  
Artificial intelligence specialist  
Big Data analyst  
Biostatistician  
Business analytics specialist  
Consumer insights analyst  
Data analytics specialist  
Data scientist  
Educator  
Machine learning scientist  
Statistician

## Examples of Industries/Sectors

Biomedical sciences  
Consumer businesses  
Education  
Financial services  
Government agencies  
Healthcare  
Infocommunication technologies  
Insurance  
Manufacturing  
Pharmaceuticals  
Research and development  
Safety and security  
Telecommunications  
Transportation



### Department of Statistics and Applied Probability

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# COMPUTATIONAL BIOLOGY PROGRAMME

## Possible Careers

Bioinformatician  
Clinical bioinformatics data scientist  
Computational microbiologist  
Computational modeller  
Computational scientist  
Gaming specialist  
Project scientist  
Researcher  
Software developer  
Technology analyst

## Examples of Industries/Sectors

Biotechnology  
Government agencies  
Healthcare  
Infocommunication technologies  
Pharmaceuticals  
Research and development  
Scientific services

## Undergraduate Programme

The **B.Sc. (Hons) in Computational Biology** is a four-year multidisciplinary programme focusing on computer-based analysis of biological problems, the fastest growing area of the life sciences.

The programme is suitable for students with keen interest in mathematics, computing and life sciences.

It also provides excellent research opportunities and mentorship. You are often mentored by two professors from different faculties.

In Years 1 and 2, you will learn about the foundations of university-level life sciences, mathematics and statistics, and computer science; how to develop, apply and interpret algorithms to biology; and how to reason analytically about biological problems.

In Years 3 and 4, you can focus on your interests, culminating with a two-semester final year research project.

### Key specialisation topics

- Big Data analysis of next-generation DNA and RNA sequencing
- Modelling of biological systems
  - Computational genomics
  - Computational neuroscience
  - Computer-aided drug design
- Theoretical foundations and analysis of genes/proteins
- Biological and pharmaceutical databases

You will acquire broadly applicable skills in modern biological sciences, mathematical and statistical analysis, as well as computer science.

# ENVIRONMENTAL STUDIES PROGRAMME

## Undergraduate Programme

The **Bachelor of Environmental Studies** is a four-year direct Honours degree programme jointly hosted by the Faculty of Science and the Faculty of Arts and Social Sciences, with participation from the Faculty of Engineering, Faculty of Law, School of Design and Environment, NUS Business School and the Saw Swee Hock School of Public Health.

It adopts an interdisciplinary approach in addressing complex, modern environmental issues such as climate change, land use, water usage, alternative energy and the building of liveable high-density cities.

The programme includes a two-year broad-based curriculum where you read core modules in biology, chemistry, economics, geography, law, management, mathematics, policy, public health and statistics.

You can specialise in either Environmental Biology or Environmental Geography:

**Environmental Biology:** This includes modules in Behavioural Biology; Biodiversity; Evolution; Field Studies; Freshwater and Terrestrial Ecology; Marine Biology; and Physiology.

**Environmental Geography:** This includes modules in Climate; Economics; Environmental Management; Geography; Geographical Information Systems; Geosciences; Modelling; and Sustainability.

### Three capstone modules

**ENV3101 and ENV3102: Environmental Challenges: Asian Case Studies:** These two interconnected modules include an extended field trip to one of the countries in the Asia region in ENV3102, where you can experience first-hand the issues you studied in ENV3101.

**ENV4101: Environmental Management in Singapore:** This is a townhall style series where you can discuss a range of professional topics with environmental experts. These roundtable discussions provide an opportunity to learn about the ins and outs of these fields.

### Programme highlights

Specially designed integrated modules emphasise small-group discussions, case studies, fireside chats and guest lectures with environmental luminaries, policy-makers and government officials.

You can participate in undergraduate research, as well as internships with environmental agencies, natural resource management agencies and environmental research centres/institutes, which provide you practical exposure at the workplace.

You will undertake real-world and real-time field studies to understand selected environmental challenges facing Asia.

## Possible Careers

Conservation biologist  
Ecologist  
Educator  
Environmental consultant  
Environmental health officer  
Environmental impact assessor  
Environmental quality specialist  
Environmental sustainability specialist  
Environmental technologist  
Forest conservationist  
Park manager  
Public policy analyst  
Researcher  
Wildlife biologist

## Examples of Industries/Sectors

Ecotourism  
Education  
Environmental consultancy  
Environmental management  
Environmental planning  
Government agencies  
Natural resource management  
Research and development  
Sustainable development



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# SPECIAL PROGRAMMES

The Faculty of Science offers a range of special programmes for students to enrich and enhance their learning, while catering to their diverse interests.

## **Joint Degree Programme with The Australian National University (ANU) Bachelor of Philosophy (Hons)**

This four-year programme combines the Bachelor of Philosophy (Hons) degree of ANU with NUS' B.Sc. (Hons) degree.

It is offered to NUS Science students in the University Scholars Programme (USP) who are majoring in Chemistry, Mathematics and Physics, and is suitable if you have an interest in, and aptitude for graduate research work.

Up to six students are accepted into the programme annually.

You will spend three semesters at NUS, followed by three semesters at ANU, before returning to NUS to complete the Honours year.

You will acquire a strong foundation in critical analysis and in-depth perspectives into the principles of each subject, while actively undertaking independent undergraduate research work.

Applications open in September/October each year. Successful students are provisionally admitted to the programme based on academic performance and other relevant qualifications. Official admission into the programme is at the end of the third semester of study.

## **Joint Degree Programme with The University of North Carolina at Chapel Hill (UNC-CH) B.Sc. in Biology**

This four-year programme, offered in collaboration between the Faculty of Science and the College of Arts and Sciences, UNC-CH, leads to a B.Sc. (Hons) in Life Sciences from NUS and a B.Sc. in Biology from UNC-CH.

It offers students from both institutions a unique learning experience encompassing advanced life sciences modules, undergraduate research and exposure to UNC-CH's liberal arts education.

You will generally spend Semesters 1 to 4 in NUS, Semesters 5 and 6 in UNC-CH and Semesters 7 and 8 in NUS.

Upon graduation, you will receive a degree jointly validated by NUS and UNC-CH.

## **Joint Degree Programme with University of Dundee (UoD) B.Sc (Hons) in Biological Sciences/Biomedical Sciences**

This programme is jointly offered by NUS' B.Sc. (Hons) in Life Sciences and UoD's B.Sc. (Hons) in Biological Sciences/Biomedical Sciences, and equips you with drug discovery and design expertise.

The first of its kind joint Honours programme enables NUS Life Sciences students to complete a full-year research project at UoD in drug discovery and design.

Upon graduation, you will receive a degree jointly validated by NUS and UoD (see page 6).

## **Joint Minor Programme in Environmental Biology or Environmental Chemistry with University of Toronto (U of T)**

You can read advanced courses for one semester in U of T, renowned for its environmental sciences. In the Environmental Biology focus, you will gain understanding of how environmental changes impact the ecology and biodiversity. In the Environmental Chemistry focus, you will develop insights on how chemical processes due to natural and human causes influence environmental elements such as soil, air and water.

*For more information, please visit [www.science.nus.edu.sg/wp-content/uploads/2019/11/JMP.pdf](http://www.science.nus.edu.sg/wp-content/uploads/2019/11/JMP.pdf). You can also email your enquiries to [scisap@nus.edu.sg](mailto:scisap@nus.edu.sg).*

# SPECIAL PROGRAMMES

## **NUS-Grandes Écoles French Double Degree Programme (FDDP)**

The Grandes Écoles are a cluster of world-renowned institutions of higher scientific learning with a history of over 200 years, known for educating France's technical and management elites. NUS has set up Double Degree Programmes with six premier French Grandes Écoles:

- Centrale Supélec (CS)
- École Polytechnique (X)
- École Nationale Supérieure des Mines de Paris (Mines ParisTech)
- École Nationale Supérieure de Techniques Avancées (ENSTA)
- École Nationale Supérieure des Télécommunications (Telecom ParisTech)
- École Nationale des Ponts et Chaussées (Ponts ParisTech)

Students are selected in the first year from amongst top engineering, science and computing applicants.

Grandes Écoles place strong emphasis on mathematics and physics curricula in the first year.

You will undergo French language preparation, spend your third and fourth year in a French institution, and return to NUS for your M.Sc. programme.

Upon graduation, you will receive three degrees - a B.Sc. (Hons) degree, an M.Sc. degree from NUS and a Diplôme d'Ingenieur (the equivalent of Masters in France) from a French Grande École.

*For more information on FDDP, please visit [www.science.nus.edu.sg/education/undergraduates/special-programmes/french-double-degree-programme-fddp/](http://www.science.nus.edu.sg/education/undergraduates/special-programmes/french-double-degree-programme-fddp/). You can also email your enquiries to [askscience@nus.edu.sg](mailto:askscience@nus.edu.sg).*

## **Special Programme in Science (SPS)**

SPS is designed for students with a passion in science, technology and research. The programme trains you to better understand and address modern multidisciplinary scientific challenges.

SPS is organised around an Integrated Science Curriculum comprising four custom-designed thematic modules (integrating biology, chemistry, mathematics and physics) and two research-oriented modules.

You can participate in an established student mentorship scheme, where you can develop and hone your teamwork and leadership skills. You will do this in a tightly knit, multidisciplinary community of staff and students with a common goal of scientific excellence.

You will acquire scientific, computational and communication skills essential for today's workforce, as well as creative and critical thinking through novel pedagogy.

Admission is by interview. We look for a passion in science and the willingness to learn new things out of your comfort zone.

*For more information on SPS, please visit <http://sps.nus.edu.sg>. You can also email your enquiries to [enquire@sps.nus.edu.sg](mailto:enquire@sps.nus.edu.sg).*

## **Special Programme in Mathematics (SPM)**

SPM is specially designed for a select group of students who have a strong passion and aptitude for the mathematical sciences.

It comprises a number of specially designed modules ("S-modules") in foundational mathematics, which are taught in greater depth and sophistication than their regular versions.

Under the close mentorship of faculty members, you will participate in two semesters of undergraduate seminars in the form of topic modules.

You can participate in undergraduate research programmes locally and overseas, as well as graduate programmes at the Department of Mathematics.

*For more information on SPM, please visit <http://ww1.math.nus.edu.sg/undergraduates.aspx?f=UP-SPM>.*

# SPECIAL PROGRAMMES

## University Scholars Programme (USP)

This multi- and interdisciplinary academic programme shapes independent, adaptable thinkers and doers through its transformative learning environment, innovative curriculum and diverse global opportunities.

The programme admits students from seven Faculties/Schools - Arts and Social Sciences; Business; Computing; Design and Environment; Engineering; Science; and Law.

You will be challenged to build upon, or go beyond your majors, by thinking critically and approaching topics from different disciplinary perspectives. This enables you to make connections across disciplines and challenge conventional ways of thinking.

You will attend seminar-style classes, and do 30% of your academic work in USP and 70% in your home Faculty/School where you read your majors.

You will flourish in different ways through an enriching residential experience in an organic, self-driven environment that encourages exchange, peer learning and collaboration. This is achieved by living at the USP residential college – Cinnamon College – at University Town, for two or more years.

You will organise or take part in USP International Programmes, which challenge you on issues outside your fields of interest and enhance your global perspectives.

USP admission opens every year with NUS' general admissions and shortlisted applicants will be interviewed. A second USP admission exercise is also considered for Faculty of Science freshmen in the 2nd semester of study.

USP is not a scholarship disbursement programme. You may, however, apply for NUS scholarships or be recipients of other scholarships. There are also financial aid initiatives and scholarships in USP to help you defray the cost of studying and living on campus.

Upon successful completion of USP requirements and an Honours programme, you will graduate with an Honours degree from your Faculty/School and receive a certificate of recognition as a University Scholar.

For more information on USP and application timelines, please visit [www.usp.nus.edu.sg](http://www.usp.nus.edu.sg). You can also email your enquiries to [usp@nus.edu.sg](mailto:usp@nus.edu.sg).

## Undergraduate Research Opportunities Programme in Science (UROPS)

This programme provides you a unique opportunity to work with our faculty members to experience the challenges and benefits of undertaking an independent research project.

You will get to work at the frontiers of scientific research and closely engage established scientists in their fields.

You will enhance your knowledge in the latest developments in science and technology, and acquire communication and presentation skills.

You can take a UROPS project during regular semesters or special terms (May to July).

For more information on UROPS, please visit [www.science.nus.edu.sg/education/undergraduates/undergraduate-research-opportunities-programme-in-science-urops/](http://www.science.nus.edu.sg/education/undergraduates/undergraduate-research-opportunities-programme-in-science-urops/). You can also email your enquiries to [scienhance@nus.edu.sg](mailto:scienhance@nus.edu.sg).

## Internships

There are multiple opportunities during your candidature to take up internships at renowned local and international organisations, through the Undergraduate Professional Internship Programme (UPIP) and Final Year Internship (FYI).

These programmes are an important part of experiential learning, which reinforces and enhances classroom learning. You will get to:

- **Broaden your perspective:** You will gain knowledge of companies and careers relevant to the industry sector of the internship provider. Internships prepare you to become workforce-ready upon graduation.
- **Translate scientific principles:** You will become adept in applying classroom learning to practical assignments at the workplace and address real-world problems.
- **Develop your network:** You can establish personal and professional networks before graduation.

Upon successful completion of the internship, you will also be awarded modular credits that count towards your graduation requirement.

For more information on internships, please visit [www.science.nus.edu.sg/industry/internships/undergraduate-professional-internship-programme-upip/](http://www.science.nus.edu.sg/industry/internships/undergraduate-professional-internship-programme-upip/). You can also email your enquiries to [sciupip@nus.edu.sg](mailto:sciupip@nus.edu.sg).

# STUDY ABROAD PROGRAMMES

Study abroad programmes with over 300 overseas partner universities open the door to a global learning experience. You will gain exposure to different cultures and academic environments. Ranging from a few weeks to two years, these programmes allow you to study abroad as part of your undergraduate studies in NUS while paying only home university fees. Courses taken as part of study abroad programmes could earn you modular credits towards fulfilling graduation requirements.

## Student Exchange Programmes

Going on exchange allows you to take modules not taught in NUS.

You will spend one semester or two at an overseas partner university.

We have collaborations with over 300 reputable partner universities. These include: University College Cork; Radboud University; University of Toronto; Colgate University; Cornell University; The University of North Carolina at Chapel Hill; La Trobe University; Chang Gung University; Nagoya University; and many more.

## Summer Programmes

Summer programmes allow you to take NUS modules in an overseas setting.

Spanning three to eight weeks, these programmes are ideal should you prefer to gain overseas learning experience outside regular semesters.

Some partner universities offering summer programmes include: University of Toronto; The University of North Carolina at Chapel Hill; and Hokkaido University.

Places offered by our partner universities are reserved for NUS Science students only.

## Overseas Summer Research Programmes

Students spend eight to 12 weeks in the laboratories of our partner universities or in overseas research institutes.

Students from all disciplines can enrol in these programmes.

Some partner universities and research institutes include: University of Cambridge; The University of North Carolina at Chapel Hill; University of Alberta; University of Toronto;

University Autónoma de Madrid; King Abdullah University of Science and Technology; Shanghai Jiao Tong University; and Chang Gung University.

## NUS Overseas Colleges (NOC) Programme

Under the NUS Overseas Colleges (NOC) programme, selected students will get to work at leading entrepreneurial hotspots across the globe - Beijing, Israel, New York, Southeast Asia, Shanghai, Shenzhen, Silicon Valley, Singapore, Stockholm and Toronto - while taking classes at our renowned partner universities like Stanford University, Tsinghua University and KTH Royal Institute of Technology.

Our programmes run between three months to a year. You will gain firsthand insights into the operations of innovative startups and experience the challenges faced by the founders of these companies.

For more information on our study abroad programmes, please visit [www.science.nus.edu.sg/education/undergraduates/study-abroad-programmes/outgoing/](http://www.science.nus.edu.sg/education/undergraduates/study-abroad-programmes/outgoing/). You can also email your enquiries to [scisap@nus.edu.sg](mailto:scisap@nus.edu.sg).

# ADMISSIONS INFORMATION

## Admission Requirements for Students with GCE 'A' Level (H1/H2) Qualifications or Equivalent

For admission to the Faculty of Science (FoS), you must have good GCE 'A' Level (H2) passes or equivalent in at least two of these Science subjects: Biology, Chemistry, Computing, Physics and Mathematics/Further Mathematics.

Students admitted to FoS will choose their major in July if they meet the prerequisites for that major. If you intend to pursue major courses like Data Science and Analytics, Environmental Studies, Food Science and Technology, or Pharmaceutical Science or Pharmacy, you can apply for any of them via the online application form.

Primary Majors Leading to an Honours Degree	Prerequisites for Students Offering H2 Curriculum or Equivalent
<ul style="list-style-type: none"> <li>• Chemistry</li> <li>• Chemistry Specialisation in Materials Chemistry Specialisation in Medicinal Chemistry Specialisation in Environment and Energy</li> </ul>	Good H2 pass (or equivalent) in Chemistry and at least a good 'O' Level pass (or equivalent) in Mathematics
<ul style="list-style-type: none"> <li>• Computational Biology<sup>a#</sup></li> </ul>	Good H2 passes (or equivalent) in Mathematics/Further Mathematics, and either Biology or Chemistry  <i>Students without H2 passes (or equivalent) in either Biology or Chemistry should have at least an 'O' Level (or equivalent) pass in it [subject to departmental approval].</i>
<ul style="list-style-type: none"> <li>• Data Science and Analytics<sup>#</sup></li> </ul>	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
<ul style="list-style-type: none"> <li>• Food Science and Technology</li> </ul>	Good H2 pass (or equivalent) in Chemistry and a good H2 pass (or equivalent) in Biology or Physics or Computing or Mathematics/Further Mathematics  <i>Students without H2 pass (or equivalent) in Biology are required to read the bridging module in Biology (i.e. LSM1301) in Semester 1 to fulfil the prerequisites for the relevant Level 1000 Life Sciences module in the syllabus.</i>

Primary Majors Leading to an Honours Degree	Prerequisites for Students Offering H2 Curriculum or Equivalent
<ul style="list-style-type: none"> <li>• Life Sciences</li> <li>• Life Sciences Specialisation in Biomedical Science Specialisation in Environmental Biology Specialisation in Molecular and Cell Biology</li> </ul>	Two good H2 passes (or equivalent) in Biology or Chemistry or Mathematics/Further Mathematics or Physics  <i>Students without H2 pass (or equivalent) in Biology or Chemistry may read the relevant bridging modules as entry requirements.</i>
<ul style="list-style-type: none"> <li>• Mathematics</li> <li>• Applied Mathematics</li> <li>• Applied Mathematics Specialisation in Mathematical Modelling and Data Analytics Specialisation in Operations Research and Financial Mathematics</li> <li>• Quantitative Finance<sup>*</sup></li> </ul>	Good H2 pass (or equivalent) in Mathematics/Further Mathematics  <i>Subject to departmental approval (applicable to Quantitative Finance only).</i>
<ul style="list-style-type: none"> <li>• Pharmaceutical Science<sup>#</sup></li> </ul>	Very good H2 pass (or equivalent) in Chemistry and a very good H2 pass (or equivalent) in Biology or Physics or Mathematics/Further Mathematics
<ul style="list-style-type: none"> <li>• Pharmacy<sup>#</sup> <i>(Professional programme where application is by direct admission only)</i></li> </ul>	Very good H2 passes (or equivalent) in Chemistry and either Biology, Mathematics/Further Mathematics or Physics
<ul style="list-style-type: none"> <li>• Physics</li> <li>• Physics Specialisation in Astrophysics Specialisation in Nanophysics Specialisation in Quantum Technologies</li> </ul>	Good H2 passes (or equivalent) in Physics and Mathematics/Further Mathematics
<ul style="list-style-type: none"> <li>• Statistics</li> <li>• Statistics Specialisation in Data Science Specialisation in Finance and Business Statistics</li> </ul>	Good H2 pass (or equivalent) in Mathematics/Further Mathematics
Interdisciplinary Degree Programme	Prerequisites for Students Offering H2 Curriculum or Equivalent
<ul style="list-style-type: none"> <li>• Environmental Studies Programme<sup>#</sup> Specialisation in Environmental Biology</li> </ul>	Good H1 pass (or equivalent) in Mathematics and a good H2 pass (or equivalent) in Biology or Chemistry

### NOTE

a) \* Admission to FoS does not automatically qualify you to choose these majors as there will be additional departmental selection due to limited places.

b) # These are strict four-year programmes. Students in other majors can graduate with a Bachelor of Science (B.Sc.) degree after three years.

c) Specialisations are awarded only with a B.Sc. (Hons) degree.

## Courses Beyond Primary Major

FoS offers a flexible curriculum, allowing you to enrich and broaden your educational experience. You can choose other courses and programmes beyond your primary major course. You may do a double degree (two degrees with two full majors), choose a double major (one primary and one second major) and/or minor programmes within and outside the Faculty.

### Within the Faculty of Science

Second Majors (Optional)	Prerequisites for Students Offering H2 Curriculum or Equivalent
• <b>Chemistry</b>	Good H2 pass (or equivalent) in Chemistry
• <b>Data Analytics</b>	Very good H2 pass (or equivalent) in Mathematics/Further Mathematics
• <b>Life Sciences</b>	Two good H2 passes (or equivalent) in Biology or Chemistry or Mathematics/Further Mathematics or Physics
• <b>Mathematics</b> • <b>Statistics</b>	Good H2 pass (or equivalent) in Mathematics/Further Mathematics
• <b>Physics</b>	Good H2 pass (or equivalent) in Physics

Minors (Optional)	Prerequisites for Students Offering H2 Curriculum or Equivalent
• <b>Analytical Chemistry</b>	Good H2 pass (or equivalent) in Chemistry
• <b>Biophysics</b>	Good H2 passes (or equivalent) in Physics, Chemistry and/or Biology
• <b>Forensic Science*</b>	Good pass in the gateway module LSM 1306 Forensic Science
• <b>Life Sciences</b>	Good H2 pass (or equivalent) in Biology
• <b>Mathematics</b> • <b>Financial Mathematics</b> • <b>Statistics</b>	Good H2 pass (or equivalent) in Mathematics/Further Mathematics
• <b>Nanoscience</b>	Good H2 pass (or equivalent) in Chemistry or Physics

Minors (Optional)	Prerequisites for Students Offering H2 Curriculum or Equivalent
• <b>Pharmaceutical Science*</b>	Good H2 pass (or equivalent) in Chemistry or Biology
• <b>Physics</b>	Good H2 pass (or equivalent) in Physics
• <b>Geosciences</b> <i>Co-hosted by FoS and Faculty of Arts and Social Sciences (FASS)</i>	Nil

Joint Minors (Optional)	Prerequisites for Students Offering H2 Curriculum or Equivalent
• <b>Aquatic Ecology*</b>	Open to students from all disciplines, except those who are reading the Bachelor of Environmental Studies programme from Academic Year 2016/2017 and onwards. An interview is required.
• <b>Engineering Materials*</b>	Good H2 pass (or equivalent) in Chemistry or Physics
• <b>Environmental Biology*</b>	Good H2 passes (or equivalent) in Biology and Mathematics/Further Mathematics
• <b>Environmental Chemistry*</b>	Good H2 passes (or equivalent) in Physics and Mathematics/Further Mathematics
• <b>Medical Physics*</b>	Open to students from Faculty of Science and Faculty of Engineering (FoE) with good H2 passes (or equivalent) in Physics and Biology

#### NOTE

\* Application is subject to departmental approval.

You can apply directly to the following double major programme within FoS via the online admission application form.

FoS Primary Major	Second Major (From FoS)	Admission Requirements*
<b>Chemistry</b>	<b>Food Science</b>	Good H2 pass (or equivalent) in Chemistry and a good H2 pass (or equivalent) in Biology or Physics or Computing or Mathematics/Further Mathematics

#### NOTE

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

## Outside the Faculty of Science

You can apply directly to the following double major programmes via the online admission application form.

FoS Primary Major	Second Major (From 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 (SoC)	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

## Major with Minor Programmes

Students can apply directly to the following major with minor programmes via the online admission application form.

FoS Primary 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 (Biz)	Good H2 pass (or equivalent) in Mathematics/Further Mathematics
Applied Mathematics	Entrepreneurship (Biz)	Good H2 pass (or equivalent) in Mathematics/Further Mathematics
Statistics	Entrepreneurship (Biz)	Good H2 pass (or equivalent) in Mathematics/Further Mathematics
Data Science and Analytics	Entrepreneurship (Biz)	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 (Biz)	Two good H2 passes (or equivalent) in Biology or Chemistry or Mathematics/Further Mathematics or Physics
Food Science and Technology	Entrepreneurship (Biz)	Good H2 pass (or equivalent) in Chemistry and a good H2 pass (or equivalent) in Biology or Physics or Computing or Mathematics/Further Mathematics

### NOTE

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

### LEGEND

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

After admission to FoS, you can also self-design your own Major/Second Major or Double Degree combinations as shown below.

### Examples of Possible Double Major Combinations

- Chemistry and Geography
- Chemistry and Management
- Chemistry and Political Science
- Life Sciences and English Language
- Life Sciences and Sociology
- Mathematics and Chinese Studies
- Quantitative Finance and Economics

### Examples of Possible Double Degree Combinations

- Chemistry and Business Administration
- Life Sciences and Business Administration
- Life Sciences and Computer Science
- Life Sciences and Economics
- Mathematics/Applied Mathematics and Business Administration
- Mathematics/Applied Mathematics and Computer Science
- Mathematics/Applied Mathematics and Economics
- Physics and Materials Science and Engineering
- Physics and Mechanical Engineering
- Quantitative Finance and Business Administration
- Quantitative Finance and Economics
- Statistics and Business Administration

For more information on self-designed programmes, please visit NUS' Registrar's Office website at <http://www.nus.edu.sg/registrar/academic-information-policies/undergraduate-students/special-programmes/double-major-programmes>. You can also email your enquiries to [askscience@nus.edu.sg](mailto:askscience@nus.edu.sg).

## Admission Requirements for Polytechnic Diploma Holders

Local polytechnic applicants (regardless of nationality) will be considered for admission if their diplomas are accredited to our Environmental Studies, Pharmaceutical Science, Pharmacy or Science courses.

Nanyang Polytechnic	NUS Major Courses
<b>Biologics and Process Technology</b>	Science (Chemistry)
<b>Biomedical Engineering</b>	Science (Physics)
<b>Chemical and Green Technology</b>	Environmental Studies Science (Chemistry)
<b>Chemical and Pharmaceutical Technology</b>	Science (Chemistry)
<b>Digital and Precision Engineering</b>	Science (Physics)
<b>Electronic Systems</b> <i>(Previously named as Electronics, Computer and Communication Engineering)</i>	Science (Physics)
<b>Engineering with Business</b> <i>(For 2017 polytechnic graduates onwards)</i>	Science (Physics)

## Nanyang Polytechnic

Nanyang Polytechnic	NUS Major Courses
<b>Food Science and Nutrition</b> <i>(Previously named as Food Science)</i>	Science (Chemistry) Science (Food Science and Technology) Science (Life Sciences)
<b>Manufacturing Engineering</b>	Science (Physics)
<b>Mechatronics Engineering</b>	Science (Physics)
<b>Medicinal Chemistry</b>	Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Molecular Biotechnology</b>	Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Molecular Biotechnology</b> <i>(Pharmaceutical and Clinical Trial track)</i>	Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Molecular Biotechnology</b> <i>(R&amp;D/Bioenterprise/Manufacturing track)</i>	Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Nanotechnology and Materials Science</b>	Science (Chemistry) Science (Physics)
<b>Nursing (three-year programme)</b>	Science (Life Sciences)
<b>Pharmaceutical Sciences</b>	Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)

## Ngee Ann Polytechnic

Ngee Ann Polytechnic	NUS Major Courses
<b>Aerospace Technology/Aerospace Technology</b> <i>(With minor in Business Management)</i>	Science (Physics)
<b>Biomedical Engineering/Biomedical Engineering</b> <i>(With minor in Business Management)</i>	Science (Computational Biology) Science (Life Sciences) Science (Physics)

## Ngee Ann Polytechnic

## NUS Major Courses

<b>Biomedical Laboratory Technology/Biotechnology</b>	Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Biomedical Science</b> <i>(For 2015 polytechnic graduates onwards)</i> • <b>Specialisation: Clinical Laboratory Technology</b> • <b>Specialisation: Biomedical Research</b> • <b>Specialisation: Medicinal Chemistry (renamed)</b>	Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Biomedical Science</b> <i>(For 2014 polytechnic graduates or earlier)</i> <b>/ Biomedical Science</b> <i>(Medical Laboratory Technology option)</i>	Environmental Studies Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Chemical Engineering</b>	Science (Chemistry)
<b>Chemical and Biomolecular Engineering</b>	Science (Chemistry)
<b>Electrical Engineering/Electrical Engineering</b> <i>(With minor in Business Management)</i>	Science (Physics)
<b>Engineering Science</b>	Science (Physics)
<b>Environmental and Water Technology</b>	Environmental Studies
<b>Landscape Design and Horticulture</b> <i>(Previously named as Horticulture and Landscape Management)</i>	Science (Life Sciences)
<b>Molecular Biotechnology</b>	Environmental Studies Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Optometry</b>	Science (Life Sciences)
<b>Pharmacy Science</b>	Science (Chemistry) <i>[For 2013 polytechnic graduates and earlier, and for 2017 polytechnic graduates onwards]</i> Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Veterinary Bioscience</b>	Environmental Studies Science (Life Sciences)

## Republic Polytechnic

## NUS Major Courses

<b>Aerospace Engineering</b>	Science (Physics)
<b>Biomedical Electronics</b>	Science (Computational Biology)
<b>Biomedical Science</b>	Environmental Studies Science (Chemistry) <i>[For 2013 polytechnic graduates and earlier]</i> Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Biotechnology</b>	Environmental Studies Science (Chemistry) <i>[For 2013 polytechnic graduates and earlier]</i> Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Environmental Sciences</b>	Environmental Studies Science (Chemistry) Science (Life Sciences)
<b>Marine Science and Aquaculture</b> <i>(For 2017 polytechnic graduates onwards)</i>	Environmental Studies Science (Life Sciences)
<b>Materials Science</b>	Science (Chemistry) Science (Physics)
<b>Pharmaceutical Sciences</b>	Environmental Studies Science (Chemistry) <i>[For 2013 polytechnic graduates and earlier]</i> Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)

## Singapore Polytechnic

## NUS Major Courses

<b>Aeronautical Engineering</b>	Science (Physics)
<b>Applied Chemistry</b> <i>(For 2018 polytechnic graduates onwards)</i> <b>Option: Industrial Chemistry</b> <b>Option: Pharmaceutical Science</b> <b>Option: Medicinal Chemistry Research</b> <i>[Merger between Diploma in Applied Chemistry with Pharmaceutical Science and Diploma in Applied Chemistry with Materials Science]</i>	Science (Chemistry) Science (Pharmaceutical Science) Science (Pharmacy)

Singapore Polytechnic	NUS Major Courses
<b>Applied Chemistry</b> <i>(For 2018 polytechnic graduates onwards)</i> <b>Option: Materials Science</b> <i>[Merger between Diploma in Applied Chemistry with Pharmaceutical Science and Diploma in Applied Chemistry with Materials Science]</i>	Science (Chemistry)
<b>Bioengineering</b> <b>Biomedical Science</b>	Science (Chemistry) Science (Life Sciences) Science (Physics) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Biotechnology</b> <i>(Medical Technology option)</i>	Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Biotechnology</b>	Environmental Studies Science (Chemistry) Science (Computational Biology) <i>[For 2017 polytechnic graduates onwards]</i> Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Chemical Engineering</b>	Science (Chemistry) Science (Food Science and Technology) <i>[For 2017 polytechnic graduates onwards]</i>
<b>Environmental Management and Water Technology</b>	Environmental Studies
<b>Food Science and Technology</b> <i>(Previously named as Chemical Process Technology [Food Technology])</i>	Science (Chemistry) Science (Food Science and Technology) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Materials Engineering</b>	Science (Chemistry)
<b>Materials Science</b> <i>(Previously named as Chemical Process Technology [Polymer Option])</i>	Science (Chemistry)

Singapore Polytechnic	NUS Major Courses
<b>Mechanical Engineering</b> <i>(For 2017 polytechnic graduates onwards)</i>	Science (Physics)
<b>Medical Technology</b>	Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Nutrition, Health and Wellness</b>	Science (Food Science and Technology) Science (Life Sciences)
<b>Optometry</b>	Science (Life Sciences)
<b>Perfumery and Cosmetic Science</b> <i>(Previously named as Chemical Process Technology [Industrial Chemistry])</i>	Science (Chemistry) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Process Engineering</b>	Science (Chemistry)

Temasek Polytechnic	NUS Major Courses
<b>Applied Food Science and Nutrition</b>	Science (Chemistry) <i>[For 2017 polytechnic graduates onwards]</i> Science (Food Science and Technology) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Biomedical Engineering</b> <i>(For 2015 polytechnic graduates onwards [Previously named as Biomedical Informatics and Engineering])</i>	Science (Computational Biology) Science (Life Sciences) Science (Physics)
<b>Biomedical Informatics and Engineering</b>	Science (Computational Biology) Science (Life Sciences)
<b>Biomedical Science</b>	Environmental Studies Science (Chemistry) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Biotechnology</b>	Environmental Studies Science (Chemistry) Science (Computational Biology) <i>[For 2017 polytechnic graduates onwards]</i> Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)



## Temasek Polytechnic

## NUS Major Courses

<b>Chemical Engineering</b>	Science (Chemistry)
<b>Mechatronics</b> <i>(For 2017 graduates onwards)</i>	Science (Physics)
<b>Pharmaceutical Science</b>	Science (Chemistry) Science (Food Science and Technology) Science (Life Sciences) Science (Pharmaceutical Science) Science (Pharmacy)
<b>Veterinary Technology</b>	Environmental Studies Science (Food Science and Technology) <i>(For 2017 polytechnic graduates onwards)</i> Science (Life Sciences)

### ADVANCED PLACEMENT CREDITS (APCs)

APCs are given to diploma holders of approved programmes from the five polytechnics in Singapore. Such students admitted to a four-year degree programme may be granted APCs in relevant modules for up to a maximum of 40 modular credits (MCs), as follows:

#### Auto-granted MCs

(i) 20 MCs from Unrestricted Elective Modules

#### Performance-based MCs

(ii) Up to 20 MCs from programme requirements may be granted based on performance in advanced placement tests and/or interviews set by the department offering the module.

Please visit NUS' Office of Admissions website for more details:

<http://www.nus.edu.sg/oam/apply-to-nus/polytechnic-diploma-from-singapore/admissions-requirements>

