

CHEMICAL & BIOMOLECULAR ENGINEERING COURSE MODULES (YEAR 3)

As the only course in Singapore that integrates biological and chemical sciences with engineering concepts, the Diploma in Chemical & Biomolecular Engineering [CBE] will train you to be very versatile to tap myriad career opportunities. The broad-based curriculum covers chemical processing, pharmaceuticals, environment science, engineering and life sciences.

In your first year, you will be equipped with a solid foundation for chemical engineering, with modules such as chemistry, biology, physics, and mathematics. You will also be introduced to how the basic concepts in science are used in engineering through the Introduction to Chemical and Biochemical Engineering module.

In your second year, you will explore the application of scientific concepts in the operation of common engineering systems and equipment. These include an in-depth study of biopharmaceutical technology, chemical engineering transfer technologies, analytical chemistry, engineering materials and reaction engineering.

In your final year, you will deepen your knowledge with one of two exciting specialisation options. Both options provide insights into the operations of integrated operating facilities through modules such as process engineering design, process instrumentation and control as well as unit operations. You will also get to explore a virtual chemical plant and train on computer simulations which will hone your communication and troubleshooting skills through simulated process setups. In addition, a six-month internship is provided to give you an opportunity to put your learning into practice. You can opt for either an Industry Internship with companies such as Chevron Oronite, ExxonMobil, Shell Petrochemicals and GlaxoSmithKline or a Research Internship in a local or an overseas research facility.

SPECIALISATION OPTIONS

General Chemical Engineering

This option provides students with the critical skills for analysing chemical processes specific to the petrochemical and specialty chemical industries.

Pharma & Biopharmaceuticals

This option provides students with knowledge of the different chemical processes, quality assessments, and the regulatory environment specific to the pharmaceutical and biopharmaceutical manufacturing industries.

LEVEL 3.1

GENERAL CHEMICAL ENGINEERING SPECIALISATION OPTION

Chemical Engineering Laboratories 3.1

This module integrates the practical aspects of Level 3.1 modules of Unit Operations, and Process Instrumentation & Control.

Industrial Chemical Processes

In this module, students will acquire a basic understanding of the chemical industry through comprehensive analyses of key chemical processes. The key manufacturing processes in the pharmaceutical industry are also covered. This module also highlights the importance and relevance of sustainability and green engineering in the chemical industry.

Petrochemical Technology

In this module, students are introduced to the petrochemical industry. Topics include an overview of the industry and its importance to Singapore and the region, its key products, raw materials, intermediate and product flows, economics of petrochemical processing and key petrochemical processes.

Process Control & Instrumentation

This module provides a broad introduction to the principles and applications of instruments in process industries such as instrumentation for temperature, flow, level and pressure measurements. Other topics include the fundamental concepts of feedback control, system dynamics and stability, PID control modes, controller tuning, multivariable control strategies, control valve sizing, and an introduction to digital control techniques and computer control of chemical processes.

Process Engineering Design

In this module, students will study process flow sheets, piping and instrumentation diagrams, process and mechanical design of equipment, cost and evaluation of projects, materials of construction, safety and loss prevention. A practical design project is used to reinforce theory.

Unit Operations

This module focuses on solvent extraction, crystallisation, drying, evaporation, distillation, digestion, absorption, adsorption and material handling as applied to unit operations in various sectors such as the petroleum, petrochemical, chemical and pharmaceutical industries.

Project ID: Connecting the Dots[^]

This module aims to prepare students for an increasingly globalized and interconnected world where problems are multi-faceted and require interdisciplinary research and collaboration to solve. Using a project-based learning approach, students will have the opportunity to work in a multi-disciplinary team to investigate and propose comprehensive recommendations for a pressing real-world problem affecting Singapore. They will be guided to step out of their disciplinary silos and effectively communicate and collaborate with peers from different backgrounds. Ultimately, the module seeks to develop independent learning skills and the ability to synthesize diverse strands of knowledge to solve a complex problem, while impressing on students the importance of being a responsible global citizen.

PHARMA & BIOPHARMACEUTICALS SPECIALISATION OPTION

Biopharmaceutical Quality Control

This module introduces the functions of a quality control entity in a pharmaceutical and biopharmaceutical manufacturing facility, as well as the various raw material, in-process, product and stability testing methodologies and specifications.

Current Good Manufacturing Practice

This module covers the US Food and Drug Administration's current Good Manufacturing Practice (GMP) regulations for pharmaceutical and related products. Various aspects, such as attributes of materials, labelling, materials in process, finished pharmaceuticals, manufacturing validation, quality control, personnel and facilities are covered.

Pharmaceutical Engineering Laboratories

This module integrates the practical aspects of Level 3.1 modules of Unit Operations, and Process Instrumentation & Control.

Process Control & Instrumentation

This module provides a broad introduction to the principles and applications of instruments in process industries such as instrumentation for temperature, level and pressure measurements. Other topics include the fundamental concepts of feedback control, system dynamics and stability, PID control modes, controller tuning, multivariable control strategies, control valve sizing, and an introduction to digital control techniques and computer control of chemical processes.

Process Engineering Design

In this module, students will study process flow sheets, piping and instrumentation diagrams, process and mechanical design of equipment, cost and evaluation of projects, materials of construction, safety and loss prevention. A practical design project is used to reinforce theory.

Unit Operations for Pharmaceutical Processes

This module covers topics such as solvent extraction, crystallisation, drying, evaporation, distillation, digestion, absorption, adsorption and material handling as applied to unit operations in various sectors such as the petroleum, petrochemical, chemical and pharmaceutical industries.

Project ID: Connecting the Dots[^]

This module aims to prepare students for an increasingly globalized and interconnected world where problems are multi-faceted and require interdisciplinary research and collaboration to solve. Using a project-based learning approach, students will have the opportunity to work in a multi-disciplinary team to investigate and propose comprehensive recommendations for a pressing real-world problem affecting Singapore. They will be guided to step

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LEVEL 3.2

INDUSTRY TRACK

Industrial Internship

Students will do an internship and project which gives them opportunities to apply the knowledge acquired in classrooms to real-world work situations. They will be attached to companies in various industries such as the petrochemicals, specialty chemicals, and pharma- or biopharmaceutical sectors.

RESEARCH TRACK

Research Internship

Students will be introduced to basic research skills, which include literature review, laboratory safety, project management, and statistical analysis of laboratory data, followed by opportunities to undertake a scientific research project. The projects will be carried out in- house or at external research institutions, which include overseas institutions.

COURSE CURRICULUM (YEAR 3)

Module Name	Credit Units
YEAR 3	
Level 3.1 (28 hours per week)	
GENERAL CHEMICAL ENGINEERING SPECIALISATION OPTION	
Chemical Engineering Laboratories 3.1	3
Industrial Chemical Processes	1.5
Petrochemical Technology	1.5
Process Control & Instrumentation	5
Process Engineering Design	8
Unit Operations	5
Project ID: Connecting the Dots ^	4
PHARMA & BIOPHARMACEUTICALS SPECIALISATION OPTION	
Biopharmaceutical Quality Control	1.5
Current Good Manufacturing Practice	1.5
Pharmaceutical Engineering Laboratories	3
Process Control & Instrumentation	5
Process Engineering Design	8
Unit Operations for Pharmaceutical Processes	5
Project ID: Connecting the Dots ^	4
Level 3.2 (22 hours per week)	
INDUSTRY TRACK	
Industrial Internship	22
RESEARCH TRACK	
Research Internship	22

Notes:

^ For more details on Interdisciplinary Studies (IS) electives, please log on to www.np.edu.sg/is/

IS Modules

The School of Interdisciplinary Studies (IS) delivers a broad-based curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge economy. IS offers both prescribed modules and electives to challenge boundaries. Prescribed modules develop students' competencies in core areas such as Communication, Innovation and Enterprise, Culture and Communication, and Personal Mastery and Development, while elective modules provide insights into Arts and Humanities, Business, Design, and Science and Technology.