

## **COURSE MODULES**

### **LEVEL 1.1**

#### **Architectural Design**

This module equips students with a fundamental set of skills for architectural presentation and representation, providing a firm grounding for the practice of architectural design. It explores how architecture is presented through the use of various modes of drawing and design techniques together with design thinking process. Students will also develop competence in physical model-making as a vital means of exploring and resolving 3D spatial design.

#### **Building Behaviour Studies 1**

Strength and stability are important aspects of structural elements that make up buildings and other infrastructures. 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.

#### **Career & Professional Preparation I**

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

#### **Engineering Mathematics 1**

This module provides students with mathematical skills for solving basic engineering problems. Topics are organised to keep pace with applications in the engineering modules. They include algebra, trigonometry, logarithms, matrices and complex numbers. A Computer Algebra System will be used where appropriate.

#### **Introduction to Architecture and Civil Engineering**

In a design studio-based learning environment, this module facilitates the development of critical thinking and fundamental design principles relating to Architecture and Civil Engineering. An understanding of Architecture and Civil Engineering provides a platform for issues to be addressed including spatial design fundamentals, design process, spatial experience, scale, proportion, anthropometry, design exploration and structural systems. Students learn to articulate architectural design ideas with structural integrity and to translate them into physical and material investigations through design primers and workshops.

#### **Sustainable City Planning**

This module provides students the fundamental knowledge to sustainable city planning and urbanism. It outlines the framework for urban planning, urban design and development in the global context and Singapore. Detailed case study of sustainable master planning applications are included for students to learn the infrastructure principles and concepts. Students are tasked to apply basic urban design and planning with considerations to urban guidelines to formulate architectural and urban ideas in creating a socially, ecologically and economically sustainable city and to develop critical design solutions for urban design interventions.

### **LEVEL 1.2**

#### **Building Behaviour Studies 2**

This is a continuation of Building Behaviour Studies 1. Students will perform structural analysis for various concrete and steel designs. They will learn to analyse and compute forces, deflections, shear forces and bending moments developed in structural members due to different loading criteria for both statically determinate and indeterminate structures.

#### **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 learn to apply CAD standards pertaining to architectural symbols, drawing conventions, line colour and layering systems. Students will also be trained to interpret and extract information from CAD drawings and to prepare CAD drawings according to Code of Practice and Standards.

### Engineering Mathematics 2

This module equips students with further mathematical skills to solve engineering problems. Topics include further trigonometry, trigonometric graphs, plane analytic geometry, differentiation with applications, and integration with applications.

### Sustainable Design Studio

This module facilitates the development of critical thinking to formulate architectural design ideas that cover the basic tenets of sustainable environment. Students will learn how to apply and integrate their creativity, knowledge and skills on a project from design process to design development in the context of environmentally friendly and sustainable design. Supplemented with green building performance analysis software, site visits and case studies of exemplary Green Mark buildings, a series of studio design exercise and environmental design studies will prepare students to address sustainability approaches for the final carbon-neutral architectural design project.

### Structure & Fabric

In this module, students will study the basic principles and construction techniques for the main building elements of low-rise buildings. The properties and applications of common building materials and functional requirements of various building elements are also examined. This module prepares students for the study of more complex structures and methods applicable to multi-storey buildings and infrastructure construction in the Infrastructure Works module during the second year.

## COURSE CURRICULUM

Module Name	Credit Units
<b>YEAR 1</b>	
<b>Level 1.1 (27.5 hours per week)</b>	
Architectural Design	4
Building Behaviour Studies 1	5
Career & Professional Preparation I	1.5
Engineering Mathematics 1	5
Introduction to Architecture & Civil Engineering	3
Sustainable City Planning	3
Innovation Toolkit ^	4
Sports & Wellness ^	2
<b>Level 1.2 (25 hours per week)</b>	
Building Behaviour Studies 2	4
Computer Aided Design	3
Engineering Mathematics 2	4
Structure & Fabric	4
Sustainable Design Studio	5
Communication & Contemporary Issues ^	4

### Notes:

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

### IS Modules

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## **COURSE MODULE**

### **ARCHITECTURE SPECIALISATION**

#### **LEVEL 2.1**

##### **Building Mechanical & Electrical Systems**

This module provides fundamental knowledge on principles of operation and layouts of mechanical and electrical systems for buildings as well as plant room and duct riser space required to accommodate equipment and distribution networks. Systems covered include building water supply, mechanical ventilation, air-conditioning, sanitary plumbing & drainage, fire protection, town gas supply, electrical power distribution, lighting and lifts & escalators. In addition, the module will also cover energy efficiency, water efficiency and indoor environmental quality requirements of the Green Mark New Buildings scheme.

##### **Career & Professional Preparation II**

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

##### **Design Studio 1**

The studio enhances the Year 1 foundation of conceptual methodologies, technique and critical thinking with the inclusion of the user, spatial planning, narrative, circulation flow and tectonics. Students are to investigate, experiment and explore conceptual designs through a series of small scale design projects. Through conceptual and analytical thinking, students develop their architectural translations into spatial articulations.

##### **Digital Architecture Modelling**

Students will be introduced to advanced skills in 3D modelling, visualization, analysis, documentation and fabrication for Architecture. Using industry standard software for parametric design modelling, students learn to harness the techniques of 3D modelling. Through creative design process, the students will generate computation design seamlessly to integrate these outputs into compelling presentations and to interface the digital fabrication to their design project.

##### **History & Theory of Western Architecture**

This module provides an introduction to a general overview of the developments in Western architecture, both historically and theoretically. It covers major movements, ideas, principles and traditions in architecture, and their influence on the global production of architecture. Exploring key works, architects and texts ranging from the classical era through the twenty-first century, students will appreciate the development of architectural ideas and built works, and their relationship with the prevailing society and culture. Intellectual discourse and critique of architectural design are expected as learning outcomes.

#### **LEVEL 2.2**

##### **Architectural Materials & Technology 1**

This module expands on students' understanding of basic construction and building technologies, and introduces basic building materials, timber and reinforced-concrete structural systems as well as creative-driven detailing

applicable to small and medium scale projects. Students are required to apply their understanding of construction methodologies and architectural detailing into their design projects.

### **Architectural Visualisation & Presentation**

As a follow-on module from Digital Architectural Modelling, this module introduces students to advance digital representational skills in both architectural renderings and presentation. Utilising the latest software in the industry, students will harness the skills and techniques learned to create compelling hybrid 2D and 3D drawings, visualisations, diagrams and presentation boards in order to visually communicate their design ideas and strategies. They also learn how to compile all their works in a digital portfolio.

### **Design Studio 2**

Design Studio 2 focuses on connecting the user's and community's needs to a design solution. This further exploration heightens students' sensitivity to the different aspects of the user/community, which shapes the design process, decision and crafting of the design project. Through the studio project, students will learn to articulate architectural spaces and to translate programmatic investigations into spatial design proposals. Students will expand design strategies to engage with the interfacing of design exploration and fabrication.

### **Fundamentals of Landscape Architecture**

This module provides students an overview of the field of landscape architecture. Students will learn about the history, theory and design processes of landscape architecture. Students will develop an understanding of design principles, appreciation towards human physical and mental responses to the softscape, hardscape and natural environment. Students will explore the design ideology and application of theory in the practice of landscape architecture.

### **Workplace Safety & Health**

The module covers the relevant legislation and standards pertaining to workplace safety & health. Students will be taught to identify the various types of industry hazards and the means of protection against these hazards. The topics will include risk management and control, safety management system, accident reporting and investigation, safe use of hand and power tools, safe handling of materials and machinery, and electrical safety.

## **CIVIL ENGINEERING SPECIALISATION**

### **LEVEL 2.1**

#### **Building Mechanical & Electrical Systems**

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#### **Computer Aided Modelling**

This module introduces students to BIM processes and applications. The students will be equipped with the practical 3D BIM structural modelling skills and technical knowledge to initiate projects using BIM. It also enables students to learn how to apply the e-submission guidelines and to understand the mandatory format for regulatory approval.

#### **Engineering Mathematics 3**

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

### Infrastructure & Building Works

This module introduces students to the various methods of construction involved in complex structures, multi-storey buildings and infrastructure engineering works as part of urban development. It covers reinforced concrete construction, precast and pre-stressed construction, and structural steelwork. Excavation works, excavation supports, ground water control, road works and pipeline construction are also included.

## LEVEL 2.2

### Land Surveying

This is the science and technology of gathering, analysing, distributing and using geographic data. Students learn to use instruments (Level and Total Station) to gather data with basic surveying techniques. They also learn to interpret, distribute and use this collected data for urban development projects. Students will carry out integrated assignments where the data collected will be transferred to AutoCAD software, to allow them to appreciate how the data are used in real projects.

### Quantity Surveying

This module covers the principles of taking-off and measurement of quantities from construction drawings for urban development works. It is used for preparing cost estimates and budgeting. 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.

### Structural Design 1

This module trains students to use the current Code of Practice for the analysis and design of structural elements in reinforced concrete construction. Students will also learn to read structural drawings for construction purposes.

### Water Resources Technology

This module introduces students to the basic behaviour of water as a liquid and the fundamental concepts that are essential for the study of water related technologies. It provides students the fundamental principles and design of water collection systems, water treatment processes, and water transmission and distribution systems.

### Workplace Safety & Health

The module covers the relevant legislation and standards pertaining to workplace safety & health. Students will be taught to identify the various types of industry hazards and the means of protection against these hazards. Topics include risk management and control, safety management system, accident reporting and investigation, safe use of hand and power tools, safe handling of materials and machinery, and electrical safety.

## COURSE CURRICULUM

Module Name	Credit Units
<b>YEAR 2</b>	
<b>ARCHITECTURE SPECIALISATION</b>	
<b>Level 2.1 (24 hours per week)</b>	
Building Mechanical & Electrical Systems	5
Career & Professional Preparation II	2
Design Studio 1	8
Digital Architecture Modelling	4
History & Theory of Western Architecture	3
Interdisciplinary Studies (IS) elective ^	2

**Level 2.2 (25 hours per week)**

Architectural Materials & Technology 1	3
Architectural Visualisation & Presentation	4
Design Studio 2	8
Fundamentals of Landscape Architecture	4
Workplace Safety & Health	4
Interdisciplinary Studies (IS) elective ^	2

**CIVIL ENGINEERING SPECIALISATION****Level 2.1 (21 hours per week)**

Building Mechanical & Electrical Systems	5
Career & Professional Preparation II	2
Computer Aided Modelling	4
Engineering Mathematics 3	4
Infrastructure & Building Works	4
Interdisciplinary Studies (IS) elective ^	2

**Level 2.2 (27 hours per week)**

Land Surveying	5
Quantity Surveying	4
Structural Design 1	7
Water Resources Technology	5
Workplace Safety & Health	4
Interdisciplinary Studies (IS) elective ^	2

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**COURSE MODULE****ARCHITECTURE SPECIALISATION****LEVEL 3.1****Architectural Materials & Technology 2**

This module enhances students' understanding with more advanced construction, building technologies, steel structural systems, façade cladding systems and materials applicable to large scale projects. It also covers sustainable construction such as green roofs and walls. Students are required to apply their knowledge through the analysis of large scale buildings and to integrate functional assemblage, architectural enclosure and structural system into their design projects in a cohesive manner.

**Design Studio 3**

This module enhances the level of the design skills with the considerations for spatial adaptability and sustainability considerations in an urban context. Students are to explore different aspects of the architectural design considerations from the contextual, physical, social and cultural perspectives. Students will develop interpretive analysis, and

conceptual and critical thinking to formulate the design narratives and to orchestrate spatial and experiential sequence through creative exploration and creation of form, space, and programme. Students will develop critical design solutions with compliance to statutory requirements for small to large scale architectures and urban interventions.

### **History & Theory of Asian Architecture**

As a follow-on module from History & Theory of Western Architecture, this module focuses on the Asian and local perspectives of architectural history and theory. Through visits, discussions and critiques of significant architectural works, architects and their influences are studied. Students will appreciate the development of architectural ideas and built works in the Asian and local contexts, and their relationship with the prevailing society and culture. Local urban conservation and refurbishment projects will be covered.

### **Professional Practice**

This module places architectural design in the context of a professional practice. Students will learn how an architectural practice is organised, the roles and responsibilities of architects, and their relationships with the other consultants and professionals of a building project team. The module will provide students the knowledge of the regulatory and discretionary building codes and standards that any architectural design in Singapore must conform to and correspondingly, the standard procedures for project application to the relevant authorities. Students are to apply relevant guidelines to their design projects.

## **LEVEL 3.2**

### **3-Month Internship**

The module provides students with the opportunity to gain experience and apply the knowledge and skills learnt in a working environment relevant to the course. Students will enhance their abilities in problem solving, communication and interpersonal skills in the module. The internship may be conducted locally or overseas. Students are required to submit weekly reports, interim and final reports, and present the internship experiences in an oral presentation at the end of the internship.

### **Design Studio 4**

In this final-year project, students will develop architectural design projects from inception to completion in a succinct manner. Through the study of architectural precedents and site analysis, students' design proposals should demonstrate a keen understanding of context, environment and spatial programming as well as sensitivity to materials techniques and skills to bring out the essence of their design through the use of various representational media to communicate design ideas effectively. The meaning of a space in relation to its function and human activities is also demonstrated against social and cultural aspects.

### **Project Management**

This module covers the principles of project management at various stages of a building and construction project. Elements of contract administration, quality management, coordination, engineering economics and finance will be taught.

## **CIVIL ENGINEERING SPECIALISATION**

### **LEVEL 3.1**

### **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 the various stages of planning. Elements of contract administration, construction and engineering economics and finance will be taught.

### **Soil Mechanics & Foundation Engineering**

Students will study the behaviour of soil under structural loading. The properties of common types of soil, soil compaction, soil permeability, shear strength of soil, 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 to support intended structures.

### **Structural Assessment & Improvement**

This module introduces the requirements of mandatory building inspection under the local 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 be given practical sessions in the use of equipment for non-destructive testing of concrete. The module also covers the process of building condition survey in preparation for conservation and refurbishment projects.

### **Structural Design 2**

The topics in this module cover the design concepts of steel structures and detailed design of various structural steel elements based on the provisions of the structural steel design code. Students will also be taught how to prepare structural steel detailing and drawings.

### **Water Reclamation Technology**

The module provides students with the fundamental principles of wastewater management. Students will be taught the design and operation of recycling technologies applied in water reclamation plants. The module also covers reclaimed water re-uses and applications as well as pumped and piped systems for collection of used water. There is focus on a planning and design approach to integrate the urban water cycle, including wastewater management into urban design.

## **LEVEL 3.2**

### **OPTION 1:**

#### **6-Month Internship**

The module provides students the opportunity to gain experience and apply the knowledge and skills learnt in a working environment relevant to the course. Students will enhance their abilities in problem solving, communication and interpersonal skills in the module. The internship may be conducted locally or overseas, depending on the availability of internship companies. Students are required to submit weekly reports, interim and final reports, and present the internship experiences in an oral presentation at the end of the internship.

### **OPTION 2:**

#### **3-Month Internship**

The module provides students with the opportunity to gain experience and apply the knowledge and skills learnt in a working environment relevant to the course. Students will enhance their abilities in problem solving, communication and interpersonal skills in the module. The internship may be conducted locally or overseas. Students are required to submit weekly reports, interim and final reports, and present the internship experiences in an oral presentation at the end of the internship.

### **Final-Year Project**

This module will allow the students to apply and integrate their knowledge and skills learnt in the first five semesters in solving a practical problem or study a given issue related to Civil Engineering. The project may be proposed by industry, staff or students themselves.

## **COURSE CURRICULUM**

<b>Module Name</b>	<b>Credit Units</b>
<b>YEAR 3</b>	
<b>ARCHITECTURE SPECIALISATION</b>	



**Level 3.1 (23 hours per week)**

Architectural Materials & Technology 2	3
Design Studio 3	10
History & Theory of Asian Architecture	3
Professional Practice	3
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2

**Level 3.2 (26 hours per week)**

3-Month Internship	12
Design Studio 4	10
Project Management	4

**CIVIL ENGINEERING SPECIALISATION****Level 3.1 (28 hours per week)**

Project Management	4
Soil Mechanics & Foundation Engineering	5
Structural Assessment & Improvement	4
Structural Design 2	6
Water Reclamation Technology	5
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2

**Level 3.2 (22 hours per week)**

6-Month Internship	22
or	
3-Month Internship	12
Final Year Project	10

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