DE adopts the “Live Design” methodology, which means learning and practising a design-centred approach to everything students do. This starts with being perceptive to people, things, actions and the surroundings. At DE, students will learn to:

- Conceptualise new and innovative products or take an everyday object and re-design it to make it more eco-friendly, functional and attractive.
- Plan sustainable cities and buildings that are in harmony with nature. Rejuvenate towns and buildings, injecting new life but preserving culture and identities.
- Maximise the profit potential of hotels and malls by improving their ambience. Identify the elements that are superfluous, out of place or missing, and propose new interiors.
- Add value to commercial and residential properties by enhancing their aesthetics, space efficiencies and keeping the buildings in tip-top condition.

The School of Design & Environment (DE) offers four diploma courses that aims to inspire students in infusing creative and eco-friendly designs into urban environment, buildings, infrastructure and products that meet the needs of people in the global cities of the 21st century and at the same time, enhance the quality of life and our living environment.

COURSES OFFERED
DE offers the following full-time, three-year diploma courses:

- Diploma in Hotel & Leisure Facilities Management (HLFM)
- Diploma in Product Design & Innovation (PDI)
- Diploma in Real Estate Business (REB)
- Diploma in Sustainable Urban Design & Engineering (SDE)

DE STUDY AWARD
The DE Study Award recognises a special group of students who have demonstrated talent and passion in the areas of design and environment. A total of 30 awards, each with a value of $800, will be given out annually to students from the School’s four diplomas.

STUDENT/GRADUATE ACHIEVEMENTS

- Two groups of HLFM students clinched the First Prize in the Tertiary Category and a Special Prize for “ABB Most Innovative Township” in the “Planning a Clean & Green Waterfront, Iskandar” competition. Chia Xun An was also awarded the prestigious “Future Young Mayor Award”.
- Students from SDE and REB joined forces for the Challenge for the Urban & Built Environment (CUBE) 2013 Competition. The team was awarded the Merit Prize for their innovative ideas in planning the future use of a section of the Tanjong Pagar Rail Corridor.
13 SDE students teamed up for the 48-hour Virtual Building Information Modelling (BIM) Competition 2013 organised by the Building and Construction Authority (BCA). They took home with them the First Runner-Up Prize for the Stellar Architecture with BIM (Education Category).

PDI students demonstrated their creativity by designing innovative products for the Motorola Solutions Design Competition. Seven students came away with a total of S$10,000 in cash prizes in the third-year category. Two students won a total of S$5000 in cash prizes in the second year category.

PDI student Soo Woei Perng designed a walking aid that allows users with lower limb injuries to carry their own belongings. He also showcased the prototype at the Korea iCreate 2013, an international convention on rehabilitation engineering and assistive technology.

FACILITIES & STAFF
The new DE teaching block is under construction. The seven-storey building will have purposefully constructed learning spaces such as design studios, product fabrication workshops and building technology laboratories that will inspire staff and students to create innovative and inventive works.

The School has a team of highly-qualified professionals with many years of industry experience. To bring out the best of our students, staff use a wide range of innovative teaching and learning strategies, methods and tools. Students are constantly engaged in creative and critical thinking, and provided with constant guidance and support.

CURRICULUM
The curriculum of DE courses is designed to provide our students with the best possible education to give them a head-start on their future employment and further studies. This student-centric approach is yet another feature of DE’s ‘Live Design’ philosophy. There is a focus on design-related modules and projects that allow students from different courses to work on multidisciplinary and collaborative projects.

DE adopts a variety of practice-oriented teaching and learning approaches to engage students in learning. These include off-campus learning, multidisciplinary and collaborative projects, industrial projects, competition projects and field visits. For example, talks by practising professionals are organised for DE students to give them a better appreciation of the industry.

A series of off-campus learning activities such as guided tours to the URA Singapore City Gallery and site visits to Resorts World Sentosa were organised to reinforce students’ learning and enhance their knowledge.

DE students also have opportunities to attend Overseas Immersion Programmes at the Tianjin University of Science & Technology and Wuchang University of Technology, China. In particular, PDI students have attended Overseas Internship Programmes at Chaoyang University of Technology, Taiwan, and Jiangnan University, China.

As part of their education in DE, our graduates will showcase their innovative projects in the annual Graduation Show. Visitors from the industry, schools, media and public will visit the show to witness the talents and innovative works of our graduates.

COLLABORATIONS
DE actively engages the industry in seeking collaboration opportunities and empowering staff and students to work on challenging and practical real-life projects. Here are a few examples:

• DE students participated in HDB projects in Punggol, Singapore’s first eco-town, under a research collaboration agreement with the HDB Building Research Institute. SDE students were involved in planning and test-bedding environmentally-friendly designs and urban solutions at Punggol Waterway, a “Green Living Laboratory”.

• DE staff and students participated in Archifest 2013 by showcasing their creative works at the Tiong Bahru site and conducted a creative workshop for the public in the National Library Building.

• HLFM and PDI students worked with a nursing home to design a portable meal tray for wheelchair users to reduce the effort and time for caregivers to serve meals.

• In another collaborative project with the National Environment Agency (NEA), HLFM and PDI students jointly designed an ergonomic hawker centre trolley for the cleaners. The trolley helps improve productivity.

• DE worked with the British Council to organise a British Council School Bag Design Competition. A group of second-year PDI students clinched the first, second, and third places, as well as two Merit Awards. The winning design will now be used as the British Council’s official school bag.
To be eligible for consideration, candidates must have the following GCE ‘O’ Level examination (or equivalent) results.

Students will also learn how to operate and manage modern ‘green’ hotels and shopping malls that use green building technology, building automation and performance simulation.

HLFM graduates will also be awarded a Fire Safety Manager Certificate that allows them to be registered as Qualified Fire Safety Managers which usually command an additional allowance.

HLFM graduates can continue their education in facilities management with the National University of Singapore (NUS) by taking the degree course in Project & Facilities Management.

Various overseas universities in Australia, United Kingdom and the United States also offer advanced standing to our graduates for entry into their bachelor’s degree courses related to Facilities Management. In addition, our graduates may also apply to various overseas universities for further studies in the hospitality industry.

### ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE ‘O’ Level examination (or equivalent) results.

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You must also fulfil the aggregate computation requirements.

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

Candidates with hearing deficiency or severe vision deficiency should not apply for the course. Those with colour vision deficiency may be considered subject to an in-house test.

### CAREER PROSPECTS

With the construction of many luxurious hotels and mega-sized leisure facilities in Singapore, there will be many job opportunities for well-trained Facilities Managers.

HLFM graduates can work as a facilities officer, property executive, business development executive, front office executive or guest relations executive. With your training in both front office and back-of-the-house operations, you will have an added advantage in gaining employment in many different hotel positions.

### ACCREDITATION FOR FURTHER STUDIES

HLFM graduates can continue their education in facilities management with the National University of Singapore (NUS) by taking the degree course in Project & Facilities Management.

Hotel and leisure facilities such as the Resorts World Sentosa, Marina Bay Sands, ION Orchard and Orchard Central are not only unique in their design; they are also sophisticated in their operations with the extensive use of new technology. A new breed of facility managers is needed to keep up with the complexities of these modern facilities and bring them to a higher level of management.

These facility managers will need to be dynamic, tech-savvy and able to understand the human psyche to deliver both the highest possible satisfaction to consumers and value to the owners. With the Diploma in Hotel & Leisure Facilities Management (HLFM), students will gain the experience they need to do just this. Students will go on internships with organisations including Resorts World Sentosa, Swissotel The Stamford, Singapore Marriott, Frasers Centrepoint, AsiaMalls Management, CapitaMalls Asia and City Development Ltd to gain valuable real-world experience.

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### Module Name | Credit Units
--- | ---
**YEAR 1**
Level 1.1 (29 hours per week)  
Economics | 5  
Food & Event Management | 5  
Front Office Management | 4  
Mechanical Facilities | 5  
Principles of Accounting | 4  
Innovation Toolkit\(^\) | 4  
Sports & Wellness\(^\) | 2  
**Level 1.2 (25 hours per week)**  
Business & Contract Law | 4  
Customer Relationship Management | 4  
Electrical Facilities | 5  
Environmental Health | 3  
Housekeeping & Aesthetics | 5  
Communication & Contemporary Issues\(^\) | 4

**YEAR 2**
Level 2.1 (21 hours per week)  
Building Elements | 4  
Computer Aided Design | 3  
Green Building & Energy Management | 4  
Introduction to Interior Design | 3  
Shopping Mall Management | 5  
Interdisciplinary Studies (IS) module\(^\) | 2  
**Level 2.2 (23 hours per week)**  
Facilities Maintenance & Building Automation | 5  
Integrated Resort Amenities Management | 4  
Principles of Management | 4  
Psychology & Consumer Behaviour | 4  
Security Management & Business Continuity | 4  
Interdisciplinary Studies (IS) module\(^\) | 2

**YEAR 3**
Level 3.1 (26 hours per week)  
Building Maintenance & Refurbishment | 4  
Fire Safety Management | 6  
Hotel Operations & Management | 4  
Marketing & Public Relations | 5  
Project Planning & Management | 3  
World Issues: A Singapore Perspective\(^\) | 2  
Interdisciplinary Studies (IS) module\(^\) | 2  
**Level 3.2 (22 hours per week)**  
Six-month Internship | 22  
**OR**  
Three-month Internship and Final-Year Project | 12

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

### Course Modules

#### LEVEL 1.1

**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 macroeconomic policy.

**Food & Event Management**
Food & beverage (F&B) services play an important role in the product and service mix of hotels. It helps a hotel to capture additional revenue, prestige and competitive advantage. In this module, students will learn the fundamental processes in a typical F&B outlet such as types of table services, pre-opening activities and service sequence. They will also acquire knowledge on types of food & wine menu, information technology used in F&B, sanitation and food safety as well as the facility layout. Event management covers a wider scope such as event venue analysis, understanding event regulatory requirements and event staging. Other critical factors for a successful event such as on-site services, security and safety, and event protocol will also be discussed.

**Front Office Management**
The front office department is a subtle department of the rooms department. Its primary responsibility is to provide the best service possible to hotel guests. Students will be introduced to the guest cycle of pre-arrival, arrival, stay-in and departure. Besides customer relations, the front office is also responsible for controlling cost vital to the...
survival of any hospitality establishment and its revenue management. Topics covered in this module include the services of front office, roles and functions of a front office manager as well as the service quality and pre-requisites of front office staff.

**Mechanical Facilities**
In this module, students will gain an overview of mechanical systems in modern high-rise buildings and learn how the proper utilisation of these systems can create a better living environment. Topics covered include water supply, sanitary systems, drainage systems, gas supply and air-conditioning systems. Students will also learn how to operate and maintain these systems in buildings.

**Principles of Accounting**
This module provides students with the knowledge to understand basic accounting theories, concepts and conventions. It will equip them with the skills to prepare simple financial statements and appreciate the importance of understanding and analysing financial statements. Such domain knowledge plays a critical role in maintaining integrity, professionalism and ethics at work in the future.

**LEVEL 1.2**
**Business & Contract Law**
Students will study legal obligations relating to the management, use and operation of a built environment. The legal system introduces the nature and administration of law. The law of contract and commercial law involve a study of self-imposed obligation by individuals. The law of torts involves a study of state-imposed obligation on individuals for civil wrongs. Students will learn the concepts and principles of law through critical analysis, logical reasoning, and problem solving and management skills.

**Customer Relationship Management**
This module will cover the principles and concepts of customer relationship management and includes the definition of customer/client service, understanding customer needs, solutions to facilities management challenges and customer relationship management (CRM) implementation.

**Electrical Facilities**
This module covers the different electrical facilities found in high-rise buildings. Topics covered include the electrical supply system, interpretation of electrical drawings, electrical safety, emergency power, lifts and escalators. Emphasis will be placed on real-life applications in the operation and maintenance of these facilities in buildings.

**Environmental Health**
This 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 will also be given an overview of indoor air pollution sources, types of pollutants and the corresponding health impacts. Current methods of treating and controlling poor indoor air quality and local guidelines on indoor air quality will also be introduced.

**Green Building & Energy Management**
This will include study of the Green Mark Listing Scheme as well as the operating and sustainability issues of green building technologies such as solar energy, wind energy, biofuels, fuel cells, rainwater harvesting in Singapore. This includes government and industry initiatives to introduce green building technologies when applied in buildings. Students will also learn how to do energy audits and take effective steps to manage energy consumption.

**LEVEL 2.1**
**Building Elements**
In this module, students will study the various building elements of substructure, superstructure, floors, walls, roofs and building finishes. They will also be taught the principles and methods of simple building construction including the discussion of relevant case studies. Practical works include laboratory-based assignments and hands-on construction of building models.

**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 will also be trained to interpret and extract information from CAD drawings and prepare CAD drawings according to CP 83. 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.

**Introduction to 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 the aesthetics and...
displays for commercial and residential projects. They will be given the opportunity to apply computer aided design skills to demonstrate their creativity in studio sessions. Three-dimensional modelling and elements of Building Information Modelling (BIM) will also be introduced in this module to prepare students for advanced applications.

**Shopping Mall Management**
This module aims to expose students to the importance of meeting tourists, shoppers, tenants and landlords’ needs and requirements towards building a vibrant retail sector as an attraction for Singapore’s economy. Students will study the evolution of shopping centres, its product life cycle, branding and positioning, retail space planning, and tenant mix, success factors of a shopping mall, lease management, loss prevention and security management, and the future challenges for the retail scene in Singapore.

**LEVEL 2.2**  
**Facilities Maintenance & Building Automation**  
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, both by means of in-house staff and outsourced management agents. Topics include maintenance works for different facilities, indoor air quality, selecting and managing contractors, maintenance contract specifications and performance-based contract. It also covers the intelligent systems of modern leisure buildings such as building automation, structural cables and broadband networks. In addition to their functions and applications, it also focuses on how these advanced features improve the productivity of occupants and add value to the business.

**Integrated Resort Amenities Management**  
This module provides students with an understanding of the various installations and amenities that are found within Integrated Resorts (IRs) such as hotels, resorts, theme parks, casinos, theatres, spas and aquatic centres. Students will also learn about the importance of cost-effectiveness in the management of such amenities and the creation of a positive ambience to the users.

**Principles of Management**  
Management is an art of planning, organising, directing and controlling of the various resources, including people, within an organisation. Students will be introduced to the basic concepts and philosophy of management, and the various motivational theories such as the Maslow's hierarchy of needs and Herzberg's theory of needs. Organisational behaviour and culture will also be introduced as a focus towards human resource management within an organisation to achieve business objectives and the effective development of management and decision-making strategies.

**Psychology & Consumer Behaviour**  
Consumer psychology provides a useful background for consumer analysis. This is particularly important for both the hospitality and facility management industries which are service-oriented. It is necessary to develop an integrated view of consumer analysis to build up good marketing strategies. Students will be introduced to the three elements of consumer psychology and behaviour, namely cognition, behaviour and environment, as well as the analysis of marketing strategies affected by these elements. Students will gain a better understanding of consumers and thus devise better marketing strategies to meet organisational objectives.

**Security Management & Business Continuity**  
This module covers the features and operation of security systems in modern buildings and the process of disaster recovery. Topics covered include the features of modern security systems, security system operations, disaster planning and data recovery, evacuation planning, and risk management. The knowledge gained in this module will enable students to address the increasing need for security and disaster recovery in modern facilities.

**LEVEL 3.1**  
**Building Maintenance & Refurbishment**  
This module covers the causes of building defects and their corresponding rectification methods. Topics covered include defects relating to foundations, concrete structures, roofs, floor and wall finishes. In addition, students will learn how to investigate building problems and handle maintenance repair works related to the building fabric. It also covers the options available to the owner of a building that suffers from obsolescence. Possibilities of refurbishing the building will be explored.

**Fire Safety Management**  
This module covers the Fire Safety Managers’ scope of work and prepares students to be fire safety managers. Topics covered include a study of the requirements contained in the Fire Safety Act, fire command centre operations, evacuation procedures, fire safety planning and fire investigation. It also covers the active and passive fire protection systems in buildings such as fire extinguishers, wet and dry rising mains, fire sprinkler systems, fire alarm systems, smoke control systems and the protection of means of escape. Case studies will be used to illustrate the importance of fire protection systems.
Hotel Operations & Management
Hotel Operations & Management implies the organisation of a current business control over several key functions of a hotel like food production and hygiene, food and beverage service, housekeeping and front office operations. In this module, besides understanding the overall view of the key functions and departments in a hotel, students will learn the art and science of running a hotel, hotel organisation structure, conceptual framework of the hotel general manager’s job, engineering and security, financial control and information management and human resource – driving hospitality into the future.

Marketing & Public Relations
This is a two-part module. Students will be introduced to the primary task of marketing to provide real value to targeted customers, motivate purchase and fulfilling customer needs. Students will also learn the concepts of marketing – the process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy consumers and organisational objectives of creating and maintaining satisfied and profitable customers. This module introduces students to the different media management theories and their applications, public relations ethics, and the roles and responsibilities of a public relations practitioner with a specific focus on working within the leisure business industry. Case studies and real life scenarios will be discussed for comprehensive learning.

Project Planning & Management
This module introduces students to the functions and methods of project planning and management in the context of projects in the hotel and leisure programmes and events, as well as facilities maintenance and refurbishment works. It covers project planning and management process, budgeting and cash flow planning, logistic planning and human resource management.

LEVEL 3.2
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.

Three-month Internship
This module provides students with the opportunity to gain experience and apply their knowledge and skills in a working environment relevant to their course. Students will be able to enhance their abilities in problem solving, communication and interpersonal skills. 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 make an oral presentation of their experiences at the end of the internship.

Final-Year Project
This module allows students to undertake a project related to their course of study. They are required to carry out applied research, design or development tasks. The nature of the project may vary from industrial collaborative projects such as continuing work from their internship attachment or working on industrial projects or even multidisciplinary projects that involve students from different courses.
The Diploma in Product Design & Innovation (PDI) offers students an insight into the success factors of popular products from the iPhone to designer furniture in the market. The course is designed to unleash students’ potential as creative product designers who have the ability to design and develop innovative products which are attractive, practical and marketable.

Learning is facilitated through practice-oriented and project-driven modules with an emphasis on aesthetics, functions and marketing. In the final year, you will go on an internship, undertake a design-and-prototype project, and a futuristic-and-exploratory product design project.

PDI students will have the opportunity to work in modern design studios and workshops, and realise their design prototypes using state-of-the-art model making and rapid-prototyping equipment and facilities.

ENTRY REQUIREMENTS
To be eligible for consideration, candidates must have the following GCE ‘O’ Level examination (or equivalent) results.

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You must have also sat for a Science or Art / Higher Art or Design & Technology or Food & Nutrition or a relevant OSIE / Applied Subject and fulfill the aggregate computation requirements.

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

Candidates with severe vision deficiency should not apply for the course.

CAREER PROSPECTS
As industries in Singapore take on higher value-added activities, more design functions are being undertaken by both multinational and local companies. Singapore is fast becoming an ideal location for the regional headquarters and nerve centres of high-technology product design and manufacturing supply chains. Well-known companies have set up design, R&D and innovation centres here. Many local companies have also started, or are starting, design and development activities.

PDI graduates will enjoy good employment prospects in multinational corporations as well as small and medium enterprises that design and manufacture products or provide product design and development services. Graduates can work as a product designer, design consultant or engineering designer. In the future, you may even consider starting your own design consultancy or design-and-manufacture company.
PDI graduates enjoy good opportunities for further study. They can pursue degree programmes at local and overseas universities in Product Design & Innovation, Product Design, Industrial Design, Product Design Engineering, and Mechanical Engineering.

The PDI course is well recognised by both local and overseas universities, which grant advanced standing for relevant degree programmes. Some of the courses in which PDI graduates may enjoy advanced standing are:

- Nanyang Technological University: Bachelor of Fine Arts (in Product Design, Digital Animation, Digital Filmmaking, Interactive Media, Photography and Digital Imaging, or Visual Communication) or Bachelor of Engineering in Mechanical Engineering
- National University of Singapore: Bachelor of Arts in Industrial Design or Bachelor of Engineering in Mechanical Engineering
- Singapore University of Technology & Design: Bachelor of Engineering in Engineering Product Development
- University of Strathclyde (UK): Bachelor of Science in Product Design & Innovation or Bachelor of Engineering in Product Design Engineering
- University of the West of England (UK): Bachelor of Science in Creative Product Design or Bachelor of Science in Product Design Technology
- Monash University (Australia): Bachelor of Industrial Design
- University of New South Wales (Australia): Bachelor of Industrial Design

### ACCREDITATION FOR FURTHER STUDIES

**Module Name** | **Credit Units**
--- | ---

**YEAR 1**

**Level 1.1 (29 hours per week)**
- Applied Mathematics 1 4
- History & Principles of Design 4
- Manufacturing Processes 5
- Materials & Design Applications 1 4
- Visual Thinking & Design Sketching 6
- Innovation Toolkit^ 4
- Sports & Wellness^ 2

**Level 1.2 (27 hours per week)**
- Computer Aided Design 1 5
- Design Presentation & Methods 3
- Conceptual Design & Model Making 6
- Applied Mathematics 2 4
- Engineering Sciences for Design 1 5
- Communication & Contemporary Issues^ 4

**YEAR 2**

**Level 2.1 (24 hours per week)**
- Computer Aided Design 2 6
- Materials & Design Applications 2 3
- Product Design Studio 1 6
- Product Aesthetics & Ergonomics 1 7
- Interdisciplinary Studies (IS) module^ 2

**Level 2.2 (25 hours per week)**
- Component Design & Development 5
- Engineering Sciences for Design 2 5
- Product Aesthetics & Ergonomics 2 4
- Product Design Studio 2 6
- Business & Project Management 3
- Interdisciplinary Studies (IS) module^ 2

**YEAR 3**

**Level 3.1 (20 hours per week)**
- Design for Manufacturability 4
- Entrepreneurship & Business Plan 3
- Product Design Studio 3 9
- World Issues: A Singapore Perspective^ 2
- Interdisciplinary Studies (IS) module^ 2

**Level 3.2 (22 hours per week)**
- Three-month Internship 12
- Capstone Project 10

Notes:

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

**IS Modules**
The School of Interdisciplinary Studies (IS) delivers a broad-based curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge economy. IS offers both prescribed modules and electives to challenge boundaries. Prescribed modules develop students’ competencies in core areas such as Communication, Innovation and Enterprise, Culture and Communication, and Personal Mastery and Development, while elective modules provide insights into Arts and Humanities, Business, Design, and Science and Technology.

### COURSE MODULES

**LEVEL 1.1**

**Applied 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.
History & Principles of Design
The module provides students with a historical perspective of design against the backdrop of developments in culture, art and technology. Students will learn about design movements and iconic design works. The module also covers elements and principles of design such as points, lines, planes, textures and space and the concepts of balance, proportion, symmetry and contrast. The basic product form and aesthetics are then learnt through assignments and discussions.

Manufacturing Processes
The module provides students with an understanding of common manufacturing processes. Through hands-on practice and integrated projects, students acquire knowledge of turning, milling, grinding, assembly, dimensional tolerances, joining processes, surface texture, etc. Students will take on projects involving producing parts according to the design drawings and specifications given, as well as designing and producing simple products with suitable manufacturing processes. Shop floor safety is emphasised.

Materials & Design Applications 1
The module covers the characteristics and properties of commonly used materials for products, including metals, plastics, rubber, ceramic, wood and composites. The module also includes the applications and criteria for selection and design considerations for common materials. Students acquire the knowledge and skills through lectures, discussions, case studies and projects.

Visual Thinking & Design Sketching
The module equips students with important skills in visual thinking, design visualisation, freehand design sketching and rendering for product design. The emphasis on hands-on practice enhances students’ creative thinking abilities from basic lines and two-dimensional (2D) sketches, to idea thumbnails and three-dimensional (3D) perspective sketches. The module also provides students with an understanding of the generic product design process as well as of the related tasks and attributes involved. The module also sets the context of the course by providing an overview of the curriculum.

LEVEL 1.2
Computer Aided Design 1
The module equips students with the knowledge and skills in using a computer-aided design (CAD) tool to produce 3D solid and surface models as well as 2D detail and assembly drawings. Students will also learn the fundamentals, conventions and practices of engineering drawing based on the International Standards Organisation (ISO) and Singapore Standards (SS) guidelines. Topics include 3D CAD modelling, 2D CAD drawings, orthographic projection, sectioning, dimensioning, conventional representations, assembly drawing, bill of materials and blueprint reading.

Design Presentation & Methods
This module focuses on the presentation of design concepts and relevant details in digital media. It includes an introduction to graphic and communication design. The students then learn, in a practice-oriented manner, the commonly-used software packages for graphic and communication design. These include image editing as well as text and graphic creation functions for poster printing and product design presentation via digital means. Students will also deepen their understanding of the design presentation methods, principles and techniques through project work.

Conceptual Design & Model Making
In this module, students will apply their creativity to the first two phases of the design cycle – writing design briefs and design specifications as well as generating design concepts. They will learn to identify target user groups, define user needs, identify product markets, conduct basic market studies, generate creative design concepts, and evaluate and refine design concepts. They will then hone their design sketching skills and generate ideas in accordance to the design specification. The module also includes workshops on making 3D models using materials such as foam, acrylic, foam core and paper board. Students will also pick up techniques in model finishing.

Applied 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.

Engineering Sciences for Design 1
This module pertains to the study of fundamentals of mechanics and applications in product design. The syllabus covers external forces in two dimensions and their effects on particles and rigid bodies at rest. Students will learn to analyse forces acting on rigid bodies by drawing free-body diagrams and applying the conditions of static equilibrium. The module also covers linear and rotational motion of particles and rigid bodies. Topics include forces and resultants, moments and couples, equilibrium, plane friction, kinematics, and kinetics of linear and rotational motions. Applications of mechanics in product design are learnt through case studies and assignments.

LEVEL 2.1
Computer Aided Design 2
In this follow-on module of Computer Aided Design 1, students are required to apply their knowledge and skills of computer-aided design for the design of relatively more complex parts and assemblies. Through
these assignments, students acquire more advanced techniques in three-dimensional (3D) modelling and production drawings. Topics include advanced 3D modelling, assembly analysis, limits and fits, application of linear and geometric tolerances in CAD and drawings.

Materials & Design Applications 2
This module is a follow-on module of Materials & Design Applications 1, focusing on the selection of plastic materials and design of plastic parts for given design requirements. It also covers knowledge of the characteristics and design considerations for parts made of other materials, including metals, wood and fabric, and other new materials for biomedical science and nanotechnology, with emphasis on their properties and applications. The module includes the topic on the principles and applications of Geometric Tolerance and Dimensioning. Students learn through projects, assignments, lectures and discussions.

Product Design Studio 1
This studio project module requires students to integrate and apply the knowledge and skills they have learnt from the various modules so far, in a design project based on a given design brief. Students are required to carry out design research, prepare design specifications, generate ideas and concepts, make mock-up models, and communicate their final design with a portfolio and presentation. There will be short lectures, case studies and assignments on topics including design research, mood board preparation, intellectual property search, and studies on contemporary styles.

Product Aesthetics & Ergonomics 1
This focuses on the study of the relationships between form and function. Topics include principles and applications of aesthetics in product design, product semantics, colour theory and their applications. Students also learn the use of computer-aided industrial design software tools and design rendering for presentations using markers. The module requires students to carry out product form and basic ergonomics studies using model making assignments.

LEVEL 2.2
Component Design & Development
This module covers the engineering principles underlying the analysis, design and selection of standard components as well as non-standard parts of products. Students learn the characteristics, applications, design analysis and selection procedure of common standard components including motor, bearings, belt and pulley systems, gears, and shafts. Projects are used to reinforce learning along with assignments and case studies on existing products. Students also learn to prepare a parts list and bill of materials, an important process in product design and development.

Engineering Sciences for Design 2
This is a follow-on module of Engineering Sciences for Design 1 (ESD1). While ESD1 focuses on the fundamentals and design applications of Mechanics, ESD2 covers the essentials of Electrical Technology, Electronics, Thermofluids, Mechanics and Strength of Materials. These topics are discussed and analysed within the context of the basic principles and applications of product design and development. Practice-oriented learning methods are emphasised. In addition to lectures, tutorials and laboratory practical sessions, design application assignments encourage students to apply the topics learnt to product design and development.

Product Aesthetics & Ergonomics 2
This module covers the principles of ergonomics (or human factors) and user-centred design, their applications in product design, the influence of these design factors in users’ preference for a particular product or system, as well as codes and standards governing product safety. It also covers anthropometrics, user-centred design principles and approaches, and environmental factors in the application of products. The emphasis is on research and a good understanding of the target users’ needs, requirements, limitations, and application in product design. The module project requires students to carry out tasks in product design, emphasising on human factors and user-centred design.

Product Design Studio 2
This is the second studio project module that requires students to integrate and apply the knowledge and skills they have learnt from the various modules so far, in a design project based on a given design brief. Students are required to carry out design research, prepare design specifications, generate ideas and concepts, make mock-up models, perform detailed design with 3D CAD models and detailed drawings, and communicate the final design via design portfolio and presentation. There will be short lectures, case studies and assignments and topics including product market segmentation and positioning, cultural and social impacts related to design, and sustainable design.

Business & Project Management
This module provides an overview of business organisation, functions and general management, leading to a detailed treatment of the organisational and operational aspects of project management in the context of product design and development. Topics include introduction to business organisation and management, organisation of projects, roles of the project manager, project planning, scheduling and controlling using network analysis such as Critical Path Method (CPM), Gantt Charts, and Programme Evaluation and Review Technique (PERT). The importance of concurrent or simultaneous product design and development in order to achieve short time-to-market is also emphasised.
LEVEL 3.1
Design for Manufacturability
The module covers the principles of Concurrent Engineering, with a focus on Design for Manufacturability (DFM) and Design for Assembly (DFA). It includes the concepts and applications of the DFM and DFA methods, and also includes topics on Value Analysis, Group Technology and Quality Function Deployment, in the context of product design and development. Students gain an appreciation of the importance of these methods in reducing manufacturing costs, enhancing product quality, reducing product development cycle time and enhancing innovation. Case studies, assignments and projects are used to enhance learning of the module.

Entrepreneurship & Business Plan
This module provides students with an understanding of the nature and attributes of entrepreneurship and business plan. Through case studies, lectures, tutorials and discussions, the students learn the general process and factors of how to start a business and develop it into a successful enterprise. The contents of a good business plan for starting a new business or for the expansion of an existing enterprise are learnt through case studies and assignments. Students will be required to write a feasibility plan for a product design and development project that they undertake in another module.

Product Design Studio 3
In this studio project module, students undertake a major individual project in designing a revolutionary product that considers future trends, avant-garde design features and application of further factors in product design. Students are required to complete the product design process from the conceptualisation of the product idea to the product design, with a 3D CAD model and drawings and documentation for production purposes. There will be guest lectures by practising designers, case studies, discussions and exercises on contemporary design topics, product innovation topics and emerging design trends.

LEVEL 3.2
Three-month Internship
The internship exposes students to the work environment as well as practices related to product design. It offers them the opportunity to apply the knowledge and skills acquired in the classroom to the real-world in areas of problem solving, communication and interpersonal skills. The internship allows students to work independently and in teams, while they take on one or more practical projects under the supervision of industry practitioners. The objective is to develop a professional approach to work, based on the relevant code of practice.

Capstone Project
This is a major project module in the PDI curriculum. It provides students with the opportunity to apply the knowledge and skills learnt to complete a major project. In this 12-week full-time project module, students undertake a major individual project, completing the life-cycle product design and development process that involves various phases from the conceptualisation of a product idea to product design, prototype making and testing, and finally preparation of drawings and documentation for production purposes.
Diploma in REAL ESTATE BUSINESS (REB)

Navigate with ease around the complexities of the real estate business. Learn the difference between good class bungalows and cluster housing, Concept Plan and Master Plan, gross floor area and strata area. Know the checklists if you wish to change your property from office to condominium. Or perhaps, be part of the dynamic urban planning team that will transform Tanjong Pagar into the next Marina Bay and Jurong Lake District into a lakeside business and leisure destination.

REB graduates will be competent in advising property owners, investors and tenants to achieve the highest financial returns. They will also be able to lend their expertise in strategic marketing and management as well as the valuation of residential, retail, office, hotel and industrial properties. Overseas training opportunities are available in the major cities of Shanghai and Hong Kong, as well as with renowned international and local firms.

Singapore’s billion-dollar property market is a sizzling hot topic. But behind all the excitement, have you ever wondered how properties are developed, how much to bid for a two-hectare land in Marina Bay, and whether the developer should build a condo, mall, office or hotel? Once the building is up, how would owners and investors manage it to maximise its value and lifespan? Hundreds of thousands of dollars could be saved through proper maintenance, building upgrading services and lowering property tax.

The Diploma in Real Estate Business (REB) is a specialised course that prepares you to be real estate professionals who will gain expertise and skills in real estate development and investment, property management, valuation and urban planning.

ENTRY REQUIREMENTS
To be eligible for consideration, candidates must have the following GCE ‘O’ Level examination (or equivalent) results.

<table>
<thead>
<tr>
<th>Subjects</th>
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</tr>
</thead>
<tbody>
<tr>
<td>English Language*</td>
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<tr>
<td>Mathematics (Elementary/Additional)</td>
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<tr>
<td>Science (with Physics, Chemistry or Biology component)</td>
<td>1-6</td>
</tr>
<tr>
<td>Computer Studies or Design &amp; Technology or Fundamentals of Electronics</td>
<td></td>
</tr>
</tbody>
</table>

Candidates must also fulfil the aggregate computation requirements.

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

CAREER PROSPECTS
With this diploma, graduates will be able to find jobs in all sectors of the real estate market and building industry. They can also find jobs in organisations searching for premises to operate their business.

REB graduates can work as an executive overseeing property investment, real estate marketing, planning and development of land, real estate financing and housing loans, property valuation, property management and many more. Alternatively, they could become project supervisors, contract administrators or quantity surveyors.
Potential employers include government departments, regulatory authorities and statutory boards, banks, property development and investment companies, real estate consultancies, town councils, construction firms and chartered surveying practices.

ACCREDITATION FOR FURTHER STUDIES
Local and overseas universities accept REB graduates into related bachelor’s degree programmes with appropriate exemptions and advanced standing:
- National University of Singapore: modules exemption equivalent to one year for the Real Estate and Project & Facilities Management course
- University of Reading (UK): Up to one year’s exemption for real estate courses
- Heriot-Watt University (UK): Up to two year’s exemption for real estate courses
- University of Queensland (Australia): Up to one year’s exemption for business degrees with specialisation in International Business, Real Estate & Development, Marketing and Business Economics

REB is recognised by the Council for Estate Agencies for the licensing and registration of real estate salespersons and key executive officers. It is also accepted by the Housing & Development Board (HDB) as a qualification for conducting inspections for valuation of resale HDB residential properties. It is also recognised by the Inland Revenue Authority of Singapore and the Singapore Institute of Surveyors and Valuers.

**COURSE CURRICULUM**

<table>
<thead>
<tr>
<th>Module Name</th>
<th>Credit Units</th>
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<tbody>
<tr>
<td><strong>YEAR 1</strong></td>
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<tr>
<td><strong>Level 1.1 (27 hours per week)</strong></td>
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<tr>
<td>Economics</td>
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<tr>
<td>Introduction to Real Estate Business</td>
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<tr>
<td>Mechanical Facilities</td>
<td>5</td>
</tr>
<tr>
<td>Principles of Accounting</td>
<td>4</td>
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<tr>
<td>Real Estate Market Research</td>
<td>4</td>
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<tr>
<td>Innovation Toolkit</td>
<td>4</td>
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<tr>
<td>Sports &amp; Wellness</td>
<td>2</td>
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<tr>
<td><strong>Level 1.2 (24 hours per week)</strong></td>
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<tr>
<td>Applied Statistics for Real Estate</td>
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<tr>
<td>Building Technology</td>
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<tr>
<td>Electrical Facilities</td>
<td>5</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>3</td>
</tr>
<tr>
<td>Principles of Law</td>
<td>5</td>
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<tr>
<td>Communication &amp; Contemporary Issues</td>
<td>4</td>
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<tr>
<td><strong>YEAR 2</strong></td>
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<tr>
<td><strong>Level 2.1 (23 hours per week)</strong></td>
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<tr>
<td>Computer-Aided Design</td>
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<tr>
<td>Introduction to Interior Design</td>
<td>3</td>
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<tr>
<td>Property Management</td>
<td>5</td>
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<tr>
<td>Real Estate Finance</td>
<td>5</td>
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<tr>
<td>Real Estate Marketing</td>
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<td>Interdisciplinary Studies (IS) module</td>
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<tr>
<td><strong>Level 2.2 (24 hours per week)</strong></td>
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<tr>
<td>Advanced Building Technology</td>
<td>4</td>
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<tr>
<td>Project Management</td>
<td>4</td>
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<tr>
<td>Property Valuation</td>
<td>5</td>
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<tr>
<td>Real Estate Law</td>
<td>5</td>
</tr>
<tr>
<td>Urban Planning &amp; Economics</td>
<td>4</td>
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<tr>
<td>Interdisciplinary Studies (IS) module</td>
<td>2</td>
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</tbody>
</table>

**Module Name** | **Credit Units**
------------------|-------------------
**YEAR 3** |              |
**Level 3.1 (24 hours per week)** |              |
Building Maintenance & Diagnostics | 4 |
Building Quantities & Costing | 4 |
Building Refurbishment | 3 |
Client Relationship Management | 4 |
Real Estate Investment | 5 |
World Issues: A Singapore Perspective | 2 |
Interdisciplinary Studies (IS) module | 2 |
**Level 3.2 (22 hours per week)** |              |
Six-month Internship | 22 |
**OR** |              |
Three-month Internship and | 12 |
Final-Year Project | 10 |

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

**IS Modules**
The School of Interdisciplinary Studies (IS) delivers a broad-based curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge economy. IS offers both prescribed modules and electives to challenge boundaries. Prescribed modules develop students’ competencies in core areas such as Communication, Innovation and Enterprise, Culture and Communication, and Personal Mastery and Development, while elective modules provide insights into Arts and Humanities, Business, Design, and Science and Technology.
COURSE MODULES

LEVEL 1.1

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 macroeconomic policy.

Introduction to Real Estate Business
This module provides an introduction to the business of real estate by studying the characteristics of land including both the uses and users of land at the national, institutional, corporate organisation and individual level. Students will be given an overview of the property development process through a study of the various stages involved. The roles and functions of the regulatory authorities, professional institutions, business associations, professionals and practitioners in real estate business will also be examined.

Mechanical Facilities
In this module, students will gain an overview of mechanical systems in modern high-rise buildings and learn how the proper utilisation of these systems can create a better living environment. Topics covered include water supply, sanitary systems, drainage systems, gas supply and air-conditioning systems. Students will also learn how to operate and maintain these systems in buildings.

Principles of Accounting
This module provides students with the knowledge to understand basic accounting theories, concepts and conventions. It will help to equip them with the skills to prepare simple financial statements of trading organisations. Most importantly, students would be trained to appreciate the importance of understanding and analysing financial statements. Such domain knowledge plays a critical role in maintaining integrity, professionalism and ethics at work in the future.

Real Estate Market Research
This module provides students with an understanding and working knowledge of research methodology for real estate market studies. Students will learn the purpose and value of research, methods of gathering and analysing data, and the presentation of results.

LEVEL 1.2

Applied Statistics for Real Estate
In this module, students will learn how to use primary and secondary data to make recommendations and draw meaningful conclusions in decision making. To achieve these objectives, students will be taught how to organise, analyse and interpret data using techniques such as sampling and estimation, hypothesis testing and correlation and regression analysis.

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

Electrical Facilities
This module covers the different electrical facilities found in high-rise buildings. Topics covered include the electrical supply system, interpretation of electrical drawings, electrical safety, emergency power and lifts & escalators. Emphasis will be placed on real-life applications in the operation and maintenance of these facilities in buildings.

Environmental Health
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 will also be given an overview of indoor air pollution sources, types of pollutants and the corresponding health impacts. Current methods of treating and controlling poor indoor air quality and local guidelines on indoor air quality will also be introduced.

Principles of Law
This module provides an introduction to the legal system of Singapore, the law of contract and commercial law, and the law of torts. Real-life examples, particularly those relating to buildings and real estate, are used to illustrate the application of legal principles. In addition, students will study the legal approach of critical analysis, logical reasoning and issue resolution.

LEVEL 2.1

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 will also be trained to interpret and extract information from CAD drawings and prepare CAD drawings according to CP 83. 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.

Introduction to 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 the aesthetics and displays for commercial and residential projects. They will be given the opportunity to apply computer-aided design skills to demonstrate their creativity in studio sessions. Three-dimensional modelling and elements of Building Information Modelling (BIM) will also be introduced in this module to prepare students for advanced applications.

Property Management
In this module, students will study the management practices for buildings of different uses. Students will acquire sufficient supervisory management knowledge and problem-solving skills to manage private and public housing, as well as retail outlets, offices and industrial spaces. A considerable portion of the module is devoted to legislations governing the maintenance and management of strata developments.

Real Estate Finance
This 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, collect and collate property data and with the aid of computer software, generate spreadsheets for decision-making and scenario analysis.

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 will 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.

LEVEL 2.2
Advanced Building Technology
This module is an extension of the module of Building Technology. It 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.

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.

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 the valuation of both public and private properties. Students will be given a good working knowledge of 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.

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

LEVEL 3.1
Building Maintenance & Diagnostics
This module covers the causes of building defects and their corresponding rectification methods. Topics covered include defects related to foundations, concrete structures, roofs, floor and wall finishes. In addition, students will learn how to investigate building problems and handle maintenance repair works related to the building fabric. Real-life case studies and laboratory work involving non-destructive testing of concrete are also included.

Building Quantities & Costing
This module draws on the students’ knowledge of Building Technology and Advanced Building Technology taught in Level 1 and 2 respectively. In this module, students will study the various models for building cost estimation and techniques on measurement of quantities.
from given drawings. They will learn how to prepare cost estimates for new constructions or improvement works during the service life of a building. Students will also be given hands-on practice on computer software for automated taking-off and billing.

Building Refurbishment
This module covers the options that are available to owners of existing buildings faced with the problem of obsolescence or redundancy. The option of refurbishment with reference to redevelopment from the process of feasibility study, decision making, procurement, project planning and management to project completion and delivery are covered in this module. The management of problems specific to refurbishment works and their concomitant risks will also be taught.

Client Relationship Management
This module introduces the principles and concepts of customer relationship management (CRM) skills. Students will learn the appropriate tools to respond effectively to customers and stakeholders within the real estate and facilities management industry. Topics covered include the definition of customer/client service, understanding client needs, solutions to real estate challenges and implementation of client relationship management. Case studies and mini projects equip students with the ability to view CRM as an asset to the organisation and leverage on this to add value to the organisation.

Real Estate Investment
Students will be given 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 covered include market studies, financial analysis, risk-return relationship, sensitivity analysis and decision-making criteria.

LEVEL 3.2
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.

Three-month Internship
This module provides students with the opportunity to gain experience and apply their knowledge and skills in a working environment relevant to their course. Students will be able to enhance their abilities in problem solving, communication and interpersonal skills. 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 make an oral presentation of their experiences at the end of the internship.

Final-Year Project
This module allows students to undertake a project related to their course of study. They are required to carry out applied research, design or development tasks. The nature of the project may vary from industrial collaborative projects such as continuing work from their internship attachment or working on industrial projects or even multidisciplinary projects that involve students from different courses.
Diploma in SUSTAINABLE URBAN DESIGN & ENGINEERING (SDE)

The Diploma in Sustainable Urban Design & Engineering (SDE) equips students with the skills and expertise to transform the built environment in ways that provide for the ecological, economic, and social needs of the present without compromising those of the future.

Students will learn to look at the urban landscape in a different light – from how a well-planned town can build its new buildings and conserve its old through sustainable technologies, to how modern cities can integrate both work and leisure while protecting and preserving the environment.

SDE students will also gain knowledge in urban planning, conservation and refurbishment as well as receive training in the design and construction of environmentally sustainable buildings and infrastructure.

Students who are not sure if they have a flair for design or an engineering mind have two semesters to build their foundation and discover their aptitude and passion before making a choice between the Architecture and Sustainable Technologies specialisations.

ENTRY REQUIREMENTS
To be eligible for consideration, candidates must have the following GCE ‘O’ Level examination (or equivalent) results.

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<thead>
<tr>
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<td>1-6</td>
</tr>
</tbody>
</table>

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

CAREER PROSPECTS
In 2009, the Inter-Ministerial Committee for Sustainable Development (IMCSD) unveiled a blueprint for Singapore’s sustainable development. The blueprint outlined the key goals and initiatives for the future through promotion of eco-friendly public housing, biodiversity, clean transport, sky-rise greenery, clean technology, sustainable high-density districts, and district sustainability programmes.

From shopping at City Square Mall, Singapore’s first eco-friendly mall, to living in HDB’s Eco-Town@Punggol or URA’s Jurong Lakeside District or hanging out at Marina Barrage, you are constantly coming into contact with one of the growing trends of today’s world: sustainable urban design and development.

Sustainable urban design is concerned with ways to plan, design and construct buildings and develop the built environment that will be needed for a more sustainable society. The focus is on both new developments and modifications that can be made to existing developments.

In 2009, the Inter-Ministerial Committee for Sustainable Development (IMCSD) unveiled a blueprint for Singapore’s sustainable development. The blueprint outlined the key goals and initiatives for the future through promotion of eco-friendly public housing, biodiversity, clean transport, sky-rise greenery, clean technology, sustainable high-density districts, and district sustainability programmes.
These initiatives have brought about a growing demand for technologists in the area of sustainable urban development and engineering. SDE graduates will be able to work in fields such as architectural planning and design, civil and structural design, environmental research and management, township planning, and building conservation and refurbishment.

ACCREDITATION FOR FURTHER STUDIES

SDE graduates can pursue a degree in related fields such as architecture, civil engineering, construction management, project management or facilities management. They may even be granted advanced standing at both local and overseas universities, such as:

- Nanyang Technological University: Bachelor of Engineering (Civil) or Bachelor of Arts (Architecture)
- RMIT University (Australia): Bachelor of Architectural Design
- University of Strathclyde (UK): Bachelor of Science (Architectural Studies) or Bachelor of Engineering (Civil)
- Heriot-Watt University (UK): Bachelor of Engineering (Architecture Engineering)
- Bond University (Australia): Bachelor of Architectural Studies
- Newcastle University (UK): Bachelor of Arts (Architecture)

COURSE CURRICULUM

<table>
<thead>
<tr>
<th>Module Name</th>
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<tbody>
<tr>
<td><strong>YEAR 1</strong></td>
<td></td>
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<tr>
<td><strong>Level 1.1 (25 hours per week)</strong></td>
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<tr>
<td>Building Behaviour Studies 1</td>
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<td>Computer Aided Design</td>
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<td>Engineering Mathematics 1</td>
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<td>Introduction to Building Systems</td>
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<td>Design Communications</td>
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<tr>
<td>Structure &amp; Fabric</td>
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<tr>
<td>Sustainable City Planning</td>
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<tr>
<td>Communication &amp; Contemporary Issues^</td>
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Architecture Specialisation

<table>
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<tr>
<th>Module Name</th>
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<td>World Issues: A Singapore Perspective^</td>
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Sustainable Technologies Specialisation

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<td>Water Resources Technology</td>
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Course Modules

Level 1.1

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.

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 will also be trained to interpret and extract information from CAD drawings and prepare CAD drawings according to CP 83. 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 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 Building Systems

This module provides the fundamental knowledge of mechanical and electrical systems associated with buildings. Topics covered include water supply, sanitary, drainage, gas supply, air-conditioning system, electrical supply system, lifts, escalators and communication systems.

Sustainable Building Design

This module covers sustainability issues relating to the development of our built environment which invariably includes buildings and infrastructure. Understanding the present challenges of the industry provides the backdrop for the issues to be addressed. Actions for sustainable designs, construction and care for our buildings are then discussed. Features of an eco-city development and case studies of exemplary buildings are also included.

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.

Design Communications

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. Lectures present the use of various freehand sketching and drawing techniques. Students will also develop competence in physical model-making as a vital means of exploring and resolving design in 3D.
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.

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.

Sustainable City Planning
The module introduces to the students the theories and principles of master planning, urban design, planning codes and guidelines that are essential for a socially, ecologically and economically sustainable city/town. It further relates them to the framework for planning and development in Singapore, highlighting local examples of sustainable planning framework such as HDB’s Eco-Town@Punggol, JTC’s Cleantech and URA’s Jurong Lakeside District. Topics include zoning, plot ratio, height control, gross floor area and other planning/building codes of practice.

ARCHITECTURE SPECIALISATION

LEVEL 2.1
Design Studio 1
This module builds upon the competency level of skills developed in the first year module of Design Communications, in terms of conceptual thinking, technique and critical thinking. While the first year module kick-starts the learning with the creation of abstract forms and spaces, this module advances the learning with the inclusion of the user and the related space-planning design challenges. Students will attempt their first studio project, where they continue to develop their drawing and rendering skills for project submission.

Integrated Building Systems
This module focuses on the realisation of an architect’s concepts through the design of mechanical and electrical (M&E) systems. It is a follow-up to the first year module of Introduction to Building. Special references will be made to integrated drawings, specifications and codes of practices relating to sustainable design and development. Students will learn about how model designs are translated into real world developments through case studies.

Architectural Materials & Technology 1
This module expands on the students’ understanding of basic construction and building technologies, and introduces further technologies and related materials in post-tensioning and shell structures. It also covers materials and technologies for sustainable construction such as green roofs and walls.

Computer Aided Modelling for Architecture
Building upon the earlier Computer Aided Design module which focuses on 2D drawings, the students are introduced to advanced skills in visualisation and presentation for architecture. Using industry standard software for 3D modelling and graphic layout, students will learn to harness the techniques of 3D modelling in one’s creative design process, and seamlessly integrate these outputs into compelling presentations.

History & Theory of Western Architecture
This module provides an introduction to a general overview of the developments in Western architecture, both historically & 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
Design Studio 2
This second studio project module focuses on connecting the user's needs to a design solution. The further exploration of the user heightens the students’ sensitivity to the different aspects of the user shape, the design process and decision. Through the studio project, the students will be introduced to interior design and space planning.
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.

Architectural Materials & Technology 2
This module introduces students to topics such as waterproofing, painting and cladding systems. Students will be exposed to more advanced building materials such as glass, fabric, glass- and fiber-reinforced-plastic materials. They will learn how such materials can add variety to architectural design as well as to detail them in a meaningful manner.

Computer Aided Rendering & Presentation
As a follow-on module from Computer Aided Modelling for Architecture, in which the students learn the skills in creating 3D models, this module introduces students to architectural rendering and presentation using 3D models that they have learnt to create. Students will learn new and suitable software that also allow them to produce layout presentations in an effective and creative way.

LEVEL 3.1
Design Studio 3
This module further enhances the level of the skills developed in the second year studio modules. This module advances learning with the inclusion of site in the design challenge. Exploration of the site enhances the students’ understanding of the different aspects of the site as important considerations in architecture, from the physical to cultural perspectives. Through the studio project, the students will be introduced to landscape architecture.

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, critiques, significant architectural works, architects and their influences are studied. The 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.

LEVEL 3.2
Three-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 local 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.

Design Studio 4
In this final-year project, students will develop design proposals in response to a defined mid-scale site or development. Through the study of architectural precedents and site analysis, students’ design proposals should demonstrate a keen understanding of context and environment. The meaning of a space in relation to its function and human activities is also demonstrated against the background of society and culture. Students should demonstrate further development in the use of different media in architectural communication, as well as proper drawing documentation.

Fundamentals of Landscape Architecture
This module aims to provide students an overview of the field of landscape architecture. Students will learn landscape architecture history, theory, design processes. Students will also learn about the types of plants commonly used in local landscaping together with their care and maintenance. The role of Singapore’s landscape industry to urban development will also be introduced to students.
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 also introduces 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.

SUSTAINABLE TECHNOLOGIES SPECIALISATION

LEVEL 2.1
Geomatics
This is the science and technology of gathering, analysing, distributing and using geographic data. Students will learn to use instruments (Level and Total Station) to gather data with basic surveying techniques. They will learn to interpret, distribute and use these collected data for urban development projects. Students will also learn knowledge on new technology related to surveying including global positioning system for project development.

Integrated Building Systems
This module focuses on the realisation of an architect’s concepts through the design of mechanical and electrical (M&E) systems. It is a follow-up to the first year module of Introduction to Building. Special references will be made to integrated drawings, specifications and codes of practices relating to sustainable design and development. Students will learn about how model designs are translated into real world developments through case studies.

Infrastructure 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 prestressed construction, and structural steelwork. Excavation works, excavation supports, ground water control, road works and pipeline construction are also included.

Computer Aided Modelling
Building upon the earlier 2D Computer Aided Design module, students are introduced to advanced skills in visualisation and presentation. Using industry standard software for 3D modelling and graphic layout, students will learn to harness the techniques of 3D modelling in one’s creative design process and seamlessly integrate these outputs into compelling presentations.

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.

LEVEL 2.2
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.

Measurement & Costing
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 fluid, the fundamentals of fluid flow, open channel flow, energy losses, and concepts that are essential for the study of water related technologies. Students will also learn the principles and design of water collection system, water treatment processes, water transmission and distribution systems.

LEVEL 3.1
Soil Science
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 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 system for collection of used water. There is focus on planning and design approach to integrate the urban water cycle, including wastewater management into urban design.

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.

LEVEL 3.2
Three-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 local 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.

Green Building Technologies
Students will learn about government and industry initiatives to introduce green building technologies such as using recycled aggregates for structural and non-structural uses, precast and modular construction. Students will learn, in detail, the different types of precast elements and how they are fabricated in the factory and assembled on site. They will also learn about the Green Mark Listing Scheme as well as the operating and sustainability issues of green technologies when applied in buildings.

Sustainable Technologies 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 Sustainable Technologies. The project may be on a topic related to building, civil engineering, and sustainable design & development.

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.