INTRODUCTION
The School of Chemical and Biomedical Engineering (SCBE), comprising Division of Chemical and Biomolecular Engineering and Division of Bioengineering, aims to empower a generation of graduates with strong fundamentals in engineering sciences and the ability to provide innovative solutions to challenging research and industrial problems.

With its dynamic faculty from internationally renowned universities, modern infrastructure and state-of-the-art research and teaching facilities, the School provides a stimulating learning environment and opportunities for students to identify and pursue personal and professional goals.

GOALS & MISSIONS
The School aims to provide educational experiences that facilitate the students to:

- Gain thorough understanding of the fundamentals of life and chemical sciences
- Effectively solve challenging problems in chemical and biomedical engineering and related areas while understanding the implications of such solutions to society
- Develop good communication and management skills through team work in the execution of experimental and design projects
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• Develop good communication and management skills through teamwork in the execution of experimental and design projects

BY COURSEWORK
Master of Science (M.Sc.) in Biomedical Engineering
This programme aims to provide biomedical engineering related undergraduates with advanced training to get ready for Ph.D. research or to join industry as potential leaders and to provide non-biomedical engineering graduates students with conversion/training courses to get into biomedical engineering related research.

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3 STREAMS
BIOMATERIALS | BIOMECHANICS | BIOINSTRUMENTATION

CORE SUBJECTS (compulsory)

• Biomedical System Design
• Physiological Systems
• Advanced Mathematics for Bioengineering
• Advanced Biomaterials (For Biomaterials stream only)
• Advanced Biomechanics (For Biomechanics stream only)
• Advanced Biomedical Engineering (For Biomedical Engineering stream only)
• Biostatistics
• Molecular Biophysics
• Biotechnology
• Advanced Cell Biology
• Biomedical Polymers and Tissue Engineering
• Biomechanics and its Applications
• Cell Therapeutics Engineering
• Special topics in Biomedical Engineering

ELECTIVE SUBJECTS (select 4 modules)

• Advanced Biomechanics (For Biomechanics stream only)
• Advanced Biomechanics (For Biomechanics stream only)
• Advanced Biomedical Engineering (For Biomedical Engineering stream only)
• Tissue Engineering & Gene Therapy
• Introductory Biomechanics
• Computational Biology
• Biostatistics
• Molecular Biophysics
• Biotechnology
• Advanced Cell Biology
• Biomedical Polymers
• Nanotechnology and its Applications
• Cell Therapeutics Engineering
• Special topics in Biomedical Engineering

Coursework students are also required to undertake a research project on an approved topic for which they must submit a dissertation for examination upon completion of their project.

BY RESEARCH
NTU-Imperial College Joint Ph.D.
Qualified candidates will be able to spend about one year at Imperial College London and about three years at NTU. Students will undertake one joint research project, under the guidance of distinguished supervisors from both universities. Students will also have opportunities to enjoy facilities at NTU and Imperial College. Upon successful completion of this programme, students will be awarded a joint Ph.D. degree by NTU and Imperial College.

Doctor of Philosophy (Ph.D.) in Chemical and Biomolecular Engineering
Doctor of Philosophy (Ph.D.) in Bioengineering
Master of Engineering (M.Eng.) in Chemical and Biomedical Engineering
Master of Engineering (M.Eng.) in Bioengineering

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CHEMICAL & BIOMOLECULAR ENGINEERING | BIOENGINEERING

Coursework Requirements (Ph.D.)

• Minimum of 6 subjects
• 3 C1 core subjects
• 3 electives subjects (Preferably at least 2 from School)

Coursework Requirements (M.Eng.)

• Minimum of 6 subjects
• 1 C1 core subject
• 2 electives subjects (Preferably at least 1 from School)

Coursework Subjects

• Advanced Mathematical Methods for Chemical Engineering
• Advanced Reactor Engineering
• Advanced Chemical Engineering Thermodynamics

CH Elective Subjects
• Nanotechnology and its Applications
• Cell Therapeutics Engineering
• Advanced Physical Chemistry

BG Subjects

• Molecular Biophysics
• Advanced Cell Biology
• Advanced Mathematics for Biomedical Engineering

BG Elective Subject
• The Singapore-Stafford Biophysics Project

Research students will also pursue research on an approved topic, submit regular progress reports to their supervisors and submit a thesis for examination. Ph.D. candidates must also pass an oral examination on the subject of their thesis and related matters.
**BY RESEARCH**

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**Doctor of Philosophy (Ph.D.) in Chemical and Biomolecular Engineering**

**Doctor of Philosophy (Ph.D.) in Bioengineering**

**Master of Engineering (M.Eng.) in Chemical and Biomolecular Engineering**

**Master of Engineering (M.Eng.) in Bioengineering**

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<td>• Advanced Cell Biology</td>
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<tr>
<td>• Advanced Chemical Engineering</td>
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The School focuses on four areas of research which are of emerging relevance and importance to Singapore and beyond. It is equipped with state-of-the-art laboratories, advanced computing facilities and an intellectually stimulating environment – the key ingredients of a world-class research institution.

Research Areas

**Nanotechnology & Advanced Catalysis**
The nanotechnology group aims to solve new frontier technological problems pertaining to health, environment, energy and sustainability. The research activities are mainly focused on the development of advanced functional nanomaterials for printed electronics, catalytic, energy and environmental applications. The group also has expertise in computational studies on heterogeneous catalysis and reaction engineering. The on-going research efforts are committed to projects of high importance in various strategic areas, such as development of single-walled carbon nanotubes based electronic devices; synthesis of semiconductor photocatalysts for production of solar fuel; catalytic conversion of carbon dioxide to fuel; development of efficient electrocatalysts for fuel cell technologies; to name a few.

**Chemical Process Engineering**
The Chemical Process Engineering group focuses on design, simulation, optimisation and control of processes arising in chemical and pharmaceutical industries. Development of stationary phases for object separation and asymmetric synthesis are being carried out by the researchers. The group has unique expertise in process engineering in multiphase system and microalgae cultivation. CO2 capture by adsorption is another strong interest of the group. In addition, we also carry out multi-scale simulation to determine thermo-dynamic properties of the materials.

**Biomolecular Process Engineering**
Effective studies and widespread use of bio-inspired products such as recombinant protein/peptide therapeutics or biopharmaceutical candidates are often hindered by the lack of viable manufacturing routes to produce them efficiently and cost-effectively on large scale. The research focus lies in the design and development of efficient bioprocesses as two process routes to emerging or existing biological products. Streamlined processes (both genetic and molecule specific for recombinant protein/peptide) that can be readily validated and scaled-up are extremely desirable to underpin the fast-growing biopharmaceutical industry and to keep protein drug costs low. We are also interested in the nanotechnology-inspired biocatalyst systems for enzyme immobilization.

**Nanomedicine & Biomedical Devices**
Innovative biological systems and devices such as biosensors, molecular drug delivery devices, bioelectronics and molecular machines provide great potential for enhanced quality of life, improved healthcare and stronger bio-defense. The most significant impact of biosystems is envisaged to be in health and medicine: diagnostics, treatment and prevention. Particularly, there is a great need in global health care for novel approaches to meet the needs of ageing populations and poor countries. Biotechnology and its biased advanced biosystems can enable cheaper, safer and more ethical production of a growing number of traditional as well as new drugs and medical services.

Faculty Researches

**Professor**
- Mary Chan
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- Lim Kee Hua
- Phua Siew Lee
- St John Lim

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**Admission Criteria**
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School of Chemical and Biomedical Engineering

Graduate Programmes

Graduate Programmes at Nanyang Technological University

Nanyang Technological University

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