

DIPLOMA IN CIVIL & ENVIRONMENTAL ENGINEERING (CEE)

(3-YEAR COURSE)

SCHOOL OF ENGINEERING



From ancient Egypt to the present day, civil engineers have designed and supervised the creation of countless structures such as buildings, dams, bridges, tunnels, highways, transit systems, airports, harbours, and wastewater treatment plants. Over time, engineering has also played an increasingly important role in protecting the environment from a variety of pollutants through strategies and specialised equipment designed to create a cleaner environment.

The **Diploma in Civil & Environmental Engineering (CEE)** is a dual-discipline course that combines training for infrastructure development and environmental protection industries. Students are equipped with the knowledge and skills to design, operate and manage structures in an environmentally safe and friendly manner. They receive comprehensive training in the intricacies of building design, water and wastewater treatment, pollution control, waste management and recycling, and environmental health management.

Besides the discipline-specific core modules, students have a good spread of elective modules to choose from and can graduate with additional Diploma Plus Certificates and/or Enhancement Certificates. These electives are carefully selected to cater to the students' diverse interests and the changing trends in the industry.

In the second or final year, students have opportunities to participate in research studies and projects, industrial training or attachment programmes, and exchange programmes, either locally or overseas.

As technology evolves, the world population increases and environmental concerns mount, the skills of civil and environmental engineers will continue to be highly valued particularly in design, construction, operation, research and management.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examinations (or equivalent) results:

Subject	'O' Level Grade
English	1-7**
Mathematics (Elementary/Additional)	1-6
Science (with Physics or Chemistry or Biology component) or Design & Technology	1-6

The aggregate computation for selection is based on grades obtained for English, Mathematics, Science or Design & Technology and two other subjects.

** Candidates with English as a second language (EL2) must have attained a minimum grade of 6.

Candidates with hearing deficiency should not apply for the course.

CAREER PROSPECTS

Graduates trained in civil and environmental engineering enjoy excellent job prospects both locally and overseas, with countless opportunities to apply their knowledge and skills to building infrastructure, protecting the environment and helping to conserve resources.

Equipped with broad-based and dual-disciplined knowledge and skills, CEE graduates are well placed for careers in both the public and private sectors. They are sought after by government agencies like the Land Transport Authority, Building Control Authority, National Environmental Agency, Public Utilities Board, Ministry of Environment and Water Resources and Ministry of Defence.

In the private sector, they can also become civil/structural designers; project supervisors; assistant environmental engineers; project engineers; environmental technologists; officers overseeing environmental health, technical support, health and safety, and environmental control; laboratory analysts; research assistants; and marketing executives.

ACCREDITATION FOR FURTHER STUDIES

CEE graduates can pursue degree programmes in civil engineering or environmental engineering at local and overseas universities. Advanced standing of one to two years' or module exemptions may be granted.

The Diploma in Civil & Environmental Engineering is recognised locally by the Society of Environmental Health, and overseas by the International Federation of Environmental Health. The Institution of Water & Environmental Management, UK, exempts CEE graduates from Part 1 of the Engineering Council examinations.

COURSE STRUCTURE

FIRST-YEAR MODULES

Level 1.1	Level 1.2
<ul style="list-style-type: none">Structural MechanicsCivil Engineering ConstructionEcologyEnvironmental HealthEngineering Mathematics 1Creativity & Applied Thinking Skills[^]Sports & Wellness[^]	<ul style="list-style-type: none">Land SurveyingComputer Aided DesignEnvironmental Chemistry & AnalysisHydraulicsEngineering Mathematics 2Individual & the Community[^]Communication Toolkit[^]

SECOND-YEAR MODULES

Level 2.1	Level 2.2
<ul style="list-style-type: none">Structural AnalysisProject ManagementNoise Pollution Monitoring & ControlClean Water TechnologyEngineering Mathematics 3Any 2 Interdisciplinary Studies (IS) modules[^]	<ul style="list-style-type: none">Geotechnical EngineeringQuantity SurveyingEnvironmental ManagementWorkplace Safety & Health 1Industrial Training Programme (not for IAP/PDD students)Innovation & Enterprise in Action[^]

FINAL-YEAR MODULES

Level 3.1	Level 3.2
<ul style="list-style-type: none">Reinforced Concrete DesignAir Quality Monitoring & ControlStructural Inspection & Repairs[*]Project 1[*]World Issues: A Singapore Perspective[^]Any 1 Interdisciplinary Studies (IS) module[^]	<ul style="list-style-type: none">Steel DesignWorkplace Safety & Health 2Water Reclamation TechnologyInternational Business[*]Project 2[*]

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules^{*}

[^] Denotes Interdisciplinary Studies (IS) module. For more details on IS modules, please log on to www.np.edu.sg/is/

^{*} Students who are selected for the six-month Industrial Attachment Programme (IAP) or Project Design & Development (PDD) will be required to take all the final-year modules (except Structural Inspection & Repairs, International Business, Project 1 & 2) in Level 3.1. Students will then do their IAP or PDD in Level 3.2.

[°] Students take two elective modules to complete their diploma. Electives are chosen and customised from a wide range of clusters under the Engineering and Non-Engineering categories.

COURSE MODULES

LEVEL 1.1

Structural Mechanics

Strength and stability are important aspects in structures. This module explores the fundamentals of statics, moments, reactions, stresses and strains in structural elements, and how they arise due to different designs and loading criteria. These basic concepts are then applied to analyse the behaviour of simple structures.

Civil Engineering Construction

This module introduces students to the various methods of construction involved in building and civil engineering works. It covers general practices in pre-construction works, construction using reinforced-concrete, precasting, prestressing and structural steelwork. Excavation works, supports, ground water control, road works, pipeline construction and tunnelling are also included.

Ecology

Ecology is the study of living things in their natural environment. This module focuses on the significance and function of natural ecosystems, and how humans have affected these systems over time. It concentrates on the interaction between human activities, natural resources and the environment. As the human population grows and technology advances, pressures on the earth's natural systems are becoming increasingly intense and complex. This module aims to promote greater environmental awareness and nurture social responsibility towards the environment.

Environmental Health

In this module, students will learn about the characteristics of disease-bearing parasitic organisms and insects, and the impact of diseases on environmental health. They are taught the fundamentals of human anatomy and physiology, epidemiology and communicable disease control, and the application of this knowledge in implementing environmental health control programmes.

Engineering Mathematics 1

This module provides students with mathematical skills that are required to solve basic engineering problems. Topics are introduced in an order intended to keep pace with the engineering modules. Topics include algebra, trigonometry, logarithms, matrices and complex numbers. Computer Algebra System will be used throughout the module.

LEVEL 1.2

Land Surveying

Students will study the elementary principles of plane surveying, and learn to use survey instruments through fieldwork and assignments. Lessons cover the use of measuring tapes, prismatic compass, levels and theodolites, and techniques in traversing surveys, levelling, plane tabling, tachometry, and setting out of circular curves.

Computer Aided Design

This module equips students with the principles and techniques of preparing computer-aided design (CAD) drawings in Architectural, Engineering and Construction (AEC) projects. Students are also trained to interpret and extract information from CAD drawings, and to prepare CAD drawings according to CP83. Emphasis will be placed on preparing CAD drawings accurately so that information can be used electronically. AutoCAD is used in this module as it is widely adopted in the AEC industry.

Environmental Chemistry and Analysis

This module introduces students to the field of environmental engineering and provides a foundation for applications in pollution control and water and wastewater technology. Students will study the practical aspects of environmental chemistry, quantitative measurements and analysis of air, water and wastewater. Principles of measurement, instrumentation and analysis are emphasised using an application-oriented approach.

Hydraulics

This module introduces students to basic hydraulic principles and fundamental concepts that are essential for the study of water and wastewater technologies. Topics covered include the properties of fluid, manometry, hydrostatics and fundamental principles of fluid flow. Head loss in pipeline, design of pipeline, flow measurements and pipe network analysis will also be covered. Students also learn open channel flow and the design of surface water drainage systems.

Engineering Mathematics 2

This module is designed to provide students with mathematical skills that are required to solve basic engineering problems. Topics are introduced in an order intended to keep pace with the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, a Computer Algebra System is used when appropriate. Topics include trigonometry, coordinate geometry, differentiation and integration with applications.

LEVEL 2.1

Structural Analysis

In this continuation of the Structural Mechanics module, students will analyse structures for the purpose of structural design in concrete or steel. The understanding of structural behaviour under various loading conditions will enable them to appreciate the importance of proper analysis. Students learn to analyse and compute forces, deflections, shear forces and bending moments developed in structural members due to different loading criteria. Both statically determinate and indeterminate structures are covered.

Project Management

This module teaches students the essentials of engineering project management. Topics covered include contract administration, site layout and organisation, engineering economics and finance. Students also learn project-planning techniques, including the use of project network planning software.

Noise Pollution Monitoring & Control

The control of noise pollution is essential in all aspects of engineering work. In Singapore, rapid economic growth and the rise of an affluent population have resulted in a greater need to control noise pollution. In this module, students explore how noise pollution arises, the health impact, measurement and monitoring of noise levels, preventive and control measures, and local environmental legislation.

Clean Water Technology

This module introduces the processes for treating raw water from various surface water sources to produce potable water. Students will be taught raw water quality parameters, treatment techniques, and the monitoring and operation of water treatment systems. The focus is on conventional water treatment technologies, particularly on chemical coagulation and flocculation processes for removal of suspended and colloidal solids in raw water. Topics covered include pre-treatment of raw water, sedimentation, coagulation, flocculation, filtration and disinfection techniques.

Engineering Mathematics 3

This module is designed to provide students with mathematical skills that are required to solve basic engineering problems. Topics are introduced in an order intended to keep pace with the application requirements in engineering modules. Topics include integration with applications, differential equations, Laplace transform, and probability and statistics. A Computer Algebra System will be used throughout the module.

LEVEL 2.2

Geotechnical Engineering

In this module, students will study the behaviour of soil when structures are built on them. The properties of common types of soils, soil compaction, soil permeability, shear strength of soils, earth pressure and stability of slopes are covered in detail. Students will also learn about soil investigation, analysis of soil samples, and shallow and piled foundations.

Quantity Surveying

This module covers the principles of taking-off and the measurement of quantities from construction drawings for the purpose of preparing cost estimates for Civil Engineering works. Topics covered include the measurement of quantities for earthwork, brickwork, concrete work, reinforcement, road pavements, pipelines, sewer lines and drainage. Students will also have practical sessions on the use of software for taking-off and costing.

Environmental Management

In this module, students will explore the concepts and principles of environmental management. Topics covered include the fundamentals of environmental impact assessment (EIA), environmental baseline studies (EBS), risk assessment, environmental management systems (EMS), ISO 14001, OSHA 18001 and environmental auditing. The module also covers the management of environmental health, particularly in the areas of food and meat hygiene. In addition, students learn the importance of health education and communication, and the legislation and laws pertaining to environmental management.

Workplace Safety & Health 1

This module focuses on the study of various aspects critical to the provision of a safe working environment. Topics covered include toxicology, clean air and ventilation, control of temperature and humidity, effects of noise and vibration on humans, industrial hygiene, and industrial diseases.

Industrial Training Programme

In this module, students are attached to organisations for a period of eight weeks to gain practical experience related to their course of study, and to hone their social skills and acquaint them with the work environment, thereby enabling them to adapt effectively to future employment in the private or public sector. During their attachment, they will undertake projects and tasks assigned by the organisation.

LEVEL 3.1

Reinforced Concrete Design

In this module, students will learn how to use the current Code of Practice for the analysis and design of reinforced concrete structures. They will also study reinforcement detailing and learn how to prepare structural drawings for construction purposes.

Air Quality Monitoring & Control

Monitoring and control of air pollution, both outdoor and indoor, are important aspects of environmental management. Students are taught the fundamentals of how air pollution arises, types of pollutant, and the corresponding environmental and health impacts. Dispersion modelling, sampling and monitoring of pollutants, techniques of identification of pollutants, preventive and control measures, and local environmental legislation and guidelines on indoor air quality will also be introduced.

Structural Inspection & Repairs

This module introduces the mandatory inspection of buildings under the Building Control Act. It covers the inspection of existing reinforced concrete structures, concrete defects, structural and non-structural cracks, non-destructive tests and repair works. Students will also have practical sessions on the use of equipment for non-destructive testing of concrete.

Project 1

In this module, students are expected to integrate the knowledge they have gained in the first two years to undertake a year-long project on a topic in the field of civil and environmental engineering. The project could be a case study, fabrication or computer-application project.

LEVEL 3.2

Steel Design

This module covers the design concepts of steel structures, and the detailed design of various structural steel elements based on the current structural steel design code. Students will learn how to prepare structural steel detailing and drawings.

Workplace Safety & Health 2

The module provides students with knowledge of the relevant legislation and standards pertaining to occupational safety. The types of hazards in various industries and protection against them are also covered. Topics include the safe use of hand and power tools, the safe handling of materials, process hazards and electrical safety.

Water Reclamation Technology

In this module, students will learn the fundamentals of collection systems for domestic wastewater, wastewater treatment techniques, monitoring and operation of wastewater treatment systems, and the code of practice relevant to sewerage and sewage treatment. The design of sewer collection systems will be covered in detail. Emerging technologies in water reclamation and water recycling will also be emphasised.

International Business

Students will learn the various types of business models, marketing and risk management for overseas projects. The focus is on critical success factors such as understanding cultural differences, project financing and human resource management in different countries.

Project 2

This module is a continuation of Project 1, where students undertake a year-long project on a topic in the field of civil and environmental engineering.

Industrial Attachment Programme

In this module, students are attached to organisations for a period of six months to prepare them for future employment in their particular discipline of study through immersion as a staff in the actual work environment. During their attachment, they will undertake projects and tasks assigned by the organisations to develop initiative, self-confidence as well as interpersonal and adaptation skills.

Project Design & Development

In this module, students will work, in teams, on a project in their particular discipline of study for a period of six months. The project will require them to research, experiment, analyse, critique and make recommendations to the subject of study. In addition to stretching the students' self-learning ability, the process will hone their essential traits like leadership, team spirit, independence, innovative spirit, and their presentation and management skills.

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

School of Engineering Elective Modules and the Diploma Plus Programme

Students take two modules from a wide range of clusters under the engineering and non-engineering categories to complete their diploma. Furthermore, students can qualify for a diploma plus by simply topping up with two additional modules from the same cluster as one of their chosen electives. The Diploma Plus Certificate helps students if they wish to pursue a university degree or increase their employability in discipline-specific areas. Students can choose electives from the range listed below.

Engineering Category

- Advanced Engineering Mathematics Cluster*
- Applied Physics Cluster*
- Mechanical Technology Cluster

Non-Engineering Category

- Economics & Financial Applications Cluster
- Green Development Cluster
- Leisure & Retail Management Cluster

Other Available Diploma Plus Certificates

- Business
- Innovation Management
- Languages (Japanese)

* Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The syllabus is based on the first-year engineering mathematics and science curricula of NUS.

For detailed module descriptions under each cluster, please refer to page 182.

COURSE CURRICULUM (NORMAL PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (25 hours per week)		
1.	Structural Mechanics	5
2.	Civil Engineering Construction	5
3.	Ecology#	2
4.	Environmental Health	4
5.	Engineering Mathematics 1#	5
6.	Creativity & Applied Thinking Skills^	2
7.	Sports & Wellness^	2
Level 1.2 (25 hours per week)		
8.	Land Surveying	4
9.	Computer Aided Design#	3
10.	Environmental Chemistry & Analysis#	5
11.	Hydraulics#	4
12.	Engineering Mathematics 2#	5
13.	Individual & the Community^	2
14.	Communication Toolkit^	2
YEAR 2		
Level 2.1 (24 hours per week)		
15.	Structural Analysis	4
16.	Project Management#	4
17.	Noise Pollution Monitoring & Control#	4
18.	Clean Water Technology#	4
19.	Engineering Mathematics 3#	4
20.	Interdisciplinary Studies (IS) module^	2
21.	Interdisciplinary Studies (IS) module^	2
Level 2.2 (25 hours per week)		
22.	Geotechnical Engineering	5
23.	Quantity Surveying	3
24.	Environmental Management	4
25.	Workplace Safety & Health 1#	4
26.	Innovation & Enterprise in Action^	4
27.	Industrial Training Programme	5
YEAR 3		
Level 3.1 (22 hours per week)		
28.	Reinforced Concrete Design	5
29.	Air Quality Monitoring & Control#	4
30.	Structural Inspection & Repairs	3
31.	Project 1	6
32.	World Issues: A Singapore Perspective^	2
33.	Interdisciplinary Studies (IS) module^	2
Level 3.2 (23 hours per week)		
34.	Steel Design	4
35.	Workplace Safety & Health 2#	4
36.	Water Reclamation Technology#	4
37.	International Business#	2
38.	Project 2	9
Across-Level Modules (Level 1.2 onwards) (6 hours per week)		
39.	School of Engineering elective module°	3
40.	School of Engineering elective module°	3

COURSE CURRICULUM (IAP/PDD PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (25 hours per week)		
1.	Structural Mechanics	5
2.	Civil Engineering Construction	5
3.	Ecology#	2
4.	Environmental Health	4
5.	Engineering Mathematics 1#	5
6.	Creativity & Applied Thinking Skills [^]	2
7.	Sports & Wellness [^]	2
Level 1.2 (25 hours per week)		
8.	Land Surveying	4
9.	Computer Aided Design#	3
10.	Environmental Chemistry & Analysis#	5
11.	Hydraulics#	4
12.	Engineering Mathematics 2#	5
13.	Individual & the Community [^]	2
14.	Communication Toolkit [^]	2
YEAR 2		
Level 2.1 (24 hours per week)		
15.	Structural Analysis	4
16.	Project Management#	4
17.	Noise Pollution Monitoring & Control#	4
18.	Clean Water Technology	4
19.	Engineering Mathematics 3#	4
20.	Interdisciplinary Studies (IS) module [^]	2
21.	Interdisciplinary Studies (IS) module [^]	2
Level 2.2 (20 hours per week)		
22.	Geotechnical Engineering	5
23.	Quantity Surveying	3
24.	Environmental Management	4
25.	Workplace Safety & Health 1#	4
26.	Innovation & Enterprise in Action [^]	4
YEAR 3		
Level 3.1 (25 hours per week)		
27.	Reinforced Concrete Design	5
28.	Air Quality Monitoring & Control#	4
29.	Steel Design	4
30.	Workplace Safety & Health 2#	4
31.	Water Reclamation Technology#	4
32.	World Issues: A Singapore Perspective [^]	2
33.	Interdisciplinary Studies (IS) module [^]	2
Level 3.2 (25 hours per week)		
(Student to do one)		
34.	Industrial Attachment Programme (IAP)	25
35.	Project Design & Development (PDD)	25
Across-Level Modules (Level 1.2 onwards)		
(6 hours per week)		
36.	School of Engineering elective module [°]	3
37.	School of Engineering elective module [°]	3

Notes:

Common modules with other courses.

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

[°] For more details on School of Engineering elective modules, please refer to page 182.

IS Modules

The School of Interdisciplinary Studies (IS) delivers the interdisciplinary curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge-based economy. IS modules challenge boundaries and offer insights into Communication, Entrepreneurship, Life Skills, Media & the Arts, and Science & Technology.

School of Engineering (SoE) Elective Modules

The SoE elective modules fall under a wide range of clusters under both Engineering and Non-Engineering categories. The aim is to provide students with the opportunity to broaden their knowledge and deepen their discipline-specific areas. Each cluster comprises a minimum of three 3-hour modules. Students are required to take two modules in order to satisfy the minimum graduating requirement.

DIPLOMA IN ENVIRONMENTAL & WATER TECHNOLOGY (EWT)

(3-YEAR COURSE)

SCHOOL OF ENGINEERING

Today, one in three people around the world do not have enough water. There is also growing concern over environmental issues and businesses are under increasing pressure to be environmentally responsible. The preservation of our environment is therefore a pressing issue, particularly when dealing with sustainable development.

The **Diploma in Environmental & Water Technology (EWT)** is a new, cutting-edge course that focuses on environmental challenges and finding effective solutions to improve the environment and natural resources.

Jointly developed with the Public Utilities Board (PUB), EWT trains students to become specialists in addressing global concerns such as groundwater pollution, air pollution, global warming, ozone depletion and improper handling of hazardous waste.

Students benefit from a good grounding in the five key areas of water technology, waste management & resource conservation, renewable energy, pollution monitoring & control, environmental management, and health & safety.

Besides the discipline-specific core modules, students have a good spread of elective modules to choose from, and can graduate with additional Diploma Plus Certificates and/or Enhancement Certificates. These electives are carefully selected to cater to the students' diverse interests and the changing trends in the industry.

In the final year, students will do a year-long project. Alternatively, they can undertake a six-month Project Design & Development (PDD) or a six-month Industrial Attachment Programme (IAP). These research/fabrication projects and practical training equip students with the essential skills to excel in the workplace of the future.

Fully supported by the National Environment Agency and PUB, and endorsed by the Ministry of Manpower, EWT opens doors for graduates in the growing industry of environmental and water technology. The partnerships ensure that students gain real-life exposure prior to graduation. In addition, outstanding candidates will receive PUB's full-term scholarships with no bond, and possible employment in the company.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examinations (or equivalent) results:

Subject	'O' Level Grade
English	1-7**
Mathematics (Elementary/Additional)	1-6
Science (with Physics or Chemistry or Biology component) or Design & Technology	1-6

The aggregate computation for selection is based on grades obtained for English, Mathematics, Science or Design & Technology and two other subjects.

** Candidates with English as a second language (EL2) must have attained a minimum grade of 6.

Candidates with hearing deficiency or severe vision deficiency including colour appreciation deficiency should not apply for the course.

CAREER PROSPECTS

The Singapore government is setting aside \$2 billion in research funds to drive the growth of the environmental and water technology industry. This translates into a doubling of employment opportunities to 11,000 positions by 2015.

Equipped with broad-based and practice-oriented knowledge and skills in protecting the environment and conserving resources, EWT graduates are well placed for careers with government agencies, statutory boards, multi-national corporations and other private organisations. They can become environmental technologists, water and wastewater treatment specialists, workplace health and safety auditors, as well as marketing executives for environment-related equipment and products.

ACCREDITATION FOR FURTHER STUDIES

Graduates will be able to gain direct admission to relevant degree programmes offered by local universities, and overseas universities in Australia, the United Kingdom and the United States, such as the following:

- Nanyang Technological University
- National University of Singapore
- University of New South Wales, Australia
- The University of Western Australia
- University of Strathclyde, Glasgow

EWT graduates in local and overseas universities may be granted module exemptions or one to two years' exemption.

COURSE STRUCTURE

FIRST-YEAR MODULES

Level 1.1	Level 1.2
<ul style="list-style-type: none"> • Environmental Chemistry & Analysis • Fundamentals of Civil Engineering • Fundamentals of M&E Engineering • Engineering Mathematics 1 • Creativity & Applied Thinking Skills[^] • Sports & Wellness[^] 	<ul style="list-style-type: none"> • Hydraulics • Environmental Biology • Ecology • Computer Aided Design • Engineering Mathematics 2 • Individual & the Community[^] • Communication Toolkit[^]

SECOND-YEAR MODULES

Level 2.1	Level 2.2
<ul style="list-style-type: none"> • Clean Water Technology • Workplace Safety & Health 1 • Noise Pollution Monitoring & Control • Solid & Hazardous Waste Management • Engineering Mathematics 3 • Any 2 Interdisciplinary Studies (IS) modules[^] 	<ul style="list-style-type: none"> • Water Reclamation Technology • Air Quality Monitoring & Control • Renewable Energy • Environmental Biotechnology • Water & Marine Pollution • Industrial Training Programme (not for IAP/PDD students) • Innovation & Enterprise in Action[^]

FINAL-YEAR MODULES

Level 3.1	Level 3.2
<ul style="list-style-type: none"> • Environmental Management System • Workplace Safety & Health 2 • Energy Conservation & Management • Project 1* • World Issues: A Singapore Perspective[^] • Any 1 Interdisciplinary Studies (IS) module[^] 	<ul style="list-style-type: none"> • Design of Water Systems • Membrane Science & Technology • Process Instrumentation & Control • Project Management* • International Business* • Project 2*

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules[°]

[^] Denotes Interdisciplinary Studies (IS) module. For more details on IS modules, please log on to www.np.edu.sg/is/

* Students who are selected for the six-month Industrial Attachment Programme (IAP) or Project Design & Development (PDD) will be required to take all the final-year modules (except Project Management, International Business, Project 1 & 2) in Level 3.1. They will then do their IAP or PDD in Level 3.2.

[°] Students take two elective modules to complete their diploma. Electives are chosen and customised from a wide range of clusters under the Engineering and Non-Engineering categories.

COURSE MODULES

LEVEL 1.1

Environmental Chemistry and Analysis

This module introduces students to the field of environmental engineering and provides a foundation for applications in pollution control, and water and wastewater technology. Students will study the practical aspects of environmental chemistry, quantitative measurements and analysis of air, water and wastewater. Principles of measurement, instrumentation and analysis are emphasised using an application-oriented approach.

Fundamentals of Civil Engineering

This module explores the basic principles and practices of civil engineering. The main topics include building materials, plants for earthwork, concreting, construction techniques, fundamentals of forces, stress and strain in structures, behaviour of structures under various loading conditions, basic analysis of forces, and bending moments in structural members. Topics on materials and plants for construction, construction technologies, fundamentals of structural mechanics and the basic concepts in the analysis of structures are also incorporated. Students will also study elementary principles of land surveying.

Fundamentals of M&E Engineering

This module provides the fundamental knowledge of mechanical and electrical systems associated with water treatment, wastewater treatment, and solid and hazardous waste management. Students are also taught the installation, operation and maintenance of these systems.

Engineering Mathematics 1

This module provides students with mathematical skills that are required to solve basic engineering problems. Topics are introduced in an order intended to keep pace with the engineering modules. Topics include algebra, trigonometry, logarithms, matrices and complex numbers. Computer Algebra System will be used throughout the module.

LEVEL 1.2

Hydraulics

This module introduces students to basic hydraulic principles and fundamental concepts that are essential for the study of water and wastewater technologies. Topics covered include the properties of fluid, manometry, hydrostatics and fundamental principles of fluid flow. Head loss in pipeline, design of pipeline, flow measurements and pipe network analysis will also be covered. Students also learn open channel flow and the design of surface water drainage system.

Environmental Biology

This module introduces students to the field of environmental microbiology, parasitology and epidemiology, and provides a foundation for further studies and applications in water and wastewater treatment, environmental health and environmental management. Students are also taught selected topics on human biology and food-borne diseases.

Ecology

Ecology is the study of living things in their natural environment. This module focuses on the significance and function of natural ecosystems, and how humans have affected these systems over time. It concentrates on the interaction between human activities, natural resources, and the environment. As the human population grows and technology advances, pressures on the earth's natural systems are becoming increasingly intense and complex. This module aims to promote greater environmental awareness and nurture social responsibility towards the environment.

Computer Aided Design

This module equips students with the principles and techniques of preparing computer-aided design (CAD) drawings in Architectural, Engineering and Construction (AEC) projects. Students are also trained to interpret and extract information from CAD drawings, and to prepare CAD drawings according to CP83. Emphasis will be placed on preparing CAD drawings accurately so that information can be used electronically. AutoCAD is used in this module as it is widely adopted in the AEC industry.

Engineering Mathematics 2

This module is designed to provide students with mathematical skills that are required to solve basic engineering problems. Topics are introduced in an order intended to keep pace with the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, a Computer Algebra System is used when appropriate. Topics include trigonometry, coordinate geometry, differentiation and integration with applications.

LEVEL 2.1

Clean Water Technology

This module introduces the processes for treating raw water from various surface water sources to produce potable water. Students are taught raw water quality parameters, treatment techniques, and the monitoring and operation of water treatment systems. The focus is on conventional water treatment technologies, particularly on chemical coagulation and flocculation processes for removal of suspended and colloidal solids in raw water. Topics covered include pre-treatment of raw water, sedimentation, coagulation, flocculation, filtration and disinfection techniques.

Workplace Safety & Health 1

This module focuses on the study of various aspects critical to the provision of a safe working environment. Topics covered include toxicology, clean air and ventilation, control of temperature and humidity, effects of noise and vibration on humans, industrial hygiene, and industrial diseases.

Noise Pollution Monitoring & Control

The control of noise pollution is essential in all aspects of engineering work. In Singapore, rapid economic growth and the rise of an affluent population have resulted in a greater need to control noise pollution. In this module, students explore how noise pollution arises, the health impact, measurement and monitoring of noise levels, preventive and control measures, and local environmental legislation.

Solid & Hazardous Waste Management

In this module, students will examine how solid and hazardous waste is generated; the pollution problems related to waste disposal; and methods of collection, handling, treatment and disposal of waste. Concepts of waste minimisation such as recycling, reusing, reducing and waste exchange will be highlighted as effective tools in waste management. Issues in biomedical waste generation, collection and treatment will be addressed. Local legislation for solid and hazardous waste will be explained in relation to the overall waste management practice.

Engineering Mathematics 3

This module provides students with mathematical skills that are required to solve basic engineering problems. Topics are introduced in an order that is intended to keep pace with the application requirements in engineering modules. Topics include integration with applications, differential equations, Laplace transform, and probability and statistics. A Computer Algebra System will be used throughout the module.

LEVEL 2.2

Water Reclamation Technology

In this module, students will learn the fundamentals of collection systems for domestic wastewater, wastewater treatment techniques, monitoring and operation of wastewater treatment systems, and the code of practice relevant to sewerage and sewage treatment. The design of sewer collection systems will be covered in detail. Emerging technologies in water reclamation and water recycling are also emphasised.

Air Quality Monitoring & Control

Monitoring and control of air pollution, both outdoor and indoor, are important aspects of environmental management. Students are taught the fundamentals of how air pollution arises, types of pollutant, and the corresponding environmental and health impacts. Dispersion modelling, sampling and monitoring of pollutants, techniques of identification of pollutants, preventive and control measures, and local environmental legislation and guidelines on indoor air quality will also be introduced.

Renewable Energy

This module introduces various forms of renewable energy including solar energy, wind power and biomass. Students will learn about the basic technologies, progress, reliability and cost economics of these renewable energy sources. Other renewable energy sources – hydropower, geothermal, ocean energy, fuel cells – will be briefly covered. Other topics discussed include a comparison of conventional energy technologies with renewable sources, global issues in resource depletion, greenhouse gas emissions and alternate energy options in Singapore.

Environmental Biotechnology

This module covers the influence and application of biotechnology in aspects relating to the environment. Students will study five major areas: treatment of waste, treatment of already polluted sites and waterways, prevention of pollution, monitoring of pollution, and biotechnological innovations in environmental management.

Water & Marine Pollution

Students are given an overview of water pollution and the impact of pollution on different types of water bodies like rivers, lakes and seas. They will learn the characteristics of polluted water bodies, types of waste streams and indicators of water pollution, waste disposal into river and the self-purification of river water systems. Eutrophication of lakes and reservoirs, marine pollution, its sources and impacts, and oil spill control at sea and beaches will also be covered.

Industrial Training Programme

In this module, students are attached to organisations for a period of eight weeks to gain practical experience related to their course of study, and to hone their social skills and acquaint them with the work environment, thereby enabling them to adapt effectively to future employment in the private or public sector. During their attachment, they will undertake projects and tasks assigned by the organisation.

LEVEL 3.1

Environmental Management System

Students will learn the application of concepts and principles in environmental management. Topics covered include the fundamentals of environmental impact assessment (EIA), environmental baseline studies (EBS), risk assessment, environmental management systems (EMS), ISO 14001, OSHA 18001, and environmental auditing.

Workplace Safety & Health 2

This module equips students with knowledge of the relevant legislation and standards pertaining to occupational safety. The types of hazards in various industries and protection against them are also covered. Topics include the safe use of hand and power tools, the safe handling of materials, process hazards and electrical safety.

Energy Conservation & Management

Energy consumption is at an all-time high, and it is uncertain how high energy costs will go. This module teaches students energy conservation efforts and innovative programmes to help people, including businesses, get in the habit of using energy more efficiently, thereby saving money, energy and the environment.

Project 1

In this module, students are expected to integrate the knowledge they have gained in the first two years to undertake a year-long project on a topic in the field of environmental and water technology. The project could be a case study, fabrication or computer-application project.

LEVEL 3.2

Design of Water Systems

This module focuses on the design of water treatment and wastewater treatment systems, and explores the process design of various units in conventional water treatment plants and wastewater treatment plants. In the design of water treatment systems, the emphasis will be on the design of bar screens, fine screens, primary sedimentation tanks, rapid mix units, flocculation tanks, filtration units, disinfection processes and contact chambers. In the design of wastewater treatment systems, the emphasis will be on activated sludge treatment processes focusing on the design of sedimentation tanks, aeration unit, design of sludge-handling facilities and anaerobic digesters. Design projects are included in this module to provide students with hands-on design experience.

Membrane Science & Technology

This module equips students with fundamental knowledge of membrane science and membrane applications in environmental engineering. Topics covered include the types of membranes and membrane modules, basic principles of membrane fabrication, general theory of membrane transport, membrane separation process, membrane fouling, liquid membranes, and facilitated transport. Membrane applications in water reclamation recycling and reuse will also be covered.

Process Instrumentation & Control

Students will study the principles and applications of process instruments and the fundamentals of automatic process control systems, which include the basic concepts of analogue and digital control, principles of feedback and loop stability. The module includes a site visit to a control plant to enhance students' learning.

Project Management

This module teaches students the essentials of engineering project management. Topics such as contract administration, site layout and organisation, engineering economics and finance will be taught. Students learn project planning techniques, including the use of project network planning software.

International Business

Students will learn the various types of business models, marketing and risk management for overseas projects. The focus is on critical success factors such as understanding cultural differences, project financing and human resource management in different countries.

Project 2

This module is a continuation of Project 1, where students undertake a year-long project on a topic in the field of environmental and water technology.

Industrial Attachment Programme

In this module, students are attached to organisations for a period of six months to prepare them for future employment in their particular discipline of study through immersion as a staff in the actual work environment. During their attachment, they will undertake projects and tasks assigned by the organisations to develop initiative, self-confidence as well as interpersonal and adaptation skills.

Project Design & Development

In this module, students will work, in teams, on a project in their particular discipline of study for a period of six months. The project will require them to research, experiment, analyse, critique and make recommendations to the subject of study. In addition to stretching the students' self-learning ability, the process will hone their essential traits like leadership, team spirit, independence, innovative spirit, and their presentation and management skills.

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

School of Engineering Elective Modules and the Diploma Plus Programme

Students take two modules from a wide range of clusters under the engineering and non-engineering categories to complete their diploma. Furthermore, students can qualify for a diploma plus by simply topping up with two additional modules from the same cluster as one of their chosen electives. The Diploma Plus Certificate helps students if they wish to pursue a university degree or increase their employability in discipline-specific areas. Students can choose electives from the range listed below.

Engineering Category

- Advanced Engineering Mathematics Cluster*
- Applied Physics Cluster*
- Mechanical Technology Cluster

Non-Engineering Category

- Economics & Financial Applications Cluster
- Green Development Cluster
- Leisure & Retail Management Cluster

Other Available Diploma Plus Certificates

- Business
- Innovation Management
- Languages (Japanese)

* Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The syllabus is based on the first-year engineering mathematics and science curricula of NUS.

For detailed module descriptions under each cluster, please refer to page 182.

COURSE CURRICULUM (NORMAL PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (23 hours per week)		
1.	Environmental Chemistry & Analysis#	5
2.	Fundamentals of Civil Engineering	5
3.	Fundamentals of M&E Engineering	4
4.	Engineering Mathematics 1#	5
5.	Creativity & Applied Thinking Skills^	2
6.	Sports & Wellness^	2
Level 1.2 (24 hours per week)		
7.	Hydraulics#	4
8.	Environmental Biology	5
9.	Ecology#	3
10.	Computer Aided Design#	3
11.	Engineering Mathematics 2#	5
12.	Individual & the Community^	2
13.	Communication Toolkit^	2
YEAR 2		
Level 2.1 (24 hours per week)		
14.	Clean Water Technology#	5
15.	Workplace Safety & Health 1#	4
16.	Noise Pollution Monitoring & Control#	4
17.	Solid & Hazardous Waste Management	3
18.	Engineering Mathematics 3#	4
19.	Interdisciplinary Studies (IS) module^	2
20.	Interdisciplinary Studies (IS) module^	2
Level 2.2 (29 hours per week)		
21.	Water Reclamation Technology#	5
22.	Air Quality Monitoring & Control#	5
23.	Renewable Energy	4
24.	Environmental Biotechnology	3
25.	Water & Marine Pollution	3
26.	Innovation & Enterprise in Action^	4
27.	Industrial Training Programme	5
YEAR 3		
Level 3.1 (21 hours per week)		
28.	Environmental Management System	4
29.	Workplace Safety & Health 2#	4
30.	Energy Conservation & Management	3
31.	Project 1	6
32.	World Issues: A Singapore Perspective^	2
33.	Interdisciplinary Studies (IS) module^	2
Level 3.2 (23 hours per week)		
34.	Design of Water Systems	3
35.	Membrane Science & Technology	3
36.	Process Instrumentation & Control	3
37.	Project Management#	3
38.	International Business#	2
39.	Project 2	9
Across-Level Modules (Level 1.2 onwards) (6 hours per week)		
40.	School of Engineering elective module°	3
41.	School of Engineering elective module°	3

COURSE CURRICULUM (IAP/PDD PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (23 hours per week)		
1.	Environmental Chemistry & Analysis#	5
2.	Fundamentals of Civil Engineering	5
3.	Fundamentals of M&E Engineering	4
4.	Engineering Mathematics 1#	5
5.	Creativity & Applied Thinking Skills^	2
6.	Sports & Wellness^	2
Level 1.2 (24 hours per week)		
7.	Hydraulics#	4
8.	Environmental Biology	5
9.	Ecology#	3
10.	Computer Aided Design#	3
11.	Engineering Mathematics 2#	5
12.	Individual & the Community^	2
13.	Communication Toolkit^	2
YEAR 2		
Level 2.1 (24 hours per week)		
14.	Clean Water Technology#	5
15.	Workplace Safety & Health 1#	4
16.	Noise Pollution Monitoring & Control#	4
17.	Solid & Hazardous Waste Management	4
18.	Engineering Mathematics 3#	4
19.	Interdisciplinary Studies (IS) module^	2
20.	Interdisciplinary Studies (IS) module^	2
Level 2.2 (24 hours per week)		
21.	Water Reclamation Technology#	5
22.	Air Quality Monitoring & Control#	5
23.	Renewable Energy	4
24.	Environmental Biotechnology	3
25.	Water & Marine Pollution	3
26.	Innovation & Enterprise in Action^	4
YEAR 3		
Level 3.1 (24 hours per week)		
27.	Environmental Management System	4
28.	Workplace Safety & Health 2#	4
29.	Energy Conservation & Management	3
30.	Design of Water Systems	3
31.	Membrane Science & Technology	3
32.	Process Instrumentation & Control	3
33.	World Issues: A Singapore Perspective^	2
34.	Interdisciplinary Studies (IS) module^	2

Module No.	Module Name	Credit Units
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Level 3.2 (25 hours per week) (Student to do one)

35.	Industrial Attachment Programme (IAP)	25
36.	Project Design & Development (PDD)	25

Across-Level Modules (Level 1.2 onwards) (6 hours per week)

37.	School of Engineering elective module ^o	3
38.	School of Engineering elective module ^o	3

Notes:

Common modules with other courses.

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

^o For more details on School of Engineering elective modules, please refer to page 182.

IS Modules

The School of Interdisciplinary Studies (IS) delivers the interdisciplinary curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge-based economy. IS modules challenge boundaries and offer insights into Communication, Entrepreneurship, Life Skills, Media & the Arts, and Science & Technology.

School of Engineering (SoE) Elective Modules

The SoE elective modules fall under a wide range of clusters under both Engineering and Non-Engineering categories. The aim is to provide students with the opportunity to broaden their knowledge and deepen their discipline-specific areas. Each cluster comprises a minimum of three 3-hour modules. Students are required to take two modules in order to satisfy the minimum graduating requirement.

DIPLOMA IN FACILITIES MANAGEMENT FOR BUSINESS (FMB)

(3-YEAR COURSE)

SCHOOL OF ENGINEERING



As the arts, tourism and hospitality sectors grow, especially in tandem with the development of the Integrated Resorts, there will be great demand for professionals with skills in the management of facilities such as state-of-the-art convention centres, educational, healthcare and recreational facilities.

The **Diploma in Facilities Management for Business (FMB)** prepares graduates for a challenging and rewarding career in the fine art of managing processes, places and people.

The first to offer such a programme in June 2004, Ngee Ann Polytechnic delivers a well-planned, hands-on curriculum which integrates the principles of business administration, architecture, and the behavioural and engineering sciences in the operations, maintenance and management of buildings and services.

Besides the discipline-specific core modules, students have a good spread of elective modules to choose from and can graduate with additional Diploma Plus Certificates and/or Enhancement Certificates. These electives are carefully selected to cater to the students' diverse interests and the changing trends in the industry.

Students can embark on six-month industrial attachment programmes with companies such as Raffles City Hotels, Jones Lang LaSalle Property Consultants, United Premas, Reuters and DBS Bank. They also enjoy opportunities to go on overseas study trips to renowned resorts.

Endorsed by the Building and Construction Authority of Singapore and recognised by the Civil Defence Academy, FMB students qualify for the Fire Safety Manager Certificate and can become a Qualified Fire Safety Manager upon graduation.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examinations (or equivalent) results:

Subject	'O' Level Grade
English	1-7**
Mathematics (Elementary/Additional)	1-6
Science (with Physics or Chemistry or Biology component) or Design & Technology	1-6

The aggregate computation for selection is based on grades obtained for English, Mathematics, Science or Design & Technology and two other subjects.

** Candidates with English as a second language (EL2) must have attained a minimum grade of 6.

CAREER PROSPECTS

With the flourishing arts, tourism and hospitality industries in Singapore, FMB graduates can expect great demand for their skills.

Excellent employment prospects abound with potential employers such as government and statutory boards, local and multi-national corporations, property developers, town councils, facilities management service providers, and consultancy firms.

Fresh graduates often start out as Facilities Officers. With the relevant exposure through on-the-job training, they progressively take on greater responsibilities and higher job functions as Facilities Managers, Environmental Consultants, Computer-Aided Facilities Management (CAFM) Consultants, Business Development Managers and Property and Workspace Planners.

ACCREDITATION FOR FURTHER STUDIES

FMB graduates will receive the Fire Safety Managers Certificate, which enables them to register as Qualified Fire Safety Managers for high-rise commercial and industrial buildings.

The National University of Singapore (NUS) grants up to one year's advanced standing to FMB graduates who enrol in degree programmes in Real Estate and Project & Facilities Management. FMB graduates can also be admitted to the second or third year of degree courses in universities in the United Kingdom, the United States and Australia.

Fast track degree in Facilities Management can be completed in one year at Deakin University, Heriot-Watt University and the University of Central Lancashire.

Graduates who apply for a Business degree with a specialisation in economics, management or international hotel and tourism management at the University of Queensland, may also be eligible for up to one year's exemption.

COURSE STRUCTURE

FIRST-YEAR MODULES

Level 1.1

- Theory of Economics
- Mechanical Systems
- Principles of Accounting
- Computer Aided Design
- Interior Design
- Creativity & Applied Thinking Skills[^]
- Sports & Wellness[^]

Level 1.2

- Electrical Systems
- Principles of Law
- Building Technology
- Client Relationship Management
- Individual & the Community[^]
- Communication Toolkit[^]

SECOND-YEAR MODULES

Level 2.1

- Advanced Building Technology
- Property Management
- Financial Resource Management
- Lighting & Acoustics Design
- Environmental Health Management
- Any 2 Interdisciplinary Studies (IS) modules[^]

Level 2.2

- Fire Engineering
- Intelligent Building & IT Infrastructure
- Project Management
- Security Management & Business Recovery
- Industrial Training Programme (not for IAP/PDD students)
- Innovation & Enterprise in Action[^]

FINAL-YEAR MODULES

Level 3.1

- Energy Management
- Space & Asset Management
- Fire Safety Management
- Project 1*
- World Issues: A Singapore Perspective[^]
- Any 1 Interdisciplinary Studies (IS) module[^]

Level 3.2

- Building Maintenance & Diagnostics
- Building Refurbishment
- Facilities Maintenance Management
- Real Estate Law*
- International Business*
- Project 2*

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules[°]

[^] Denotes Interdisciplinary Studies (IS) module. For more details on IS modules, please log on to www.np.edu.sg/is/

* Students who are selected for the six-month Industrial Attachment Programme (IAP) or Project Design & Development (PDD) will be required to take all the final-year modules (except Real Estate Law, International Business, Project 1 & 2) in Level 3.1. Students will then do their IAP or PDD in Level 3.2.

[°] Students take two elective modules to complete their diploma. Electives are chosen and customised from a wide range of clusters under the Engineering and Non-Engineering categories.

COURSE MODULES

LEVEL 1.1

Theory of Economics

This module equips students with basic knowledge of economic theory on individual decision-making (microeconomics) and social policy formulation (macroeconomics). Microeconomics examines how individuals, households and firms make economic decisions; how they interact to determine the quantity and price of goods and factors of production; and the allocation of resources. Macroeconomics explores the determination of real income, employment, price level and inflation in an economy, and the conduct of macro-economic policy. Tutorial discussions and assignments will cultivate students' critical analysis, logical reasoning and problem-solving skills in the application of the economic theory.

Mechanical Systems

Students are given an overview of the mechanical services in a modern high-rise structure. Topics include water supply system, sanitary, drainage, gas supply and air-conditioning systems, with an emphasis on real-life application in the operation and maintenance of these facilities in buildings.

Principles of Accounting

This module provides students with the technical knowledge to prepare simple accounts for a sole proprietor, partnership, and non-profit organisation. Students are introduced to cash budget preparation and interpretation of financial reports.

Computer Aided Design

This module equips students with the principles and techniques of preparing computer-aided design (CAD) drawings in Architectural, Engineering and Construction (AEC) projects. Students are also trained to interpret and extract information from CAD drawings, and to prepare CAD drawings according to CP83. Emphasis will be placed on preparing CAD drawings accurately so that information can be used electronically. AutoCAD is used in this module as it is widely adopted in the AEC industry.

Interior Design

This module introduces drafting and illustration techniques of developing and presenting design. Students will explore the various principles of design, planning and drawing. Students will be able to apply knowledge gained from this and other building modules to manage decoration and display for commercial and residential projects. They will have opportunities in studio sessions to apply computer-aided design skills to demonstrate their creativity.

LEVEL 1.2

Electrical Systems

This module covers the different electrical facilities in a high-rise building. Topics include electrical supply systems, lift and escalators and communication systems. The emphasis will be on real-life application in the operation and maintenance of these facilities in buildings.

Principles of Law

The module introduces the legal system in Singapore, the law of contract and commercial law, and the law of torts. Real-life examples particularly those relating to building and real estate, are used to illustrate the application of legal principles. In addition, students become familiar with the legal prospect of critical analysis, logical reasoning and issue resolution.

Building Technology

This module studies the basic principles and construction techniques for the main building elements of light structural forms, including low-rise buildings. The properties of the common materials used and the functional requirements of the various elements are also examined. The module prepares students for more complex structures and multi-storey buildings in Advanced Building Technology in the second year.

Client Relationship Management

This module introduces the principles and concepts of customer relationship management skills. Students will learn the appropriate tools to respond effectively to customers and stakeholders within the real estate and facilities management industry. Topics include definition of customer/client service, understanding client needs, solutions to facilities management challenges, and client relationship management (CRM) implementation. Case studies and mini projects will be used to provide students with a thorough understanding of CRM and its application to the facilities management industry through analysis of clients, their needs and behaviour. This equips students with the ability to view CRM as an asset to the organisation and leverage on this to add value to the organisation.

LEVEL 2.1

Advanced Building Technology

This module is an extension of Building Technology. The module examines the more complex forms of construction used in high-rise buildings and large-span structures. The knowledge gained prepares students for third-year modules on Building Maintenance & Diagnostics and Building Refurbishment.

Property Management

This module studies the management practices for buildings of different uses. Students will have sufficient supervisory management knowledge and problem-solving skills to manage private and public housing, as well as retail, office and industrial spaces. A considerable portion of the module is devoted to legislations governing the maintenance and management of strata developments.

Financial Resource Management

This module covers the management of financial resources as part of facility management function. All facilities, including buildings, are viewed as part of the financial assets with the objective of maximising total return. Topics include financial management tools such as cash flow projection, net present value, internal rate of return, discounted cash flow model, and long- and short-term financing.

Lighting & Acoustics Design

This module offers an introduction to lighting and acoustics. The emphasis for this module will be on the quantitative and qualitative aspects of lighting design, lighting sources, lighting control and the maintenance aspect of the lighting system. The principles of acoustics, acoustics properties of materials and building systems and sound transmission between rooms will also be covered.

Environmental Health Management

The module covers the general aspects of environmental health, including the study of epidemiology, vector control and food hygiene. Students will learn to apply these concepts and principles to health management, and workplace health and safety. Students also gain an overview of indoor air pollution sources, types of pollutants and the corresponding health impacts. Current methods of treating and controlling indoor air quality and local guidelines on indoor air quality will also be introduced.

LEVEL 2.2

Fire Engineering

This module covers the active and passive fire protection systems in buildings and equips students to be fire safety managers. Topics include the fire alarm, fire extinguisher, wet and dry riser and sprinkler system, means of escape and its protection. Case studies are used to illustrate the importance of fire protection systems. This module is supported by practical work in the laboratory and a design project.

Intelligent Building & IT Infrastructure

This module covers intelligent building technologies of modern buildings such as building automation, structural cable, broadband network and energy audit. In addition to the functions and applications, this module focuses on how these advanced features improve the productivity of occupants and add value to the buildings. Students will also be exposed to the basic aspects of energy management, and energy-saving methods and practices.

Project Management

This module teaches the students the rudiments of modern construction project management. The module covers the principles of Project Management in the construction business at various stages of planning. Elements of contract administration, construction and engineering economics and finance will be taught.

Security Management & Business Recovery

This module covers the features and operation of security systems in modern buildings and the process of disaster recovery. Topics include features of modern security systems, security system operation, disaster planning, disaster recovery of data, evacuation planning, and risk management. The knowledge gained enables students to address the increasing need of building occupants for security and disaster recovery.

Industrial Training Programme

In this module, students are attached to organisations for a period of eight weeks to gain practical experience related to their course of study, and to hone their social skills and acquaint them with the work environment, thereby enabling them to adapt effectively to future employment in the private or public sector. During their attachment, they will undertake projects and tasks assigned by the organisation.

LEVEL 3.1

Energy Management

This module emphasises the importance of energy management in reducing operation costs for businesses and in saving the environment. The module gives students an overall view of the underlying technologies, services and schemes that provide comprehensive energy management. Students will learn how to relate energy to cost savings, and to conduct onsite energy surveys to identify energy-saving opportunities.

Space & Asset Management

This module covers the management of space as an asset. Topics include space definition, planning, tagging and tracking of space usage, forecasting and allocation of space, management of furniture and equipment, life cycle costing and benchmarking. Students will be able to obtain a working knowledge of CAFM products as a planning and management tool.

Fire Safety Management

This module covers the Fire Safety Managers' scope of work and prepares students to be fire safety managers. Topics include the Fire Safety Act, fire command centre, evacuation procedures, fire plan, and fire investigation.

Project 1

Students are expected to integrate the knowledge they have gained in the first two years to undertake a year-long project on a topic in the field of facilities management. The project may be a case study, research or computer-application project.

LEVEL 3.2

Building Maintenance & Diagnostics

This module covers the causes of building defects and their corresponding rectification methods. Topics include defects relating to foundation, concrete structures, roof, floor and wall finishes. In addition, students will learn to investigate building problems, and will be able to handle maintenance repair works related to the building fabric. Real-life case studies and laboratory work using sophisticated equipment for non-destructive testing of concrete are also included.

Building Refurbishment

This module covers the options open to an owner when his building suffers from obsolescence. The module explores the possibilities of refurbishing the building.

Facilities Maintenance Management

This module covers the skills and knowledge required for entry-level jobs in facilities maintenance, and trains graduates to handle maintenance work as facilities owners, by using both in-house staff and outsourcing to managing agents. Topics include maintenance works for different facilities, indoor air quality, selecting and managing contractors, maintenance contract specification, performance-based contract, and facilities condition assessment.

Real Estate Law

This module covers law pertaining to the ownership, transaction, and tenancy of real estate. Topics include land law, tenancy law, mortgages, property taxation, and property development regulations.

International Business

Students will learn the various types of business models, marketing and risk management for overseas projects. The focus is on critical success factors such as understanding cultural differences, project financing and human resource management in different countries.

Project 2

This module is a continuation of Project 1, where students undertake a year-long project on a topic in the field of facilities management.

Industrial Attachment Programme

In this module, students are attached to organisations for a period of six months to prepare them for future employment in their particular discipline of study through immersion as a staff in the actual work environment. During their attachment, they will undertake projects and tasks assigned by the organisations to develop initiative, self-confidence as well as interpersonal and adaptation skills.

Project Design & Development

In this module, students will work, in teams, on a project in their particular discipline of study for a period of six months. The project will require them to research, experiment, analyse, critique and make recommendations relating to the subject of study. In addition to stretching the students' self-learning ability, the process will hone essential traits like leadership, team spirit, independence, an innovative spirit, and presentation and management skills.

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

School of Engineering Elective Modules and the Diploma Plus Programme

Students take two modules from a wide range of clusters under the engineering and non-engineering categories to complete their diploma. Furthermore, students can qualify for a diploma plus by simply topping up with two additional modules from the same cluster as one of their chosen electives. The Diploma Plus Certificate helps students if they wish to pursue a university degree or increase their employability in discipline-specific areas. Students can choose electives from the range listed below.

Engineering Category

- Advanced Engineering Mathematics Cluster*
- Applied Physics Cluster*
- Mechanical Technology Cluster

Non-Engineering Category

- Economics & Financial Applications Cluster
- Green Development Cluster
- Leisure & Retail Management Cluster

Other Available Diploma Plus Certificates

- Business
- Innovation Management
- Languages (Japanese)

* Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The syllabus is based on the first-year engineering mathematics and science curricula of NUS.

For detailed module descriptions under each cluster, please refer to page 182.

COURSE CURRICULUM (NORMAL PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (24 hours per week)		
1.	Theory of Economics#	5
2.	Mechanical Systems#	5
3.	Principles of Accounting#	4
4.	Computer Aided Design#	3
5.	Interior Design#	3
6.	Creativity & Applied Thinking Skills^	2
7.	Sports & Wellness^	2
Level 1.2 (23 hours per week)		
8.	Electrical Systems#	5
9.	Principles of Law#	5
10.	Building Technology#	5
11.	Client Relationship Management#	4
12.	Individual & the Community^	2
13.	Communication Toolkit^	2
YEAR 2		
Level 2.1 (24 hours per week)		
14.	Advanced Building Technology#	5
15.	Property Management#	5
16.	Financial Resource Management	4
17.	Lighting & Acoustics Design	3
18.	Environmental Health Management#	3
19.	Interdisciplinary Studies (IS) module^	2
20.	Interdisciplinary Studies (IS) module^	2
Level 2.2 (27 hours per week)		
21.	Fire Engineering	5
22.	Intelligent Building & IT Infrastructure	5
23.	Project Management#	4
24.	Security Management & Business Recovery	4
25.	Innovation & Enterprise in Action^	4
26.	Industrial Training Programme	5

Module No.	Module Name	Credit Units
YEAR 3		
Level 3.1 (22 hours per week)		
27.	Energy Management	5
28.	Space & Asset Management	4
29.	Fire Safety Management	3
30.	Project 1	6
31.	World Issues: A Singapore Perspective^	2
32.	Interdisciplinary Studies (IS) module^	2
Level 3.2 (24 hours per week)		
33.	Building Maintenance & Diagnostics#	4
34.	Building Refurbishment#	3
35.	Facilities Maintenance Management	3
36.	Real Estate Law	3
37.	International Business#	2
38.	Project 2	9
Across-Level Modules (Level 1.2 onwards) (6 hours per week)		
39.	School of Engineering elective module°	3
40.	School of Engineering elective module°	3

COURSE CURRICULUM (IAP/PDD PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (24 hours per week)		
1.	Theory of Economics#	5
2.	Mechanical Systems#	5
3.	Principles of Accounting#	4
4.	Computer Aided Design#	3
5.	Interior Design#	3
6.	Creativity & Applied Thinking Skills^	2
7.	Sports & Wellness^	2
Level 1.2 (23 hours per week)		
8.	Electrical Systems#	5
9.	Principles of Law#	5
10.	Building Technology#	5
11.	Client Relationship Management#	4
12.	Individual & the Community^	2
13.	Communication Toolkit^	2
YEAR 2		
Level 2.1 (24 hours per week)		
14.	Advanced Building Technology#	5
15.	Property Management#	5
16.	Financial Resource Management	4
17.	Lighting & Acoustics Design	3
18.	Environmental Health Management#	3
19.	Interdisciplinary Studies (IS) module^	2
20.	Interdisciplinary Studies (IS) module^	2

COURSE CURRICULUM (IAP/PDD PATH)

Module No.	Module Name	Credit Units
YEAR 2		
Level 2.2 (22 hours per week)		
21.	Fire Engineering	5
22.	Intelligent Building & IT Infrastructure	5
23.	Project Management#	4
24.	Security Management & Business Recovery	4
25.	Innovation & Enterprise in Action^	4
YEAR 3		
Level 3.1 (26 hours per week)		
26.	Energy Management	5
27.	Space & Asset Management	4
28.	Fire Safety Management	3
29.	Building Maintenance & Diagnostics#	4
30.	Building Refurbishment#	3
31.	Facilities Maintenance Management	3
32.	World Issues: A Singapore Perspective^	2
33.	Interdisciplinary Studies (IS) module^	2
YEAR 3		
Level 3.2 (25 hours per week)		
(Student to do one)		
34.	Industrial Attachment Programme (IAP)	25
35.	Project Design & Development (PDD)	25
Across-Level Modules (Level 1.2 onwards)		
(6 hours per week)		
36.	School of Engineering elective module°	3
37.	School of Engineering elective module°	3

Notes:

Common modules with other courses.

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

° For more details on School of Engineering elective modules, please refer to page 182.

IS Modules

The School of Interdisciplinary Studies (IS) delivers the interdisciplinary curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge-based economy. IS modules challenge boundaries and offer insights into Communication, Entrepreneurship, Life Skills, Media & the Arts, and Science & Technology.

School of Engineering (SoE) Elective Modules

The SoE elective modules fall under a wide range of clusters under both Engineering and Non-Engineering categories. The aim is to provide students with the opportunity to broaden their knowledge and deepen their discipline-specific areas. Each cluster comprises a minimum of three 3-hour modules. Students are required to take two modules in order to satisfy the minimum graduating requirement.

DIPLOMA IN REAL ESTATE BUSINESS (REB) (3-YEAR COURSE)

SCHOOL OF ENGINEERING



With upcoming developments such as the Integrated Resorts in Marina and Sentosa, the new business and financial centre in Marina Bay, and the rejuvenation of the Central Business District and Orchard Shopping Belt, there is a demand for specialists in property management, real estate marketing and property valuation services, as well as in property-related industries.

To take advantage of this, prospective students should consider the **Diploma in Real Estate Business (REB)**, a well-established course that trains and nurtures students in the business and management of real estate. The course takes a holistic approach towards the business of real estate, equipping students with the skill sets required to perform entry-level jobs in the planning, development, marketing, management and valuation of real estate projects and financial products related to real estate.

Besides the discipline-specific core modules, students have a good spread of elective modules to choose from, and can graduate with additional Diploma Plus Certificates and/or Enhancement Certificates. These electives are carefully selected to cater to the students' diverse interests and the changing trends in the industry.

REB students can look forward to participating in overseas training programmes in major cities in China, India and Australia; and gaining experience with Singapore's prominent property developers, real estate investment companies and property consultancy firms. Study trips to state-of-the-art commercial and retail developments, townships, integrated resorts and theme parks in Asia provide experiential and exploratory learning in real estate business.

REB students are equipped with knowledge not only of real estate, but of business, finance and investment, IT and communication skills. Graduates can market and manage attractive shopping centres, Integrated Resorts and theme parks, as well as create value for luxury condominiums, office and retail properties.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examinations (or equivalent) results:

Subject	'O' Level Grade
English	1-7**
Mathematics (Elementary/Additional)	1-6
Science (with Physics or Chemistry or Biology component) or Design & Technology	1-6

The aggregate computation for selection is based on grades obtained for English, Mathematics, Science or Design & Technology and two other subjects.

** Candidates with English as a second language (EL2) must have attained a minimum grade of 6.

CAREER PROSPECTS

REB graduates can easily find employment in various sectors of the real estate market and building industry, as well as in sectors that deal in property assets. Roles that will be a good fit include positions as project supervisors; executives overseeing investment, marketing, planning and development; officers overseeing finance and loans, valuation, contracts and property; research assistants; and assistant quantity surveyors.

There is also a demand for REB graduates to value residential, office and retail properties for banks, owners and purchasers, or to help owners unlock the value of their property through collective sales. Experienced graduates can apply for the House Agent's Licence issued by the Inland Revenue Authority of Singapore.

Potential employers include government departments and statutory boards, property developers, banks, investment companies, real estate consultancy firms, management corporations, town councils, construction companies, and chartered surveying practices.

ACCREDITATION FOR FURTHER STUDIES

Local and overseas universities accept REB graduates into related degree programmes with appropriate exemptions and advanced standing.

The National University of Singapore (NUS) grants one year's advanced standing to REB graduates for degree programmes in Real Estate and Projects & Facilities management. Many graduates with some working experience have also enrolled for part-time degree courses offered at NUS.

At the University of Reading and Heriot-Watt University, both in the United Kingdom, graduates potentially enjoy exemptions of one and two years respectively when they apply for degrees in real estate.

A fast track degree in real estate or facilities management can be completed in one year at Deakin University, University of Central Lancashire and Heriot-Watt University (distance-learning).

REB graduates are eligible for up to one year's exemption when you apply for a business degree, with specialisation in economics, management or international hotel & tourism management at the University of Queensland.

The Diploma in Real Estate Business is recognised by the Inland Revenue Authority of Singapore. Graduates with some working experience can apply for a House Agent's Licence without having to take the Common Examinations for House Agents (CEHA).

COURSE STRUCTURE

FIRST-YEAR MODULES

Level 1.1	Level 1.2
<ul style="list-style-type: none"> Theory of Economics Mechanical Systems Principles of Accounting Computer Aided Design Interior Design Creativity & Applied Thinking Skills[^] Sports & Wellness[^] 	<ul style="list-style-type: none"> Electrical Systems Principles of Law Building Technology Client Relationship Management Individual & the Community[^] Communication Toolkit[^]

SECOND-YEAR MODULES

Level 2.1	Level 2.2
<ul style="list-style-type: none"> Property Management Real Estate Marketing Project Management Urban Planning & Economics Environment Health Management Any 2 Interdisciplinary Studies (IS) modules[^] 	<ul style="list-style-type: none"> Property Valuation Real Estate Law Advanced Building Technology Real Estate Market Research Industrial Training Programme (not for IAP/PDD students) Innovation & Enterprise in Action[^]

FINAL-YEAR MODULES

Level 3.1	Level 3.2
<ul style="list-style-type: none"> Building Maintenance & Diagnostics Building Reurbishment Landscape Management* Project 1* World Issues: A Singapore Perspective[^] Any 1 Interdisciplinary Studies (IS) module[^] 	<ul style="list-style-type: none"> Real Estate Finance Real Estate Investment Building Quantities & Costing International Business* Project 2*

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

- Any 2 School of Engineering (SoE) elective modules*

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

* Students who are selected for the six-month Industrial Attachment Programme (IAP) or Project Design & Development (PDD) will be required to take all the final-year modules (except Landscape Management, International Business, Project 1 & 2) in Level 3.1. Students will then do their IAP or PDD in Level 3.2.

° Students take two elective modules to complete their diploma. Electives are chosen and customised from a wide range of clusters under the Engineering and Non-Engineering categories.

COURSE MODULES

LEVEL 1.1

Theory of Economics

This module equips students with basic knowledge of economic theory on individual decision-making (microeconomics) and social policy formulation (macroeconomics). Microeconomics examines how individuals, households and firms make economic decisions; how they interact to determine the quantity and price of goods and factors of production; and the allocation of resources. Macroeconomics explores the determination of real income, employment, price level and inflation in an economy, and the conduct of macro-economic policy. Tutorial discussions and assignments will cultivate students' critical analysis, logical reasoning and problem solving skills in the application of the economic theory.

Mechanical Systems

Students are given an overview of the mechanical services in a modern high-rise structure. Topics include water supply system, sanitary, drainage, gas supply and air-conditioning systems. This module emphasises real-life application in the operation and maintenance of these facilities in buildings.

Principles of Accounting

This module provides students with the technical knowledge to prepare simple accounts for a sole proprietor, partnership, and non-profit organisation. Students are introduced to cash budget preparation and interpretation of financial reports.

Computer Aided Design

This module provides students with the principles and techniques of preparing computer-aided design (CAD) drawings in Architectural, Engineering and Construction (AEC) projects. Students are also trained to interpret and extract information from CAD drawings, and to prepare CAD drawings according to CP83. Emphasis will be placed on preparing CAD drawings accurately so that information can be used electronically. AutoCAD is used in this module as it is widely adopted in the AEC industry.

Interior Design

This module introduces drafting and illustration techniques of developing and presenting design. Students will learn the various principles of design, planning and drawing. Students will be able to apply knowledge gained from this and other building modules to manage decoration and display for commercial and residential projects. They will have opportunities in studio sessions to apply computer-aided design skills to demonstrate their creativity.

LEVEL 1.2

Electrical Systems

This module covers the different electrical facilities in a high-rise building. Topics include the electrical supply system, lift and escalators, and the communication system. The emphasis will be on real-life application in the operation and maintenance of these facilities in buildings.

Principles of Law

The module introduces the legal system in Singapore, the law of contract and commercial law, and the law of torts. Real-life examples, particularly those relating to building and real estate, are used to illustrate the application of legal principles. In addition, students become familiar with the legal approach of critical analysis, logical reasoning and issue resolution.

Building Technology

This module studies the basic principles and construction techniques for the main building elements of light structural forms, including low-rise buildings. The properties of the common materials used and the functional requirements of the various elements are also examined. The module prepares students for more complex structures and multi-storey buildings in Advanced Building Technology in the second year.

Client Relationship Management

This module introduces the principles and concepts of customer relationship management skills. Students will learn the appropriate tools to respond effectively to customers and stakeholders within the real estate and facilities management industry. Topics include the definition of customer/client service, understanding client needs, solutions to real estate challenges and client relationship management (CRM) implementation. Case studies and mini projects will be used to provide students with a thorough understanding of CRM and its application to the real estate industry through analysis of clients, their needs and behaviour. This equips students with the ability to view CRM as an asset to the organisation and leverage on this to add value to the organisation.

LEVEL 2.1

Property Management

This module studies the management practices for buildings of different uses. Students will have sufficient supervisory management knowledge and problem-solving skills to manage private and public housing, as well as retail, office and industrial spaces. A considerable portion of the module is devoted to legislation governing the maintenance and management of strata developments.

Real Estate Marketing

This module presents real estate from a business perspective, and provides students with an understanding of the fundamentals of marketing and real estate agency practices. Students are exposed to real estate marketing techniques and learn to identify problems and to apply problem-solving skills to face the challenges of the real estate marketing profession. Current and relevant case studies will be highlighted during lectures and discussed during smaller tutorial group settings.

Project Management

This module introduces students to the rudiments of modern construction project management. The module covers the principles of Project Management in the construction business at various stages of planning. Elements of contract administration, as well as construction and engineering economics and finance will be taught.

Urban Planning & Economics

This module complements the modules of Property Valuation and Real Estate Marketing. The topics in this module include a study of the concept of land as an economic resource, the real estate market and planning system in Singapore. The module will provide students with adequate knowledge of urban planning and urban economics.

Environmental Health Management

The module covers the general aspects of environmental health, including the study of epidemiology, vector control and food hygiene. Students will learn to apply these concepts and principles to health management, and workplace health and safety. Students also gain an overview of indoor air pollution sources, types of pollutants and the corresponding health impacts. Current methods of treating and controlling indoor air quality and local guidelines on indoor air quality will also be introduced.

LEVEL 2.2

Property Valuation

This module covers the basic concepts and principles of property valuation, the purposes for which valuation is requested, the six functions of \$1, and the various methods used locally for valuing both public and private properties. The module provides students with working knowledge and competency in the valuation of real estate interests for the purposes of sale and purchase, investment, mortgage, development charge, and property tax.

Real Estate Law

Students will study the area of law relating to the various types of interest in land, the rights and duties attached to these interests, and the legal consequences for infringing these rights. The Law of Real Property includes the study of land law concepts, landlord and tenant law, interests in land, and property registration. Topics covered under Public Administration and Control of Land include law of taxation relating to property, legislation governing sale of residential and commercial properties, and restriction on foreign ownership of residential properties. The Principles of Law module is a pre-requisite for this module.

Advanced Building Technology

This module is an extension of Building Technology. The module examines the more complex forms of construction used in high-rise buildings and large-span structures. The knowledge gained prepares students for third-year modules in Building Maintenance & Diagnostics and Building Refurbishment.

Real Estate Market Research

This module provides students with an understanding and working knowledge of research methodology for real estate market studies. Students are introduced to the purpose and value of research, methods of gathering and analysing data, and the presentation of results.

Industrial Training Programme

In this module, students are attached to organisations for a period of eight weeks to gain practical experience related to their course of study, and to hone their social skills and acquaint them with the work environment, thereby enabling them to adapt effectively to future employment in the private or public sector. During their attachment, they will undertake projects and tasks assigned by the organisation.

LEVEL 3.1

Building Maintenance & Diagnostics

This module covers the causes of building defects and their corresponding rectification methods. Topics include defects relating to foundation, concrete structures, roof, floor and wall finishes. In addition, students will learn to investigate building problems, and will be able to handle maintenance repair works related to the building fabric. Real-life case studies and laboratory work using sophisticated equipment for non-destructive testing of concrete are also included.

Building Refurbishment

This module covers the options open to an owner when his building suffers from obsolescence. The module will explore the possibilities of refurbishing the building.

Landscape Management

Students are given an overview of tropical landscape management aimed at enhancing the built environment in Singapore. The topics include plant identification, principles of planting and planting techniques, plant protection and maintenance of softscapes and hardscapes.

Project 1

Students are expected to integrate the knowledge they have gained in the first two years to undertake a year-long project on a topic in the field of real estate or building. The project could be a case-study, fabrication or computer-application project.

LEVEL 3.2

Real Estate Finance

The module will provide students with an understanding of real estate financing issues. Topics include financial markets and institutions, financing instruments and financial risks. Students will have the opportunity to apply their knowledge in Real Estate Market Research to collect and collate property data, and to use a computer to generate spreadsheets for decision-making and scenario analysis.

Real Estate Investment

Students will acquire an understanding of the real estate investment decision-making process in this module. It focuses on the fundamental concepts and principles of investment and the practical skills needed for making real estate investment decisions. Topics include market study, financial analysis, risk-return relationship, sensitivity analysis and decision-making criteria.

Building Quantities & Costing

The module covers the various models for building cost estimation and the techniques on measurement of quantities from given drawings. Students will learn how to prepare cost estimates for new construction or improvement works during the service life of a building. Students will also have hands-on practice on software for automated taking-off and billing. It draws on the students' knowledge of Building Technology and Advanced Building Technology taught in Level I and II respectively. Students learn to take off quantities for items of work according to standard rules for measurement. Having acquired the basic skills of taking-off the students are then trained to use computers for quantity take-off and preparation of Bills of Quantities.

International Business

Students will learn the various types of business models, marketing and risk management for overseas projects. The focus is on critical success factors such as understanding cultural differences, project financing and human resource management in different countries.

Project 2

This module is a continuation of Project 1, where students undertake a year-long project on a topic in the field of real estate or building.

Industrial Attachment Programme

In this module, students are attached to organisations for a period of six months to prepare them for future employment in their particular discipline of study through immersion as a staff in the actual work environment. During their attachment, they will undertake projects and tasks assigned by the organisations to develop initiative, self-confidence as well as interpersonal and adaptation skills.

Project Design & Development

In this module, students will work, in teams, on a project in their particular discipline of study for a period of six months. The project will require them to research, experiment, analyse, critique and make recommendations regarding the subject of study. In addition to stretching the students' self-learning ability, the process will hone their essential traits like leadership, team spirit, independence, innovative spirit, and their presentation and management skills.

ACROSS-LEVEL MODULES (LEVEL 1.2 ONWARDS)

School of Engineering Elective Modules and the Diploma Plus Programme

Students take two modules from a wide range of clusters under the engineering and non-engineering categories to complete their diploma. Furthermore, students can qualify for a diploma plus by simply topping up with two additional modules from the same cluster as one of their chosen electives. The Diploma Plus Certificate helps students if they wish to pursue a university degree or increase their employability in discipline-specific areas. Students can choose electives from the range listed below.

Engineering Category

- Advanced Engineering Mathematics Cluster*
- Applied Physics Cluster*
- Mechanical Technology Cluster

Non-Engineering Category

- Economics & Financial Applications Cluster
- Green Development Cluster
- Leisure & Retail Management Cluster

Other Available Diploma Plus Certificates

- Business
- Innovation Management
- Languages (Japanese)

* Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The syllabus is based on the first-year engineering mathematics and science curricula of NUS.

For detailed module descriptions under each cluster, please refer to page 182.

COURSE CURRICULUM (NORMAL PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (24 hours per week)		
1.	Theory of Economics#	5
2.	Mechanical Systems#	5
3.	Principles of Accounting#	4
4.	Computer Aided Design#	3
5.	Interior Design#	3
6.	Creativity & Applied Thinking Skills^	2
7.	Sports & Wellness^	2
Level 1.2 (23 hours per week)		
8.	Electrical Systems#	5
9.	Principles of Law#	5
10.	Building Technology#	5
11.	Client Relationship Management#	4
12.	Individual & the Community^	2
13.	Communication Toolkit^	2
YEAR 2		
Level 2.1 (25 hours per week)		
14.	Property Management#	5
15.	Real Estate Marketing	5
16.	Project Management#	4
17.	Urban Planning & Economics	4
18.	Environmental Health Management#	3
19.	Interdisciplinary Studies (IS) module^	2
20.	Interdisciplinary Studies (IS) module^	2
Level 2.2 (29 hours per week)		
21.	Property Valuation	5
22.	Real Estate Law	5
23.	Advanced Building Technology#	5
24.	Real Estate Market Research	5
25.	Innovation & Enterprise in Action^	4
26.	Industrial Training Programme	5

DIPLOMA IN REAL ESTATE BUSINESS (REB) (3-YEAR COURSE)
SCHOOL OF ENGINEERING

Module No.	Module Name	Credit Units
YEAR 3		
Level 3.1 (20 hours per week)		
27.	Building Maintenance & Diagnostics#	4
28.	Building Refurbishment#	3
29.	Landscape Management	3
30.	Project 1	6
31.	World Issues: A Singapore Perspective^	2
32.	Interdisciplinary Studies (IS) module^	2
Level 3.2 (23 hours per week)		
33.	Real Estate Finance	4
34.	Real Estate Investment	4
35.	Building Quantities & Costing	4
36.	International Business#	2
37.	Project 2	9
Across-Level Modules (Level 1.2 onwards) (6 hours per week)		
38.	School of Engineering elective module°	3
39.	School of Engineering elective module°	3

COURSE CURRICULUM (IAP/PDD PATH)

Module No.	Module Name	Credit Units
YEAR 1		
Level 1.1 (24 hours per week)		
1.	Theory of Economics#	5
2.	Mechanical Systems#	5
3.	Principles of Accounting#	4
4.	Computer Aided Design#	3
5.	Interior Design#	3
6.	Creativity & Applied Thinking Skills^	2
7.	Sports & Wellness^	2
Level 1.2 (23 hours per week)		
8.	Electrical Systems#	5
9.	Principles of Law#	5
10.	Building Technology#	5
11.	Client Relationship Management#	4
12.	Individual & the Community^	2
13.	Communication Toolkit^	2
YEAR 2		
Level 2.1 (25 hours per week)		
14.	Property Management#	5
15.	Real Estate Marketing	5
16.	Project Management#	4
17.	Urban Planning & Economics	4
18.	Environmental Health Management#	3
19.	Interdisciplinary Studies (IS) module^	2
20.	Interdisciplinary Studies (IS) module^	2

Module No.	Module Name	Credit Units
YEAR 2		
Level 2.2 (24 hours per week)		
21.	Property Valuation	5
22.	Real Estate Law	5
23.	Advanced Building Technology#	5
24.	Real Estate Market Research	5
25.	Innovation & Enterprise in Action^	4
YEAR 3		
Level 3.1 (23 hours per week)		
26.	Building Maintenance & Diagnostics#	4
27.	Building Refurbishment#	3
28.	Real Estate Finance	4
29.	Real Estate Investment	4
30.	Building Quantities & Costing	4
31.	World Issues: A Singapore Perspective^	2
32.	Interdisciplinary Studies (IS) module^	2
Level 3.2 (25 hours per week) (Student to do one)		
33.	Industrial Attachment Programme (IAP)	25
34.	Project Design & Development (PDD)	25
Across-Level Modules (Level 1.2 onwards) (6 hours per week)		
35.	School of Engineering elective module°	3
36.	School of Engineering elective module°	3

Notes:

Common modules with other courses.

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

° For more details on School of Engineering elective modules, please refer to page 182.

IS Modules

The School of Interdisciplinary Studies (IS) delivers the interdisciplinary curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge-based economy. IS modules challenge boundaries and offer insights into Communication, Entrepreneurship, Life Skills, Media & the Arts, and Science & Technology.

School of Engineering (SoE) Elective Modules

The SoE elective modules fall under a wide range of clusters under both Engineering and Non-Engineering categories. The aim is to provide students with the opportunity to broaden their knowledge and deepen their discipline-specific areas. Each cluster comprises a minimum of three 3-hour modules. Students are required to take two modules in order to satisfy the minimum graduating requirement.

DIPLOMA IN TECHNOLOGY (BUILDING SERVICES) (3-YEAR PART-TIME COURSE)

SCHOOL OF ENGINEERING

The **part-time Diploma in Technology (Building Services)** is a six-stage, part-time evening course. The course is structured in a modular form based on a module-credit system. To qualify for the award of the Diploma, students are required to complete all the core modules from the six stages and, in addition, another 20 credit units of cross-disciplinary elective modules.

Students receive comprehensive training in the intricacies of building design. Graduates will be equipped with the knowledge and skills to design, operate and manage structures in an environmentally safe and friendly manner.

COURSE STRUCTURE

Stage 1:

- Engineering Mathematics A
- Principles of DC Circuits
- Building CAD

Stage 2:

- Engineering Mathematics B
- Principles of AC Circuits
- Analogue and Digital Electronics

Stage 3:

- Building Water and Sanitary Services
- Building Electrical Services

Stage 4:

- Fire Engineering
- Basic Air-Conditioning

Stage 5:

- Fire Safety Management
- Applied Air-Conditioning
- Distribution System Design

Stage 6:

- Building Automation System
- Building Services Integration and Coordination
- Building Construction

This diploma is administered by the Centre for Professional Development (CPD). For more information about this course, please log on to www.np.edu.sg/cpd/ or contact the CPD at 64606353.

DIPLOMA IN WATER TECHNOLOGY (3-YEAR PART-TIME COURSE)

SCHOOL OF ENGINEERING

The **part-time Diploma in Water Technology** is a six-stage, part-time evening course. The course is structured in a modular form based on a module-credit system. To qualify for the award of the Diploma, students are required to complete all the core modules from the six stages and, in addition, another 20 credit units of cross-disciplinary elective modules.

Singapore fully recognises the water and environmental challenges facing a world of limited resources and a growing population. In response to market needs, the Diploma in Water Technology is offered as a new, cutting-edge course that provides the opportunity to understand these challenges and to find environmentally balanced solutions. The programme is infused with multidisciplinary elements to create well-rounded graduates who are highly valued by the industry for their analytical and problem-solving skills.

COURSE STRUCTURE

Stage 1:

- Engineering Mathematics
- Environmental Water Chemistry
- Information Technology
- Principles of Civil Engineering

Stage 2:

- Principles of Mechanical & Electrical Engineering
- Environmental Health and Safety
- Environmental Science
- Basic Hydraulics

Stage 3:

- Water Resources and Hydrology
- Drainage Systems
- Sewerage Systems

Stage 4:

- Wastewater Treatment
- Industrial Water Pollution Control

Stage 5:

- Water Treatment
- Water Supply and Distribution System
- Environmental Management
- Environmental Law

Stage 6:

- Advanced Water Reclamation
- Instrumentation and Control Systems

This diploma is administered by the Centre for Professional Development (CPD). For more information about this course, please log on to www.np.edu.sg/cpd/ or contact the CPD at 64606353.