

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (26.5 hours per week)	
Career & Professional Preparation I	1.5
Computer Programming	4
Electrical Technology	4
Engineering Mathematics 1	5
Engineering Materials	4
Engineering Mechanics	4
Innovation Toolkit 1 ^	2
Sports & Wellness ^	2
Level 1.2 (27 hours per week)	
Composite Materials	3
Electronics Technology	4
Engineering Design Drafting	5
Engineering Mathematics 2	5
Manufacturing Technology & Practice	4
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.

The Minor in Business Management has the same Year 1 curriculum except for Composite Materials.

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.

Computer Programming

This practice-oriented module will equip 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. On completion of the module, students will be able to explain and write C programmes for simple engineering applications.

Electrical Technology

This module will provide the foundation in electricity to prepare students for more specialised subjects. It will deal with basic concepts of electrical circuits and the methods used to analyse them. The module will emphasise the understanding of basic electrical circuit laws (Ohm's Law, Kirchhoff's Voltage and Current Laws) and network theorems, and their application to electrical network analysis. Topics include fundamentals of electricity, network theorems, capacitance, electromagnetic induction and inductance, AC circuit theory and transformer fundamentals.

Engineering Mathematics 1

This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics will be introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic will be on simple applications and problem solving. Topics include algebra, trigonometry, logarithms, plane analytic geometry, matrices and complex numbers. Throughout the module, there will be an appropriate use of a Computer Algebra System.

Engineering Mechanics

This module will introduce students to the study of external forces in two dimensions and their effect on particles and rigid bodies that are at rest. Students will acquire the skills 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 will also aim to equip students with the skills to analyse problems of rigid bodies in motion. Only linear motion in two dimensions will be covered. Topics include kinematics and kinetics of linear motion.

Engineering Materials

This module will introduce students to the equilibrium phase diagrams, structures, and properties of common engineering materials with emphasis on mechanical testing methods, heat-treatment, international standard specifications, selection and applications of such materials. Topics include classification of materials, mechanical testing, alloying, steels, non-ferrous alloys, plastics, ceramics, composites, corrosion and selection of materials and shaping processes.

LEVEL 1.2

Composite Materials

This module aims to provide students with knowledge of the design, analysis and fabrication of composites materials used in engineering design applications. Topics include basic principles of the design, characterisation, fabrication and repair of composites materials.

Electronics Technology

This module will introduce the fundamental concepts of electronics which include analogue and digital electronic devices and circuits. The first section covers concepts pertaining to analogue electronics. These include understanding the analogue electronic circuitry, diodes, transistors and their applications. The second half of the module covers concepts on digital electronics. Topics include number systems, Boolean algebra, combinational logic design, applications of latches, flip-flops, counters and registers.

Engineering Design Drafting

This module will cover the basic principles of engineering drafting and the application of an industry-standard Computer-Aided Design & Drafting tool to produce detailed drawings of engineering parts. This practice-oriented module will comprise short lectures complemented by hands-on exercises with emphasis on practical examples and

industry practices. Topics include orthographic projection, sectioning, dimensioning, conventional representation and assembly drawing.

Engineering Mathematics 2

This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics will be introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic will be on simple applications and problem solving. Throughout the module, there will be appropriate use of a Computer Algebra System. Topics include Trigonometry, differentiation and simple integration with applications.

Manufacturing Technology & Practice

This module will allow students to acquire the basic knowledge and skills of manufacturing processes, including drilling, turning, milling, grinding, nonconventional machining, welding and assembly. The module will be practice-oriented with classroom lectures complemented by practical sessions involving the making of specially-designed work pieces.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 2	
Level 2.1 (26 hours per week)	
Applied Mechanics	5
Career & Professional Preparation II	2
Engineering Design Thinking	3
Engineering Mathematics 3	4
Industrial Automation	5
Thermodynamics	5
Interdisciplinary Studies (IS) elective ^	2
Level 2.2 (26 hours per week)	
Computer-Aided Design & Analysis	4
Computer-Aided Manufacturing	4
Engineering System Design 1	4
Fluid Mechanics	4
Mechanical Design Practice	3
Strength of Materials	5
Interdisciplinary Studies (IS) elective ^	2

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 2	
Level 2.1 (26 hours per week)	
Applied Mechanics	5
Computer-Aided Design & Analysis	4
Engineering Design Thinking	3
Engineering Mathematics 3	4
Engineering System Design 1	4
Marketing Fundamentals	4

Business & the Economy ^	2
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Level 2.2 (24 hours per week)

Career & Professional Preparation II	2
Fundamentals of Financial Management	4
Industrial Automation	5
Mechanical Design Practice	3
Strength of Materials	5
Thermodynamics	5

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COURSE MODULES

LEVEL 2.1

Applied Mechanics

This is a follow-on module of Engineering Mechanics. It will equip students with the necessary skills to analyse problems of rigid bodies at rest and in motion. Topics include trusses, friction, work energy method, power and efficiency & Impulse momentum method. This knowledge plays an important role in many diverse engineering applications of the modern world, such as the design of cars, structures, airplanes and various types of machines. Students will be guided to solve engineering problems using these mechanics principles.

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.

Engineering Design Thinking

This module aims to teach students the engineering design thinking process that designers adopt to define the problem, do relevant research to acquire information, analyse knowledge and provide creative solutions to the problem in the design and planning fields. With the thinking process, problems can be framed, the right questions can be asked, more ideas can be created and the best answers can be chosen.

Engineering Mathematics 3

This module is a continuation of Engineering Mathematics 2. Topics include Integration Techniques & Applications, First Order Differential Equation, Laplace Transform, Probability and Statistics.

Industrial Automation

This module will allow students to explore the concepts of logic and sequential control, and their applications in industrial automation. They will be introduced to a spectrum of technologies, ranging from pneumatics and electro-pneumatics to programmable controllers, with emphasis on component technology leading to circuit design and implementation. Topics include automated mechanisms, ladder diagrams, basic and advanced features of programmable controllers, design techniques and applications.

Marketing Fundamentals

This module will introduce 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.

Thermodynamics

This module covers the properties of working fluids, the first law of thermodynamics and its application to both non-flow and flow processes. Topics include the first law of thermodynamics, properties of liquids and vapours, non-flow processes with steam, steady flow processes with steam, properties of perfect gases, and non-flow processes with perfect gases.

LEVEL 2.2

Computer-Aided Design & Analysis

This practice-oriented module is designed to give students an appreciation of the scope of computer graphics and hands-on practice on the applications of Computer-Aided Design (CAD) in engineering design. This module aims to help the students in the application of the drafting concepts and modelling techniques for development of product models in the design process. Students will learn the principles and capabilities of CAD through three dimensional (3D) solid modelling of engineering components and assembly. A project is used to consolidate the concepts and techniques learnt in the CAD module and Computer-Aided Manufacturing (CAM) module. Another project is used to consolidate the concepts and techniques learnt in the CAD module and Engineering System Design 1 (ESD1) module.

Computer-Aided Manufacturing

This module will allow students to acquire the basic knowledge and skills in handling modern manufacturing processes. The module is practice-oriented with classroom lectures complemented by practical sessions on computer-numerical-control (CNC) turning and milling, PRO/NC, reverse engineering, coordinate measuring machines, automation and assembly. There is also coverage on electronics manufacturing and automatic assembly processes. Safety and a positive work attitude form an integral part of the module.

Engineering System Design 1

This module will equip students with the fundamental knowledge and practice of proper engineering design process and the applications of engineering principles and analysis in the design, sizing and selection of components such as electric motor, coupling, gears, bearing, chain drives, and fastener and compression spring. Case studies of existing machines and systems, guided tutorials, quizzes, assignments and a practical project will be used to reinforce the theoretical aspects.

Fluid Mechanics

This module will provide an introduction to the principles of fluid mechanics and their application in analysing systems in which fluid is the working medium. Topics include fluid statics, pressure measurement, hydrostatic forces on submerged surfaces, buoyancy, fluid in motion, Bernoulli Equation, flow measurement, piping system, pump performance, and system characteristics.

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.

Mechanical Design Practice

This is a hands-on module that aims to provide students with opportunities to put the knowledge and skills learnt from the Engineering Design Thinking module into practice through the detailed design, fabrication and testing of an engineering application prototype. In the process, students will hone their design knowledge and skills required for their final-year project or internship.

Strength of Materials

This module aims to provide students with the foundational knowledge of strength of materials with emphasis on applications and problem solving. Topics include simple stresses and strains, torsion in shaft, shear force and bending moment diagrams, stresses in beams, combined stresses and experimental stress analysis.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 3	
INTERNSHIP	
Level 3.1 (27 hours per week)	
Applied Thermodynamics	5
Engineering System Design 2	5
Instrumentation & Control	5
Mechanics of Machines & Materials	5
Project Management	3
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (22 hours per week)	
6-Month Internship	22
NON-INTERNSHIP	
Level 3.1 (26 hours per week)	
Instrumentation & Control	5
Mechanical Project Design 1 (in the specific specialization)	7
Mechanics of Machines & Materials Specialisation Module (Automotive Technology & Motorsports, Biomedical Applications, Design Innovation, or Environment & Energy Systems)	5
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (23 hours per week)	
Applied Thermodynamics	5
Engineering System Design 2	5
Mechanical Project Design 2 (in the specific specialization)	10
Project Management	3

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 3	
INTERNSHIP	
Level 3.1 (26 hours per week)	
Business Management Elective	4
Engineering System Design 2	5
Fluid Mechanics	4
Mechanics of Machines & Materials	5
Starting & Managing an Enterprise	4
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (22 hours per week)	
6-Month Internship	22
NON-INTERNSHIP	
Level 3.1 (24 hours per week)	
Business Management Elective	4
Mechanics of Machines & Materials	5
Project Design & Business Application 1	7
Starting & Managing an Enterprise	4
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (24 hours per week)	
Applied Thermodynamics	5
Engineering System Design 2	5
Fluid Mechanics	4
Project Design & Business Application 2	10

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COURSE MODULES

LEVEL 3.1 & 3.2

6-Month Internship

The six-month internship will provide students with the opportunity to apply the knowledge acquired in the classroom to work situations, and demonstrate problem solving, communication and interpersonal skills in a work environment. The programme enables students to hone their ability to work independently and in teams, while they take on one or more practical projects under the supervision of industry practitioners. The objective is to develop a professional approach to work based on the relevant code of practice.

Applied Thermodynamics

This module will allow students to learn the application of thermodynamics principles to energy conversion, transformation and management. Topics include thermodynamics processes, the second law of thermodynamics, gas power cycles, engine performance testing, nozzles, steam power plant, heat transfer and introductory thermal management.

Engineering System Design 2

This module will equip students with the fundamental knowledge and practice for the design of multiple discipline projects. Case studies where working examples are used to introduce and reinforce the knowledge acquired by students through lectures. A project is used to enhance and cultivate analytical thinking and independent learning in the design environment.

Instrumentation & Control

This module will cover instruments, feedback control systems, control components, system performance and stability. Topics include concepts of feedback control, principles and application of measuring sensors, control valves, control modes, use of analytical tools for system performance and stability analysis, servo control systems, and process control applications.

Mechanical Design Project 1

This module will allow students to work in teams to design and develop a product or system related to their final-year option module. In the project, students will learn to apply their knowledge and skills in creative problem solving, engineering and design, teamwork and project management. This module focuses on the identification of problem or need, research and design.

Mechanical Design Project 2

This module follows on from Mechanical Design Project 1. Based on the design prepared in the first semester, students will be required to fabricate the prototype and assemble the parts, test and refine the prototype and prepare the refined design and a project report. The students will also be required to do a final presentation to a panel of examiners.

Mechanics of Machines & Materials

This module will provide students with the experience of solving engineering problems based on the principles and theories covered in the earlier Mechanics modules. Topics include velocity and acceleration diagrams, effects of the mass of members of mechanism, friction mechanisms and the effects of friction on screw threads and belt drives, balancing of shafts and its application to gears and pulleys, and the causes and control of machinery vibration.

Project Design & Business Application 1

This module will allow students to integrate the business and engineering knowledge they gained during the first two years of study and undertake a year-long project in the field of Mechanical Engineering. They will be required to conduct a market survey for a particular product need, conceptualise the product and develop a business proposal/plan for the product.

Project Design & Business Application 2

This module is a continuation of Project Design & Business Application 1 where students will develop their product into a working prototype. They will also be required to document their design and fabrication process in a project report and present their work to a panel of examiners.

Project Management

This module aims to provide students with a thorough understanding of projects and project management techniques such as project planning, scheduling and controlling using network analysis such as Critical Path Method (CPM), Gantt Charts and Program Evaluation & Review Technique (PERT). The major topics include Introduction to Projects and Project Management, CPM, Resource Scheduling, Project Costs, Project Control and PERT. The module is supplemented with tutorial assignments. Case studies are included to reinforce basic understanding and concepts which can be applied in practical situations.

Starting & Managing an Enterprise

This module will allow students to 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 include entrepreneurial concepts and issues, business entry and exit strategies, types of business ownership, sources of business financing, venture launch and management principles.

FINAL-YEAR SPECIALISATION MODULES

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

Automotive Technology & Motorsports

This activity-based module covers the structures, functions, main components and operations of land vehicles and motorsports, including the recent development of 'green' vehicles. The module will prepare students to undertake an automotive project, which takes them through the complete cycle of idea generation, design, manufacturing, testing and presentation.

Biomedical Applications

This activity-based module covers biomechanics and rehabilitation engineering, biomaterials and implant, and medical imaging with rapid prototype. The module will prepare students to undertake a biomedical application project, which involves the complete cycle of idea generation, design, manufacturing, prototype testing, report and presentation.

Design Innovation

This activity-based module covers the design, innovation and development process involving problem research and definition, target user group and product design specifications, aesthetic and ergonomic requirements. The module will prepare students to undertake a design innovation project, which involves the complete cycle of idea generation, design, manufacturing, prototype testing, report and presentation.

Environment & Energy Systems

This activity-based module covers environmental issues and energy saving in mechanical systems, alternative and renewable energy sources, and the heat transfer principles and design requirements and applications students to undertake an environment and energy system project, which involves the complete cycle of idea generation, design, manufacturing, prototype testing, report and presentation.

BUSINESS MANAGEMENT ELECTIVES

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, 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 and 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#
- Computer-Aided Design Skills (World Skills Singapore)
- Workplace Safety & Health

Other available Diploma Plus Certificates

- Advanced Engineering Mathematics*
- Business**
- Innovation Management
- 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).