

BIOMEDICAL ENGINEERING COURSE MODULES

Intrigued by how the marriage of engineering technology and life sciences can benefit mankind? That's where biomedical engineering comes into play. This forward-thinking field is responsible for the design of sophisticated medical equipment such as diagnostic and therapeutic machines and lifesaving devices like the artificial heart and dialysis machine. In fact, you can be part of this fascinating industry when you join the Diploma in Biomedical Engineering [BME]

The first diploma of its kind in Singapore, BME is jointly delivered by Ngee Ann Polytechnic's School of Engineering and School of Life Sciences & Chemical Technology. Besides teaching you how to develop medical equipment, BME also gives you a firm grounding in research that could lead to discovery of new treatments for medical conditions.

In your first year, you will acquire a strong foundation in engineering in topics covering electrical, electronic and mechanical engineering. You will also gain an overview of biomedical engineering. Then in your second year, you will study cell and molecular biology alongside medical instrumentation and physiological systems. You will also be equipped with electronic design prototyping skills.

In your final year, you will focus on areas such as clinical engineering as well as various types of medical equipment. You will also work in teams to design and develop biomedical products. What's more, you will have the opportunity to go on a six-month local or overseas internship with a university, hospital, MNC or research institute.

LEVEL 2.1

BioPhysics

This module provides a strong foundation for Biomedical Engineering modules in subsequent levels. It introduces students to the usual physics topics other than those topics that will be covered in other modules of the course. Additionally, examples taken from the human body or from biomedical applications will be used to illustrate the physical principles. It is the intention of this module to provide a broad scope of content without excessive depth in order to prepare students for the diverse and multidisciplinary nature of biomedical engineering.

Cell & Molecular Biology

This module provides an introduction to Cell and Molecular Biology concepts. It equips students with an understanding of eukaryotic cell biology, including fundamental chemicals necessary for life, structure and function of cells and organelles, cellular transport mechanisms, cell divisions, DNA replication, protein synthesis, genetics, principles of inheritance, cell-to-cell interactions and cell development.

Electronic Design Prototyping 1

The main objectives of this module are to introduce students the techniques to construct an electric circuit and practical skills in measurement and troubleshooting. Students will learn the process for planning, construction and testing of a project. The focus of the module is on the hands-on practice for bread boarding, PCB design and assembly and test & measurement. Simple troubleshooting techniques and CAD tools will also be introduced to aid in their design of the PCB.

Engineering Mathematics 3A

This module is designed to provide students with further mathematical skills to solve basic engineering related problems. The topics are introduced in an order that is intended to keep abreast of the application requirements in their other engineering modules. Topics include integration with applications, differential equations, Laplace Transform and Fourier Series.

Healthcare IT

Students are introduced to the concept of networking in healthcare industry. Nowadays, medical equipment and devices are integrated with network capability. The involvement of information technology in clinical engineering is

constantly of increased importance. In this module, students will gain knowledge in the area of inter-networking in the healthcare environment such as hospitals. Students will learn to configure, examine and troubleshoot network systems. Extensive laboratory sessions provide hands-on experience for the students to acquire the skills to build and maintain flat, switched, routed and wireless networks. In addition, they will learn techniques to identify and isolate connectivity problems from equipment failures.

Medical Instrumentation

This module presents an understanding of electronic instrumentation and measurements with a focus on physiological signals. It covers measurement errors, transduction of bioelectric signals, different types of amplifiers and filters, signals and noise, power supplies, batteries, oscillators, timer, ultrasound.

Career & Professional Preparation II

This module helps students with skills necessary to seek and secure work. They will also be equipped to communicate their personal brand in a positive way. As students sharpen their communication skills, they will also learn how to market themselves effectively.

Interdisciplinary Elective Module (IS Module)

Students embark on a general module from categories ranging from Communication, Life Skills, Entrepreneurship, Media & the Arts to Science & Technology.

LEVEL 2.2

Applications Programming

This practice-oriented module equips students with the fundamental knowledge and skills required to develop Windows applications. The students will develop conceptual understanding to design and develop applications to solve business and engineering problems. Main topics include branch and loop, array, data files accessing and methods.

Electronic Design Prototyping 2

The main objectives of this module are to introduce students the prototyping techniques on electronic assembly and practical skills in electronic project design. Students will learn the process for planning, construction and testing of a project. The focus of the module is on the hands-on practice for CAD design, bread-boarding, point-to-point wiring, PCB assembly, test & measurement, and fault finding on electronic circuits.

Embedded System

This module introduces the fundamentals of a modern embedded system based on the 32-bit Advanced RISC Machines (ARM). It presents the basic processor architecture together with the concept of System-on-Chip (SoC), it covers the use of C programming language in modern embedded system and is supplemented by assembly language. Freescale i.mx (media extension) application processor is used to demonstrate the basic hardware interfacing architecture of a typical integrated ARM SoC which includes memory, LCD display, touch panel, I2C, USB etc. The eLinux is used to cover the concept of 'Real Time Operating System (RTOS)' used in modern day embedded systems.

Fundamentals of Control Systems

This module provides students with a basic coverage of feedback control systems. The topics cover basic concepts of automatic control, control systems' components, simple analytical tools and stability analysis of systems. Students are also introduced to the use of Matlab/Simulink as a computer tool in control systems analysis. A brief overview of programmable logic controllers is also included.

Physiological Systems

This module provides the fundamental understanding of the anatomy and physiology of the human body, which is an essential foundation for subsequent modules. The cardiovascular, neurological and respiratory systems will be highlighted in this study. Other systems in the human physiology will be briefly mentioned.

World Issues: A Singapore Perspective (IS Module)

This module takes a global approach to significant current and historical events. The aim is to enhance students' understanding of such events and issues in the context of Singapore, as well as challenge students to think critically about choices and decision-making vis-à-vis the nation state.

Module Name	Credit Units
YEAR 2	
Level 2.1 (27 hours per week)	
BioPhysics	4
Cell & Molecular Biology	3
Electronic Design Prototyping 1	3
Engineering Mathematics 3A	4
Healthcare IT	4
Medical Instrumentation	5
Career & Professional Preparation II	2
Interdisciplinary Studies (IS) elective ^	2
Level 2.2 (24 hours per week)	
Applications Programming	4
Electronic Design Prototyping 2	4
Embedded System	5
Fundamentals of Control Systems	5
Physiological Systems	4
World Issues: A Singapore Perspective ^	2

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.