

## **CHEMICAL & BIOMOLECULAR ENGINEERING COURSE MODULES (YEAR 1)**

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 1.1**

#### **Career & Professional Preparation I**

This module is part of the Education and Career Guidance framework to provide students with the tools and resources necessary for their career and/ or further education. In this first module, students will undergo personal discovery and exploration of industry and career prospects. Students will learn how to plan and set achievable goals in preparation for their future. Students will also learn the importance of passion and professionalism, along with basic teamwork and interpersonal skills.

#### **Engineering Mathematics 1**

Students will study mathematical subjects relevant to engineering applications. This module provides them with the necessary mathematical skills required in other engineering subjects. Topics include algebra, exponential and logarithmic functions, trigonometry, combination and permutation, plane analytical geometry, binomial expansion, determinants and matrices.

#### **Introduction to Chemical & Biochemical Engineering**

Students are introduced to basic chemical engineering concepts and applications, for example, units and dimensions, material balance calculations, reaction stoichiometry, reaction engineering, and fluid mechanics. Upon completion of this module, students will be able to undertake basic chemical engineering calculations. This module also provides hands-on practice of AutoCAD in engineering drafting to allow students to appreciate the use of

computer software in the engineering field.

### Organic & Biological Chemistry

This practical-oriented module is designed to give students an introduction to organic and biological chemistry. Students will be introduced to the chemistry of hydrocarbons, alcohols, amines, carboxylic acids and their derivatives. The structure, function and chemical reactions of carbohydrates, lipids, proteins, nucleic acids, enzymes and coenzymes are also covered.

### LEVEL 1.2

#### Biomolecular Science

This module introduces students to cell biology, microorganisms and techniques in microbiology. Students will learn about cell structure, cell membrane, microbial growth and nutrition, cellular transport mechanisms, DNA replication, transcription and translation, mycology, virology and aseptic techniques.

#### Engineering Mathematics 2

A continuation of the Engineering Mathematics 1 module, topics in this module include complex numbers, statistical techniques, differentiation, integration, further integration techniques and numerical methods for evaluating definite integrals. Emphasis is placed on their applications in solving engineering- related problems. A mathematical software package is also used to solve these problems.

#### Inorganic & Physical Chemistry

This module covers the principles of physical chemistry as well as the reactions and properties of inorganic compounds. Students will study the structure of matter, chemical bonding, chemical calculations, electrochemistry and redox reaction, chemical equilibria, ionic equilibria, chemical kinetics, thermochemistry, transition metal chemistry and chemistry of solutions, including acids and bases.

#### Thermodynamics

In this module, students will study the fundamental concepts of thermodynamics and fluid mechanics. Topics include the first and second laws of thermodynamics, properties of liquids and vapours, non-flow processes and steady flow processes with steam and perfect gases. The concepts of pressure, pressure head, and pressure measurement will also be discussed

### COURSE CURRICULUM (YEAR 1)

Module Name	Credit Units
<b>YEAR 1</b>	
<b>Level 1.1 (23 hours per week)</b>	
Career & Professional Preparation I	1
Engineering Mathematics 1	6
Introduction to Chemical & Biochemical Engineering	5
Organic & Biological Chemistry	8
Innovation Made Possible ^	3
<b>Level 1.2 (28.5 hours per week)</b>	
Biomolecular Science	4.5
Engineering Mathematics 2	6
Inorganic & Physical Chemistry	8
Thermodynamics	5
Communication Essentials ^	3
Sports & Wellness ^	2

**Notes:**

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