

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (24.5 hours per week)	
Career & Professional Preparation I	1.5
Electrical Technology	4
Electronic Measurement & Prototyping Skills	3
Engineering Mathematics 1	5
Engineering Mechanics	4
Introduction to Biomedical Engineering	3
Innovation Toolkit 1 ^	2
Sports & Wellness ^	2
Level 1.2 (28 hours per week)	
BioPhysics	4
Computer Programming	4
Digital Logic	3
Discrete Analogue Electronics	6
Engineering Mathematics 2	5
Communication & Contemporary Issues^	4
Innovation Toolkit 2 ^	2

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 1	
Level 1.1 (22.5 hours per week)	
Career & Professional Preparation I	1.5
Computer Programming	4
Electrical Technology	4
Engineering Mathematics 1	5
Engineering Mechanics	4
Innovation Toolkit 1 ^	2
Sports & Wellness ^	2
Level 1.2 (30 hours per week)	
BioPhysics	4
Digital Logic	3
Discrete Analogue Electronics	6
Electronic Measurement & Prototyping Skills	3
Engineering Mathematics 2	5
Introduction to Biomedical Engineering	3
Communication & Contemporary Issues^	4
Innovation Toolkit 2 ^	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.

COURSE MODULES

LEVEL 1.1

Career & Professional Preparation I

This module helps to give students a foundational introduction to their three-year diploma course curriculum and how it prepares them for industry. It will help them to embark on their three-year course with the end in mind, through guided reflection of their personal characteristics, and producing an overall game plan for their future education and career goals. The module aims to deepen students' commitment to the sector that the course prepares them for.

Electrical Technology

This module builds the necessary foundation for electrical circuit analysis covering electrical theorems and techniques for analysing and solving direct and alternating current circuit problems. Laboratory assignments include basic electrical measurement skills and concepts learnt in lectures and tutorials.

Electronic Measurement & Prototyping Skills

This module equips students with the necessary practical skills in electronic circuit construction and measurements. Students will be introduced basic practical skills such as soldering, identification of components and use of various electronic instruments.

Engineering Mathematics 1

This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast with the application requirements in engineering modules. The emphasis in each topic is on applications and problem solving. Topics include algebra, trigonometry, logarithms, plane analytic geometry, matrices and complex numbers.

Engineering Mechanics

This module introduces students to the study of external forces in two dimensions and their effect on particles and rigid bodies that are at rest. Students learn to analyse the forces acting on the bodies by drawing free-body diagrams and applying the conditions of equilibrium. Topics include forces and resultants, moments and couples, equilibrium, and the concepts of plane friction. This module also aims to equip students with the skills to analyse problems of rigid bodies in motion. Only linear and rotational motion in two dimensions will be covered. Topics include Kinematics of linear and rotational motion, and Kinetics of linear and rotational motion.

Introduction to Biomedical Engineering

This module aims to provide students with an understanding and appreciation of the field of Biomedical Engineering. Students will learn a list of common roots, prefixes and suffixes in order to have a strong foundation of medical terminology. They will be introduced to the wide range of medical devices & equipment. The functions and

responsibilities of the biomedical technician/engineer will be explored. Basic concepts of medical instrumentation, which encompasses transducers and signal conditioning/ processing, will be taught. Finally students learn the types of medical device classes and the various safety standards.

LEVEL 1.2

BioPhysics

In this module, students are introduced to various principles of Physics as they apply to the human body. These include energy, work, power, heat, temperature, pressure and electricity within the body. They are also exposed to the use of Physics in medical applications such as hearing, sight and radiation. This module provides a strong foundation for subsequent Biomedical Engineering modules.

Computer Programming

This practice-oriented module equips students with the basic knowledge and skills in computer programming using C language. The main topics include basic computing concepts, fundamentals of C, branching, loops, and C functions. Upon completion of the module, students will be able to explain and write C programmes for simple engineering applications.

Digital Logic

This module provides students with the fundamental knowledge and skills in logic design. Students will learn about the combinational and sequential logics and how to design and use them to control digital systems. A project will be used to reinforce students' learning and help them to relate their learning to real-life examples.

Discrete Analogue Electronics

This module lays a foundation in electronics. It will cover concepts pertaining to analogue devices. With the fundamentals of basic circuit theory frequently revisited, the module will deal with the operating characteristics, working principles and applications of discrete electronic devices such as the various types of diodes, MOSFETs and BJTs. Practical circuits will be used to enhance and strengthen the students' knowledge so that they will acquire the relevant competencies to move on to more specialised modules.

Engineering Mathematics 2

This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Topics include further trigonometry, differentiation with applications, and basic integration with applications.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 2	
Level 2.1 (26 hours per week)	
Cell & Molecular Biology	3
Digital Electronics	5
Electronic Design Prototyping 1	3
Engineering Mathematics 3A	4
Healthcare IT	4
Medical Instrumentation	5
Interdisciplinary Studies (IS) elective ^	2
Level 2.2 (26 hours per week)	

Applications Programming	4
Career & Professional Preparation II	2
Electronic Design Prototyping 2	4
Embedded System (ARM)	5
Fundamentals of Control Systems	5
Physiological Systems	4
Interdisciplinary Studies (IS) elective ^	2

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 2	
Level 2.1 (26 hours per week)	
Cell & Molecular Biology	3
Digital Electronics	5
Electronic Design Prototyping 1	3
Engineering Mathematics 3A	4
Fundamentals of Financial Management	4
Medical Instrumentation	5
Business & the Economy ^	2
Level 2.2 (25 hours per week)	
Applications Programming	4
Career & Professional Preparation II	2
Electronic Design Prototyping 2	4
Fundamentals of Control Systems	5
Marketing Fundamentals	4
Physiological Systems	4
Effective People Management ^	2

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COURSE MODULES

LEVEL 2.1

Cell & Molecular Biology

This module provides a solid foundation in the area of cell and molecular biology. The topics covered include Eukaryotic cell structure and function, molecular biology, bioinformatics, cell communication and differentiation, and cancer.

Digital Electronics

This module covers the fundamentals of digital electronics. The basic principles and techniques of digital system and design are covered. It prepares the students for subsequent modules that discuss microprocessors and microcomputers. The main topics covered are number systems, Boolean Algebra, combinational logic circuits and minimisation techniques, flip-flops and multivibrators, IC counters, and data handling devices. Characteristics of standard TTL and high speed CMOS are also discussed.

Electronic Design Prototyping 1

This module builds upon the skills learned in the Electronic Measurement and Prototyping Skills module. The main objectives of this module are electronic circuit construction, measurement and simple troubleshooting techniques. Students will be introduced Computer-aided design (CAD) tools to design printed circuit board (PCB) of simple circuits.

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 included in this module are integration with applications, differential equations, Laplace Transform and Fourier Series.

Healthcare IT

Students are introduced to the concept of networking in the healthcare industry. Nowadays, most medical equipment are integrated with network capability. 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

In this module, students will gain an understanding of electronic instrumentation and measurements with a focus on physiological signals. Topics covered include measurement errors, transduction of bioelectric signals, different types of amplifiers and filters, signals and noise, power supplies, batteries, oscillators, timers and ultrasound.

MINOR IN BUSINESS MANAGEMENT

Fundamentals of Financial Management

This module covers basic accounting and financial concepts and principles to enable students to understand and interpret financial statements and reports. Students will also have an understanding of costing concepts and the financial techniques used in making financial decisions and evaluating capital investment projects.

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.

Career & Professional Preparation II

This module helps to equip 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.

Electronic Design Prototyping 2

This module builds upon the skills learned in the module, Electronic Design Prototyping 1. The main objectives of this module are to introduce prototyping and testing techniques, fault simulation and fault finding used in electronic project design. Students will also use CAD tools to design PCB of more complex circuits.

Embedded System (ARM)

This module introduces the fundamentals of a typical modern embedded system based on the 32-bit Advanced RISC Microprocessor (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 systems and is supplemented by assembly language. The Motorola i.mx application processor is used to demonstrate the basic hardware interfacing architecture of a typical integrated ARM SoC.

Fundamentals of Control Systems

This module provides students with a basic coverage of feedback control systems. The topics cover basic concepts of automatic control, components of control systems, 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.

Physiological Systems

Students will study the anatomy and physiology of the human body. This module emphasises the importance of the cardiovascular and neurological systems in the integration of our physiological processes. The respiratory, endocrine, skeletal, muscular, digestive and excretory systems will also be studied.

MINOR IN BUSINESS MANAGEMENT

Marketing Fundamentals

The module introduces concepts and principles of the marketing of goods and services to enable students to better understand and evaluate the marketing system in which products and services are planned, priced, promoted and distributed. Apart from the four P's in marketing, topics covered also include segmentation, targeting and positioning, product mix, service marketing, channel decisions and branding.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 3	
INTERNSHIP	
Level 3.1 (22 hours per week)	
BME Project Design	10
Clinical Engineering	4
Diagnostic, Therapeutic & Laboratory Equipment	3
Interdisciplinary Studies (IS) module ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (22 hours per week)	
6-Month Internship	22
	6
NON-INTERNSHIP	
Level 3.1 (22 hours per week)	

Biomechanics & Rehabilitation Engineering	3
Object-Oriented Programming	5
Project Design & Development 1	10
Interdisciplinary Studies (IS) module ^	2
World Issues: A Singapore Perspective ^	2

Level 3.2 (23 hours per week)

Biomaterials & Implants	4
Clinical Engineering	4
Diagnostic, Therapeutic & Laboratory Equipment	3
Project Design & Development 2	12

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 3	
INTERNSHIP	
Level 3.1 (22 hours per week)	
Business Management Elective	4
Clinical Engineering	4
Diagnostic, Therapeutic & Laboratory Equipment	3
Medical Imaging Technology	3
Starting & Managing an Enterprise	4
Interdisciplinary Studies (IS) module ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (22 hours per week)	
6-Month Internship	22
NON-INTERNSHIP	
Level 3.1 (25 hours per week)	
Business Management Elective	4
Biomechanics & Rehabilitation Engineering	3
Project Design & Development 1	10
Starting & Managing an Enterprise	4
Interdisciplinary Studies (IS) module ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (23 hours per week)	
Biomaterials & Implants	4
Clinical Engineering	4
Diagnostic, Therapeutic & Laboratory Equipment	3
Project Design & Development 2	12

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COURSE MODULES**LEVEL 3.1 & 3.2****6-Month Internship**

In this module, students will be attached to sponsoring companies for a period of approximately six months. During their internships, students will undertake projects assigned by the company or be involved in operations or maintenance-related work. Student internships may be undertaken locally or overseas.

Biomaterials & Implants

This module covers the types of biomaterials that can be used inside the human body, both for short and long-term implantations, and their composition, properties and applications in skeletal, cardiovascular, dental, facial and breast implants. Students will also find out how the host body may react to the implantation of these foreign bodies. Current research on tissue engineering, which is seen as the alternative to implants, will also be covered.

Biomechanics & Rehabilitation Engineering

This module introduces students to the application of engineering statics and dynamics to perform simple force analyses of the musculo-skeletal system. They will learn to appreciate the kinematics and kinetics of human motion. They will also learn about the role of an engineer in rehabilitation under different medical conditions.

BME Project Design

In this module, small groups of students will start project work during their Level 2.2 vacation (full-time over five weeks) and continue over the first semester in Level 3. Students will gain practical experience in the design and implementation of a project to demonstrate their engineering and presentation skills, and knowledge gained in the various academic modules, especially in medical devices and equipment. This module provides the opportunity for students to demonstrate their creativity and initiative.

Clinical Engineering

Students will be taught biomedical equipment procurement, management, operation, calibration, testing and maintenance in order to provide quality patient care. They will discover the physiological effects of electricity and study the application of various electrical safety devices in a hospital environment. The IEC601-1 Electrical Safety Test procedures and safety limits are emphasised. Patient and operator safety, including the handling of chemicals, lasers, X-rays and radio-isotopes are also taught. Other topics include inferential statistics and hypothesis testing.

Diagnostic, Therapeutic & Laboratory Equipment

In this module, students will learn the functions, features and limitations of the most important hospital diagnostic and therapeutic equipment, as well as clinical lab instruments. Examples of diagnostic equipment are patient monitoring systems, respiratory measurement equipment and electroencephalography. Defibrillators, cardiac pacemakers and surgical equipment are some of the therapeutic equipment covered. The clinical lab instrumentation includes spectrophotometers, chromatographs and blood cell counters.

Medical Imaging Technology

This module aims to provide students with an understanding and appreciation of the field of Medical Imaging. Students will be taught the different types of medical imaging principles and their application in diagnostic therapy. Image processing theory and concepts are introduced before the various imaging technologies are taught. Specific areas of radiology include topics such as ultrasound imaging, radionuclide imaging, X-ray, Computer Tomography (CT) and Magnetic Resonance Imaging (MRI) are taught. This activity-based module helps students to learn through web research, assignment and exercises, and to identify themselves with their future profession in Biomedical Engineering.

Object-Oriented Programming

This module builds on the foundation of the Applications Programming module and introduces the concepts of Object-Oriented Programming to the students. It covers the area from the fundamental concepts of Object-Oriented Programming to Web forms, database access, and some graphics and animation.

Project Design & Development 1

In this module, students will work in teams of two or three to design and implement a project that demonstrates their engineering skills as well as teamwork over a period of two semesters. The module is structured to encourage creativity and innovative thinking. This will also help students to develop a positive work attitude and good team spirit.

Project Design & Development 2

This module follows on from Project Design & Development 1. Students are required to demonstrate their ability and resourcefulness in implementing their selected project design solution. The scope of work includes printed circuit board fabrication, wiring, assembly and testing of the final prototype according to the specifications and requirements defined in Project Design and Development 1. In addition, software-based projects may require database coding, operating system implementation and testing, server and client system design, portable design field test and web-based integration.

MINOR IN BUSINESS MANAGEMENT

Project Design & Business Application 1

The objective of this module is to enable students to apply the concept of engineering, marketing, and financial management, learnt during the course of their study, in completing a final-year project with business application. The concept of business application shall be introduced and applied at different stages of product design and development cycle. Students will have opportunities to integrate engineering and business concepts, market research and strategy, in the design and development of a product. The design of a product will be developed based on the need of a specific industry or targeted users/stakeholders. While integrating the engineering and business concepts, the financial aspects of developing a product will also be incorporated into the product design and development.

Project Design & Business Application 2

Students are required to demonstrate their ability and resourcefulness in constructing and completing engineering experimental model(s) to demonstrate the functionality and feasibility of engineering design(s) of their identified solution(s) to meet and fulfil users'/ stakeholders' needs and experiences identified in Project Design & Business Application 1.

Starting & Managing an Enterprise

In this module, students generate business ideas and propose how these ideas can be developed into a business plan incorporating operational and financial requirements and marketing strategies for a new enterprise. In addition, students will learn how the principles of management can be applied to organise and develop the enterprise. Topics covered include entrepreneurial concepts and issues, business entry and exit strategies, types of business ownership, sources of business financing, venture launch and management principles.

BUSINESS MANAGEMENT ELECTIVE

Students are to choose *one* of the three electives below:

Managing Service Operations

This module introduces the operations in service organisations and the use of techniques for designing, planning, organising and controlling resources for the delivery of goods and services to meet customers' needs and organisational objectives. Concepts covered include service facility, managing facilitating goods, Business Management Electives forecasting demand, managing waiting lines, process improvement, inventory management, service supply relationship and service quality.

Supply Chain Management

This module introduces students to the process of planning, implementing, controlling the operations of the supply chain. It will cover the movement and storage of raw materials, work-in-process inventory and finished goods from point-of-origin to point-of-consumption. The module also emphasises the effect supply chain management has on the success and profitability of the organisation.

Understanding Buyer Behaviour

The module provides students with a basic understanding of buyer behaviour concepts. It explores various influencing factors that affect buyer decisions. Buyers could be consumers or corporate buyers. Topics covered include consumer decision-making processes, perceptions and attitudes, consumer demographics and lifestyles, and cultural and group influences.

DIPLOMA PLUS PROGRAMME

The Diploma Plus Programme (DPP) is designed to provide students with proficiency in a selected domain area, either to broaden or deepen their knowledge/skills in their main discipline of study, or to equip them with additional professional knowledge that would better prepare them for further study or increase their employability. Students can select elective modules from a wide range of clusters to obtain their Diploma Plus Certificate. DPP is optional and it will not affect the graduating requirement for the award of a diploma.

Students can choose the DPP clusters from the list below. The offer of a DPP cluster is subject to the condition that the minimum class size is met and based on available vacancies.

Engineering Clusters

- Applied Physics[#]
- Biomedical Engineering
- Computer & Communication Systems

Other available Diploma Plus Certificates

- Advanced Engineering Mathematics^{*}
- Business^{**}
- Foreign Languages

[#] The Applied Physics syllabus is aligned with the NTU's FE1012: Physics A module. NP students who obtain good grades in the Applied Physics modules will be granted exemption from the FE1012: Physics A module.

^{*} The CAEM syllabus is aligned with the 'A' Level H2 Pure Mathematics syllabus. NP graduates who have successfully completed the revised CAEM will be granted exemption from the NUS' MA1301 Proficiency Test.

^{**} Students pursuing the Minor in Business Management cannot take the DPP Certificate in Business (CIB).

