

DIPLOMA IN CIVIL & ENVIRONMENTAL ENGINEERING (CEE) (3-YEAR COURSE)

SCHOOL OF ENGINEERING
ENVIRONMENT & ENERGY CLUSTER



From ancient Egypt to the present day, civil engineers have been engaged in the design and construction of countless structures such as buildings, dams, bridges, tunnels, highways, transit systems, airports, harbours and wastewater treatment plants. Engineering also plays an ever increasing role in the protection of the environment using the latest state-of-the-art technology. The **Diploma in Civil & Environmental Engineering (CEE)** is a dual discipline course that combines training for infrastructural development and environmental protection.

Students are equipped with the knowledge and skills to design, operate and manage structures in an environmentally safe and friendly manner. They will 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 wide variety of elective modules to choose from and can graduate with additional Diploma Plus Certificates and Enhancement Certificates. These electives are carefully selected to cater to the students' diverse interests and changing trends in the industry.

In their second or final year of study, students will have the opportunity to participate in research studies and projects, internships, and immersion or exchange programmes, conducted either locally or overseas.

As the world's population increases and technology evolves together with mounting environmental concerns, the skills of civil and environmental engineers will be highly valued, particularly in the fields of design, construction, operation, research and management.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examination (or equivalent) results and fulfill the aggregate computation requirements:

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

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

** Candidates with English as a second language 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. There will be countless opportunities for them to apply their knowledge and skills to the building of infrastructures, protection of the environment and conservation of resources.

Equipped with broad-based knowledge and skills in dual disciplines, 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 Environment Agency, Public Utilities Board, Ministry of the Environment and Water Resources, National Parks Board and Ministry of Defence.

In the private sector, they can take up careers as civil/structural designers, project supervisors, assistant environmental engineers, project engineers, environmental technologists, environmental control officers, assistant safety officers, laboratory analysts, research assistants and marketing executives.

ACCREDITATION FOR FURTHER STUDIES

CEE graduates can pursue bachelor's degree programmes in civil engineering or environmental engineering at local and overseas universities. Advanced standing or module exemptions may be granted at the following universities:

- **National University of Singapore** and **Nanyang Technological University**
Advanced standing of one year for Civil Engineering or Environmental Engineering courses
- **University of Queensland (Australia)**
- **Bond University (Australia)**
- **University of Wollongong (Australia)**
- **RMIT University (Australia)**
- **University of Newcastle upon Tyne (UK)**

Module Name Credit Units

Engineering Mathematics 3#	4
Interdisciplinary Studies (IS) module^	2
Interdisciplinary Studies (IS) module^	2

Level 2.2 (20 hours per week)

Geotechnical Engineering	5
Quantity Surveying	3
Environmental Management	4
Workplace Safety & Health 1#	4
Innovation & Enterprise in Action^	4

YEAR 3

Level 3.1 (25 hours per week)

Reinforced Concrete Design	5
Air Quality Monitoring & Control #	4
Steel Design	4
Workplace Safety & Health 2 #	4
Water Reclamation Technology#	4
World Issues: A Singapore Perspective^	2
Interdisciplinary Studies (IS) module^	2

Level 3.2 (25 hours per week)

(Student to do one)	
Six-month Internship	25
Project Design & Development (PDD)	25

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

School of Engineering (SoE) elective module*	3
School of Engineering (SoE) elective module*	3

COURSE CURRICULUM (INTERNSHIP / PDD)

Module Name Credit Units

YEAR 1

Level 1.1 (25 hours per week)

Structural Mechanics	5
Civil Engineering Construction	5
Ecology#	2
Environmental Health	4
Engineering Mathematics 1 #	5
Creativity & Applied Thinking Skills^	2
Sports & Wellness^	2

Level 1.2 (25 hours per week)

Land Surveying	4
Computer-Aided Design#	3
Environmental Chemistry & Analysis#	5
Hydraulics#	4
Engineering Mathematics 2#	5
Communication Toolkit^	4

YEAR 2

Level 2.1 (24 hours per week)

Structural Analysis	4
Project Management#	4
Noise Pollution Monitoring & Control#	4
Clean Water Technology	4

COURSE CURRICULUM

(NON-INTERNSHIP / NON-PDD)

Module Name Credit Units

YEAR 1

Level 1.1 (25 hours per week)

Structural Mechanics	5
Civil Engineering Construction	5
Ecology#	2
Environmental Health	4
Engineering Mathematics 1#	5
Creativity & Applied Thinking Skills^	2
Sports & Wellness^	2

Level 1.2 (25 hours per week)

Land Surveying	4
Computer-Aided Design#	3
Environmental Chemistry & Analysis#	5
Hydraulics#	4
Engineering Mathematics 2#	5
Communication Toolkit^	4

YEAR 2

Level 2.1 (24 hours per week)

Structural Analysis	4
Project Management #	4

Module Name	Credit Units
Noise Pollution Monitoring & Control #	4
Clean Water Technology#	4
Engineering Mathematics 3 #	4
Interdisciplinary Studies (IS) module^	2
Interdisciplinary Studies (IS) module^	2
Level 2.2 (25 per week)	
Geotechnical Engineering	5
Quantity Surveying	3
Environmental Management	4
Workplace Safety & Health 1 #	4
Innovation & Enterprise in Action^	4
Two-month Internship	5
YEAR 3	
Level 3.1 (22 hours per week)	
Reinforced Concrete Design	5
Air Quality Monitoring & Control #	4
Structural Inspection & Repairs	3
Project 1	6
World Issues: A Singapore Perspective^	2
Interdisciplinary Studies (IS) module^	2
Level 3.2 (23 hours per week)	
Steel Design	4
Workplace Safety & Health 2 #	4
Water Reclamation Technology#	4
International Business#	2
Project 2	9
Across-Level Modules (Level 1.2 onwards) (6 hours per week)	
School of Engineering (SoE) elective module*	3
School of Engineering (SoE) 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 165.

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.

COURSE MODULES**LEVEL 1.1****Structural Mechanics**

Strength and stability are important aspects of 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 used 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, reinforced concrete constructions, precastings, prestressing and structural steelworks. Excavation works, supports, ground water control, road works, pipeline constructions and tunnelling are also included.

Ecology

Ecology is the study of living things in their natural environment. This module focuses on the significance and functions 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 is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, there is appropriate use of a Computer Algebra System. Topics include algebra, trigonometry, logarithms, matrices and complex numbers.

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 compasses, 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 prepare CAD drawings according to CP 83. Emphasis is 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 & Analysis

This module introduces students to the field of environmental engineering and provides the 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 fluids, manometry, hydrostatics and fundamental principles of fluid flow. Head loss in pipelines, design of pipelines, flow measurements and pipe network analysis will also be covered. Students will also learn about open channel flow and the design of surface water drainage systems.

Engineering Mathematics 2

This module provides students with mathematical skills for solving basic engineering problems. Topics are organised to keep pace with applications in the engineering modules. Throughout the module, a Computer Algebra System will be used when appropriate. Topics covered include trigonometry, coordinate geometry, differentiation and integration with applications.

LEVEL 2.1

Structural Analysis

This is a continuation of the Structural Mechanics module. Students will perform structural analysis for various concrete and steel designs. Students will 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 will also study project-planning techniques including the use of a project network planning software.

Noise Pollution Monitoring & Control

The control of noise pollution is essential in all aspects of engineering. The rapid economic growth and growing affluence in Singapore have resulted in a greater need to control noise pollution. In this module, students are taught on how noise pollution arises and its impact on health, 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 provides students with mathematical skills for solving basic engineering problems. Topics are organised to keep pace with applications in the engineering modules. Topics covered include integration with applications, differential equations, Laplace transforms, 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 soils under structural loading. 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 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 earthworks, brickworks, concrete works, reinforcements, 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. This module also covers the management of environmental health, particularly in the areas of food and meat hygiene. In addition, students will learn about 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.

Two-month Internship (Non-Internship/Non-PDD Pathway only)

In this module, students will be attached to organisations for a period of eight weeks to gain practical experience related to their course of study. This allows students to adapt themselves to the work environment in preparation for future employment. During their internship, they will undertake projects and tasks assigned by the organisation.

LEVELS 3.1 and 3.2

COMMON MODULES

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 both outdoor and indoor air pollution are important aspects of environmental management. Students are taught the fundamentals of how air pollution arises, types of pollutants, 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.

Steel Design

This module covers the design concepts of steel structures and elements using the current design code. Students will learn how to prepare structural steel detailings 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 found in various industries and the means for protection are also covered. Other topics include the safe use of hand and power tools, safe handling of materials, process hazards and electrical safety.

Water Reclamation Technology

The module introduces students to sewage characteristics, sewer design and maintenance and unit operations in a conventional wastewater treatment plant. The module will also cover the fundamentals of sewage collection systems for domestic wastewater, wastewater treatment technologies, monitoring and operation of wastewater treatment systems and the code of practice relevant to sewerage and wastewater treatment. Students will also learn about sludge treatment and disposal technologies. Emerging technologies in water reclamation and water recycling are also emphasised.

INTERNSHIP/PDD PATHWAY

Six-month Internship

In this module, students will be attached to organisations for a period of six months. This is to prepare them for future employment in their particular discipline of study. During their internship, they will undertake projects and tasks assigned by the organisations. This allows them the opportunity to take initiatives as well as to develop their self-confidence, interpersonal and adaptation skills.

Project Design & Development (PDD)

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 on 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.

NON-INTERNSHIP/NON-PDD PATHWAY

Structural Inspection & Repairs

This module introduces the requirements of mandatory building inspection 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 be given 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 gained in their first two years of study and undertake a year-long project on a topic in the field of civil and environmental engineering. This could be done as a case study, fabrication or computer-application project.

International Business

Students will learn about 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.

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 elective clusters 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 the 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 Clusters

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

Non-engineering Clusters

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

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 165.