Head’s Message

The Department of Chemistry is the highest-ranked chemistry department in Asia with both a regional and global outlook. With excellent teaching and research faculty from all over the world who possess strong expertise in a wide variety of chemistry sub disciplines, the finest and latest knowledge is imparted to our students.

Today, we offer both undergraduate and graduate programmes leading to B.Sc., B.Sc. (Hons), M.Sc. and Ph.D. degrees in Chemistry. For undergraduate programme, we offer 3-year BSc and 4-year BSc(Hons) undergraduate degrees. Many of our students actively participate in internship programmes at local industries or in research institutes during the semester or vacation period. The department also offer exchange or visit programmes in many top overseas universities in US, Europe, Australia and China.

Our teaching laboratories equip with state-of-the-art instruments for hands-on training relevant to industry. Coupled with one of the best research facilities in the world, our students have excellent opportunity to perform innovative research that tackle real-world issues. Strong collaborative ties with our international partners not only enables our students to embark on exciting and fulfilling overseas opportunities, but it also takes learning beyond the classroom. With the incorporation of an excellent and multifaceted curriculum, we prepare our students with the right skills and knowledge to face the challenges of the future.
Undergraduate Programme

**B.Sc. and B.Sc. (Hons) PROGRAMME**

- Accredited by the Royal Society of Chemistry.
- Offers a 3-year 120 MCs programme leading to B.Sc. degree, and a 4-year 160 MCs degree programme leading to B.Sc. (Hons) degree.
- Imparting the finest and cutting-edge knowledge to our students directly from our excellent teaching and research faculty from all over the world who possess strong expertise in a wide variety of chemistry sub-disciplines.
- Building students’ strong foundation knowledge across all chemistry disciplines with structured hands-on laboratory training in the first 2 years.
- Focusing on higher chemistry learning to match student interests in various multidisciplinary subjects including nanotechnology, chemical biology, medicinal chemistry, materials chemistry, energy and environmental sciences as well as advanced research laboratory training in the last 2 years.
- Honours student has option to pursue either a Final Year Project in a research laboratory or a Final Year Internship in a related company.
- B.Sc. (Hons) students with strong research aptitude and inclination will be considered for Ph.D. programme with scholarship support.
Undergraduate Programme

DOUBLE MAJOR in CHEMISTRY and FOOD SCIENCE PROGRAMME

- A direct 4-year B.Sc. (Hons) degree programme with a double major in Chemistry and Food Science jointly offered with NUS Department of Food Science and Technology.
- Through this programme, students will be equipped with the knowledge of food chemistry and learn about aspects of food, down to their molecular composition.

MINOR PROGRAMMES

- The Department offers Minor programmes in Nanoscience, Environmental Chemistry, Analytical Chemistry, and Forensic Science.
- The Minor in Environmental Chemistry is a joint Minor with University of Toronto, in which students spend one semester (Year 3, Semester 2) in Toronto.

B.Sc. (Hons) and B.Phil. (Hons) PROGRAMME

- A 4-year joint degree programme with Australia National University (ANU).
- Students only need to complete 100 modular credits at NUS Chemistry and 72 modular credit at ANU to obtain both the B.Sc.(Hons) degree from NUS and the B.Phil.(Hons) degree from ANU.
- Students have the opportunity to study abroad for 3 semesters at ANU.
# Undergraduate Curriculum

## Foundation
- CM1111 Inorganic Chemistry 1
- CM1121 Organic Chemistry 1
- CM1131 Physical Chemistry 1
- CM1191 Experiments in Chemistry 1
- MA1421 Basic Applied Mathematics
- LSM1401 Fundamentals of Biochemistry
- + 4 FR/GE/UE Modules*

## Advanced
- CM2101 Physical Chemistry 2
- CM2111 Inorganic Chemistry 2
- CM2121 Organic Chemistry 2
- CM2191 Experiments in Chemistry 2
- CM2192 Experiments in Chemistry 3
- + 5 FR/GE/UE Modules*

## Specialisation
- CM3291 Advanced Experiments in Inorg. & Org. Chemistry
- CM3292 Advanced Experiments in Analyt. & Phys. Chemistry
- CM3xxx Chemistry Elective Module
- CM3xxx Chemistry Elective Module
- CM3xxx Chemistry Elective Module
- + 5 FR/GE/UE Modules*

## Professional Development
- CM4xxx Chemistry Elective Module
- CM4xxx Chemistry Elective Module
- CM4xxx Chemistry Elective Module
- + FYP / FYI Modules
- + 2 FR/GE/UE Modules*

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*FR = Faculty-Level Requirements
GE = General Education
UE = Unrestricted Electives
## Elective Modules at a glance

### General Elective Modules
- **CM3201** Principles of Chemical Processes
- **CM3212** Transition Metal Chemistry
- **CM3222** Organic Reaction Mechanisms
- **CM3231** Quantum Chemistry & Molecular Thermodynamics
- **CM3288** Advanced UROPS in Chemistry I
- **CM3289** Advanced UROPS in Chemistry II

### Electives for Specialisation in Environment & Energy
- **CM3241** Instrumental Analysis I
- **CM3242** Instrumental Analysis II
- **CM3261** Environmental Chemistry
- **CM3267*** Computational Thinking & Programming in Chemistry
- **CM4241** Trace Analysis
- **CM4242** Advanced Analytical Techniques
- **CM4269** Sustainable and Green Chemistry
- **CM4282** Energy Resources

*also satisfies university requirement for computational thinking

### Electives for Specialisation in Medicinal Chemistry
- **CM3221** Organic Synthesis: The Disconnection Approach
- **CM3225** Biomolecules
- **CM4225** Organic Spectroscopy
- **CM4227** Chemical Biology
- **CM4271** Medicinal Chemistry
- **CM4274** The Art and Methodology in Total Synthesis

### Electives for Specialisation in Materials Chemistry
- **CM3251** Nanochemistry
- **CM3252** Polymer Chemistry I
- **CM3253** Material Chemistry I
- **CM4251** Characterization Techniques in Materials Chemistry
- **CM4252** Polymer Chemistry II
- **CM4253** Materials Chemistry II
- **CM4254** Chemistry of Semiconductors
- **CM4258** Advanced Polymer Science

### Electives for Specialisation in Medicinal Chemistry
- **CM3296** Molecular Modelling: Theory & Practice
- **CM4211** Advanced Coordination Chemistry
- **CM4212** Advanced Organometallic Chemistry
- **CM4214** Structural Methods in Inorganic Chemistry
- **CM4228** Catalysis
- **CM4238** Selected Topics in Physical Chemistry

*also satisfies university requirement for computational thinking
- Career opportunities in the industrial, civil service and the education sectors are available upon graduation.
- Professions include scientists, engineers, process managers and quality assurance officers in the chemical, pharmaceutical, petrochemical, and specialty chemicals organisations, as well as scientific officers in the civil service and science teachers in the education service.
- Our graduates are well-poised for Ph.D. research in Singapore and leading universities worldwide and have gone on to lead R&D at multinational companies or pursue academic careers as professors.
Research Opportunities

• Putting theory into practice, students are given opportunities to work with leading Chemistry Professors on a research project module (Undergraduate Research Opportunities Programme in Science - UROPS) as early as after Year 1.

• Perform innovative research to tackle real-world issues and opportunity to work in our state-of-the-art laboratories equipped with the latest technological advances in chemical equipment and instrumentation.

• Vast opportunities to collaborate with our international partners working on cutting edge research projects.

• Excellent teaching and research faculty from all over the world who possess strong expertise in a wide variety of chemistry areas.

• Some of our Professors are among the most influential scientists in their fields for 2019, based on Clarivate Analytics' Highly Cited Researchers List. Their research has significantly influenced others and among the top 1% most referenced study in their field.
Impact on Society

**Combating tuberculosis through the study of fatty molecules**

Professor Chng Shu Sin and his group recently developed elegant biochemical assays to characterise the function of the membrane protein MmpL3 as a lipid transporter, which is critical for outer membrane assembly and small molecule inhibition. This finding has significant impact on current and future drug discovery efforts to fight tuberculosis.

**Efficient photon upconversion for bioimaging application**

Professor Liu Xiaogang and his group have discovered a novel class of rare-earth nanocrystals that have unusually long excited state lifetimes. These can then produce efficient emission of violet light by sequentially absorbing three or four infrared photons, which was previously not possible. This upconversion process can potentially benefit high-contrast deep-tissue biological imaging, as it is less susceptible to background light contamination.

**Towards new flame retardant materials**

Professor Rowan Young’s team has developed a new reaction that generates poly-brominated materials from environmentally hazardous fluorocarbon waste. The team is developing new Brominated Flame Retardants, additives incorporated into many plastics to reduce flammability. This can potentially generate industrially useful materials from waste products at lower disposal cost.
**Impact on Society**

**Converting carbon dioxide into useful chemicals**

Professor Jason Yeo Boon Siang’s team has developed a copper catalyst capable of recycling carbon dioxide (CO$_2$) back into useful chemicals and fuels such as propanol, in a single step. They used agglomerates of copper nanocrystals to facilitate the electrocatalytic reduction of CO$_2$ at room temperature and pressure, and without the use of environmentally harmful organic solvents. Propanol can also be blended with gasoline to deliver cleaner burning fuels with lower greenhouse gas emissions, achieving a more habitable environment.

**Developing Next-Generation Semiconductor Materials**

Researchers from Department of Chemistry, namely Professors Richard Wong, Loh Kian Ping, Wu Jishan, Chen Wei, Christian Nijhuis and Huynh Han Vinh, and Department of Electrical Engineering are partnering Applied Materials Inc., to establish the Applied Materials-NUS Advanced Materials Corporate Lab to develop novel semiconductor processes, chemistry and materials to enable the next generation of semiconductor manufacturing. This university-industry collaboration will design, synthesize and test new materials as well as processing techniques for atomic layer deposition and etching for advanced semiconductor manufacturing.
Internship Opportunities

• Students are given an opportunity to have first-hand work experience in chemical-related industry during the summer break/vacation/semester locally.
• Students can elect to participate in the Undergraduate Professional Internship Programme (UPIP) with our industrial partners to proactively engage in career preparation and experience day-to-day working life.
• Students also have the option to take up a semester-long Final Year Internship in their final year instead of doing a Final Year Project.
• Some of the institutions, companies and research centres where our students have gone for their internship are listed below:

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<th>A*STAR</th>
<th>Abbott</th>
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<th>Givaudan</th>
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<td>MSD</td>
<td>Nanolumi</td>
<td>NHB</td>
<td>Nestle</td>
<td>Nippon Paint</td>
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<tr>
<td>Shimadzu</td>
<td>Solent Chemicals</td>
<td>Solvay</td>
<td>Symrise</td>
<td>Tate&amp;Lyle</td>
<td>TUV SUD</td>
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Ms Lum Yi Chyi (Class of 2019), embarked on a year-long internship at ARPlanet Technology (Shanghai) Co. Ltd, through overseas programme organised by NUS College Overseas. “...Although the learning curve might be steep initially for a student as chemistry major in a technical company, it was an extremely rewarding journey where I could experience something very different and (the internship) improved both my hard and soft skills tremendously...”.
Student Life

- The department promotes a vibrant student life by supporting 3 student bodies catered to different aspects of student life.
- Chemistry Graduate Society (CGS) represents the graduate students in the department and establishes a student support network focusing on community integration, well-being and professional development.
- Chemical Sciences Society (CSS) is the largest student body and represents the undergraduate students in the department. CSS focuses on student well-being, welfare and integration to the department and NUS.
- American Chemistry Society Singapore Chapter (ACSSC) is a recent externally-funded establishment who are interested in enhancing chemistry learning for NUS students.
- At Faculty and University-level, students have plenty of opportunities to join sports club/games club based on their interests.
Scholarships & Bursaries

Scholarships for Chemistry Students
- Kiang Ai Kim Chemistry Merit Scholarship
- Huang Hsing Hua Chemistry Merit Scholarship
- NUS Science - Lawrence Chia Merit Scholarship
- NUS Science - Yeo Keng Joon Merit Scholarship

Other University-level Scholarships
- NUS Sports Scholarship
- NUS Performing & Visual Arts Scholarship

Awards
- Ang Kok Peng Memorial Award Undergraduate
- Chemistry Alumni Study Awards

Bursaries
- Kwan Fook Ngah & Kum Lai Yoke Bursary
- MG Bursary
- Tan Eng Liang Bursary
- Shaw Phaik Hwa Bursary
- Tan Sau Fun Bursary

Admission Requirements

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<th>Pre-University Education</th>
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<td>A Level</td>
<td>For admission to Science, at least two H2 subjects in Chemistry (strongly preferred), Biology, Physics, Computing and Mathematics or Further Mathematics are required.</td>
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<tr>
<td>Polytechnic Diploma</td>
<td>Accredited Polytechnic Diploma only. A list is available at the Office of Admissions (OAM) website.</td>
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<tr>
<td>IB Diploma and foreign qualifications</td>
<td>Please refer to Office of Admissions (OAM) website</td>
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Find more information on admission and financial aids at [www.nus.edu.sg/oam](http://www.nus.edu.sg/oam)
**10 Good Reasons to Choose Chemistry at NUS**

1. NUS Chemistry is a top-ten chemistry department in the world and the top department in Asia for the past 5 years based on Quacquarelli Symonds (QS) World University Rankings by subject.

2. The rigorous NUS chemistry curriculum is accredited by the Royal Society of Chemistry (RSC). It has a strong emphasis on practical chemistry education that is relevant to industry. The excellent teaching laboratories are well-equipped with the state-of-the-art instruments for intensive hands-on training. Based on the needs of the Singapore chemical industry, the curriculum is continually revised to meet the emerging needs, e.g. new trends in energy & environment, big data analytics and machine learning applications.

3. The NUS chemistry curriculum is flexible in order to cater to different needs of students:
   i. option to graduate with a BSc degree in 3 years,
   ii. option to specialize in either medicinal chemistry, environment & energy or materials chemistry,
   iii. conduct intensive final year research project or internship in the university or industry
   iv. variety of elective modules to meet student interests.

4. Through various internship opportunities, Year-2, -3 and/or -4 students can gain first-hand experience in working in the real world and better prepare themselves for the future.

5. The NUS chemistry curriculum provides plenty of research opportunities through Undergraduate Research Opportunities Programme (UROPS) and Final Year Project (FYP) for carrying out research under the guidance of renowned chemistry professors.
10 Good Reasons to Choose Chemistry at NUS

6. NUS provides abundant overseas exchange programmes to top universities in US, Europe, China, Australia and many others.

7. Through the Centre of Future-Ready Graduates, NUS students are being prepared well for their career. Chemistry graduates have diverse job opportunities in the healthcare, pharmaceutical, materials science, environment, energy and even banking and commercial sectors.

8. With the generous donation from alumni, NUS Chemistry financially supports students in need with an array of financial aid schemes and scholarships.

9. NUS campus has excellent infrastructure and a vibrant culture. The campus is centrally located and serviced by a good transport system with Kent Ridge MRT station right inside the campus.

10. Chemistry students have opportunities to engage in translational research and make a direct impact on the society. Research topics ranges from solving environmental problems, design & synthesis of novel cancer drugs, synthesis of next-generation of materials for semiconductor industry and many others can be explored here.

Contact us at:
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