

DIPLOMA IN

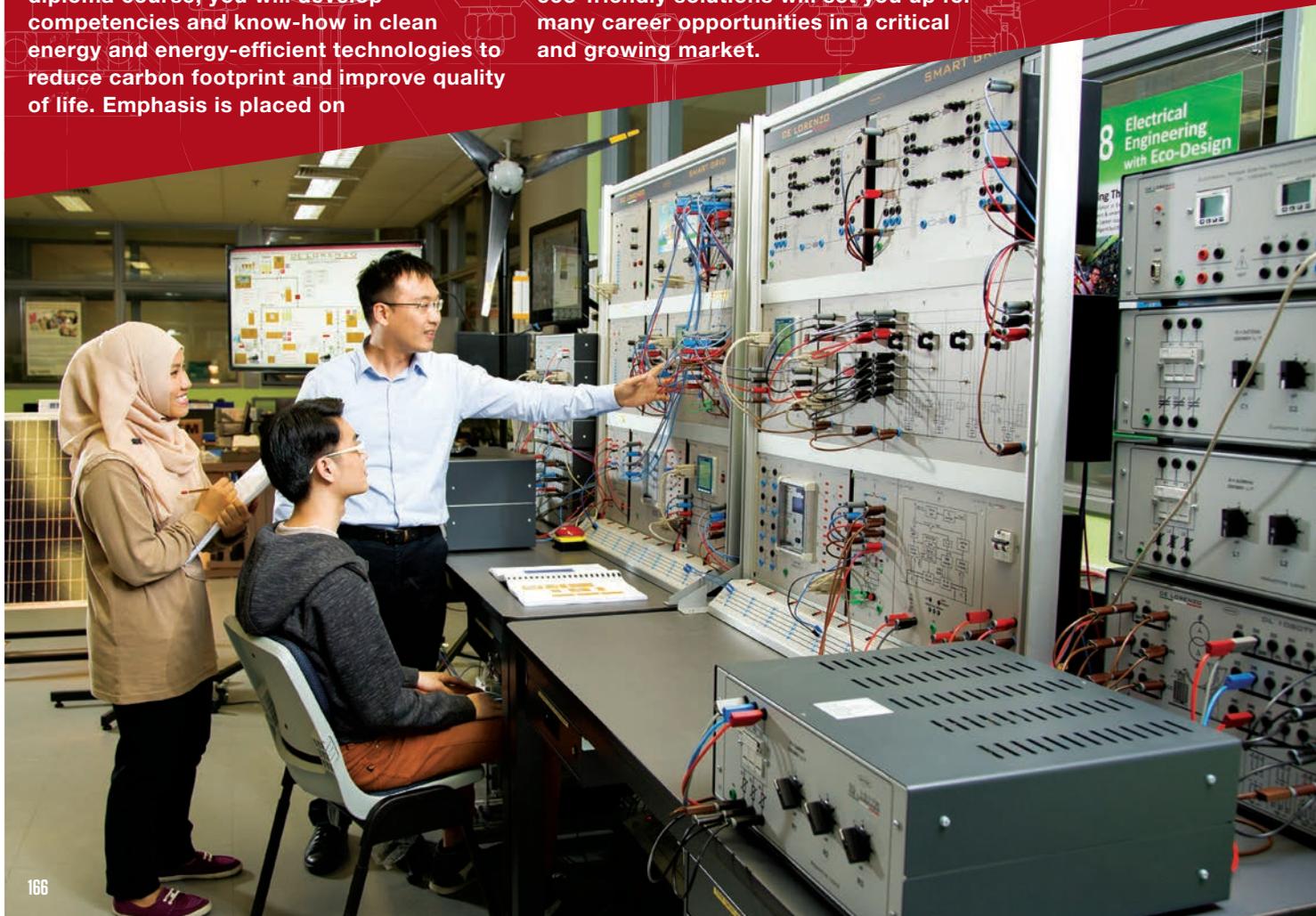
# ELECTRICAL ENGINEERING WITH ECO-DESIGN

Ever wonder how electricity is generated and distributed in the modern power grid? Are you excited about clean energy or interested to learn about managing electrical systems in smart, energy-efficient buildings?

Through this eco-design integrated diploma course, you will develop competencies and know-how in clean energy and energy-efficient technologies to reduce carbon footprint and improve quality of life. Emphasis is placed on

building a solid foundation in electrical engineering, clean energies, power systems, sustainable technologies and energy management, to prepare you for specialisation in power systems engineering or green and smart technologies.

Your skills in enabling sustainable eco-friendly solutions will set you up for many career opportunities in a critical and growing market.



## WHY THIS DIPLOMA?

- Robust demand for trained professionals in electrical engineering.
- Numerous scholarships or sponsorship opportunities during the course of study.
- Learn about power generation, transmission and distribution, smart grids, as well as energy-efficient solutions.
- Strong industry and academic links with organisations such as Singapore Power and Newcastle University in the UK.

## IT WILL ENABLE YOU TO...

- Be an electrical engineering technologist with eco-design know-how.
- Become competent in clean energy, energy management, power systems engineering, smart grids, electrical systems, and green and sustainable technologies.
- Exploit and harness new smart technologies for energy efficiency and reducing carbon footprint.
- Develop innovative green and sustainable systems and solutions in industry projects.
- Gain exposure and experience through overseas internship programmes, project centre attachments and immersion programmes.

## DURATION

Three academic years on a full-time basis.

## FURTHER EDUCATION

You can pursue further studies with up to two years' exemption for related undergraduate programmes at reputable universities in Singapore and overseas such as Australia, the UK or the US.

## CAREER PROSPECTS

You can look forward to exciting and rewarding careers in the power sector and in the fast-growing energy market for sustainable, eco-friendly engineering and business solutions. Opportunities abound in a wide spectrum of industries such as:

- Electrical engineering & services
- Power engineering
- Energy management
- Facility management
- Operations management
- Sustainable solutions
- Clean energy
- Research & development
- Technopreneurship & entrepreneurship

## ENTRY REQUIREMENTS<sup>^</sup>

You must have obtained the following minimum GCE 'O' Level results:

- **English Language (EL1)**  
Grade 1–7
- **Elementary/Additional Mathematics** Grade 1–6
- **A relevant Science subject**  
Grade 1–6

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<sup>^</sup> Please refer to the section on entry requirements for diploma courses for more details.

## COURSE STRUCTURE

### YEAR 1 – SEMESTERS 1 & 2

#### Core Modules

- EG1951** Engineering Mathematics 1A
- EG1952** Electrical Technology
- EG1953** Digital Electronics
- EG1954** Electrical System & Distribution Practices
- EG1956** Engineering Physics
- EG1957** Communication Skills 1
- EG1958** Introduction to Engineering
- EG1961** Engineering Mathematics 1B
- EG1962** AC Circuits
- EG1963** Analog Electronics
- EG1964** Computer & Programming
- EG1965** Electrical CAD
- EG1967** Thinking & Problem Solving Skills

#### General Studies\*

### YEAR 2 – SEMESTERS 1 & 2

#### Core Modules

- EG2951** Engineering Mathematics 2A
- EG2952** Electrical Circuit Analysis
- EG2953** Microcontroller Systems
- EG2954** Network Technology
- EG2955** Electrical Installation Project
- EG2957** Research & Presentation Skills
- EG2958** Eco-Design & Sustainable System Development
- EG2961** Engineering Mathematics 2B
- EG2962** Power Devices & Applications
- EG2963** Electrical Machines & Drives
- EG2964** Automation Control
- EG2965** Control System Project
- EG2967** Service Management
- EG2968** Innovation & Entrepreneurship

#### General Studies\*

### YEAR 3 – SEMESTERS 1 & 2

#### Elective Programmes (Select one)

##### Power Systems Engineering

###### Core Modules

- EG3952** Professional & Interpersonal Communication Skills
- EG3959** Instrumentation and Control
- EG3962** Power System Analysis & Management
- EG3970** Power Transmission & Distribution
- EG3972** Full-Time Semestral Project\*\*
- EG3975** Green Design Practices & Technologies

###### General Studies\*

###### Internship#

###### Elective Modules (Choose one)

- EG3957** Distributed Control Systems
- EG3963** Enterprise Development
- EG3967** Sustainable Design Project
- EG3968** Smart Grid

##### Green & Smart Technologies

###### Core Modules

- EG3952** Professional & Interpersonal Communication Skills
- EG3958** Intelligent Enterprise Systems
- EG3968** Smart Grid
- EG3969** Energy Systems & Power Distribution
- EG3972** Full-Time Semestral Project\*\*
- EG3975** Green Design Practices & Technologies

###### General Studies\*

###### Internship#

###### Elective Modules (Choose one)

- EG3954** Solar Photovoltaic Systems
- EG3957** Distributed Control Systems
- EG3963** Enterprise Development
- EG3967** Sustainable Design Project

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\* To complete 60 hours for General Studies Modules with the aim of promoting a holistic education and learning experience. Choose modules from clusters that include foreign languages, communication and interpersonal skills, leadership and teamwork, values and society, general knowledge and interests, and healthy and active lifestyle.

\*\*Students taking EG3976 or EG3974 would not need to do EG3972.

# Internship (Choose one)

EG3971 Internship Programme (12 weeks)

EG3976 Internship Programme (24 weeks)

EG3974 Overseas Internship Programme

# MODULE SYNOPSES

## SCHOOL OF ENGINEERING

### EG1951

#### **Engineering Mathematics 1A** [60 hours]

This module provides students with the basic mathematical principles and tools necessary to underpin their education in the engineering discipline. It will enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems. Topics covered include engineering functions, trigonometry, complex numbers, determinants, matrices and vectors. At the end of this module, students will be able to demonstrate understanding of, and competence in, the basic mathematics of engineering, such as vectors, matrices, exponential and logarithmic functions, and complex numbers.

### EG1952

#### **Electrical Technology** [60 hours]

This module covers electrical fundamentals and their uses and applications in electrical and electronic circuits. Topics covered include principles of electricity, resistive circuits, magnetism and electromagnetism, inductive and capacitive circuits, and DC and AC sources. Students will need this knowledge to analyse, interpret and solve engineering problems in the electrical and related industries.

### EG1953

#### **Digital Electronics** [60 hours]

This module is designed to equip students with essential principles and concepts of digital electronics and components. Students will learn the techniques in designing and trouble-shooting digital electronics circuits.

### EG1954

#### **Electrical System & Distribution Practices** [60 hours]

This module covers the application and safe use of electricity. The main topics to be covered include an overview of power generation, transmission and distribution systems, types of energy sources, electrical safety and protection principles based on the relevant codes of practices, and interpretation of electrical drawings.

### EG1956

#### **Engineering Physics** [30 hours]

This module provides students with basic physics principles and tools necessary to underpin their education in the engineering discipline. It will enable them to apply the knowledge, techniques, and skills in the analysis and solution of engineering problems. Topics covered include units, measurement, vectors, kinematics, force, work, energy, momentum, and waves. At the end of this module, students will be able to demonstrate understanding of, and competence in, basic engineering science.

### EG1957

#### **Communication Skills 1** [30 hours]

This module is designed to equip students with oral and written communication skills required in an academic and social environment. The students will learn the essentials of the communication process, expressions in polite communication, reading and note-taking skills as well as technical writing skills. Students will practise presentation techniques to enable them to speak with greater confidence. The focus is to help students enhance their interpersonal communication abilities and develop positive self-esteem to handle social and workplace situations better.

**EG1958****Introduction to Engineering [60 hours]**

This module aims to promote students' interest in engineering by providing a platform for them to have experience building practical projects in various engineering disciplines, and applying and integrating the knowledge from different modules in the semester. Students will first conceptualise, design, implement and finally operate interesting and practical projects. Through this platform, students will be able to hone their creative thinking and problem-solving skills, build synergistic teamwork and enhance their communication skills. Knowledge acquired serves as foundation for advanced modules in electrical engineering.

**EG1961****Engineering Mathematics 1B [60 hours]**

This module provides students with the essential knowledge in calculus and analytical skills for solving engineering problems encountered in their course of study. It also serves as a foundation for advanced topics in the second year. Topics include concept of limits; derivatives of polynomial, trigonometric, inverse trigonometric, exponential and logarithmic functions; indefinite and definite integrals of common engineering functions; and differentiation and integration with engineering applications.

**EG1962****AC Circuits [60 hours]**

This module will equip students with the knowledge and skills to analyse AC circuits. Topics include circuit elements and laws, resistive circuits, inductance and capacitance, impedance concepts, techniques of circuit analysis, AC resonance and three-phase circuits. AC power, power triangle and power factor will also be covered.

**EG1963****Analog Electronics [60 hours]**

This module is designed to provide students with comprehensive understanding of modern electronic devices and their applications. It covers the characteristics and applications of various types of diodes, transistors as well as operational amplifiers. Students will learn the operating principles of fundamental analog circuit building blocks such as rectifiers and amplifiers, and where they are commonly being used. Knowledge acquired from this module serves as foundation for advanced modules in electrical engineering.

**EG1964****Computer & Programming [60 hours]**

This module will provide the foundation for object-oriented programming modules. Students will learn computer programming for engineering applications. They will also learn about computer hardware and software, problem-analysis, problem-solving techniques and developing essential programming skills. Such understanding of the various software development techniques is valuable for prospective programmers to create application software using modular design approach.

**EG1965****Electrical CAD [30 hours]**

This module equips students with engineering drawing knowledge and introduces the use of computer-aided design for electrical schematics. Upon completion of the module, the students will be able to interpret electrical schematics and produce engineering drawings relevant to industry using CAD.

**EG1967****Thinking & Problem-Solving Skills [30 hours]**

This module is designed to teach thinking and problem skills. It covers the techniques of Critical Thinking and Creative Thinking, through which students will develop a systematic approach towards identifying and analysing the cause of a problem, as well as generate and evaluate ideas to give the best solution to a problem. The module is augmented with case studies and projects.

**EG2951****Engineering Mathematics 2A [60 hours]**

This module provides students with the basic theory of ordinary differential equations and Laplace transform. The module focuses on differential equations that arise in practice and the emphasis will be on solving these equations and understanding the possible behaviours of solutions. Topics covered include partial derivatives, first and second order differential equation and their applications, numerical approximation to solutions of differential equations, Laplace transform and applications. At the end of the module, students will be able to demonstrate a sound knowledge of a range of techniques for solving linear ordinary differential equations and apply it to solve real-life problems in engineering.

**EG2952****Electrical Circuit Analysis [60 hours]**

This module will introduce students to analytical methods and techniques for evaluating electrical circuits. Topics covered include review of phasor analysis, network theorems, 2-port networks, AC power analysis and measurement techniques and three-phase circuit analysis. Students will need these circuit analysis techniques to analyse, interpret and solve engineering problems in the electrical and its related industries.

**EG2953****Microcontroller Systems [60 hours]**

This module is designed to foster knowledge and practical skills in designing and interfacing microcontroller-based systems. Coverage includes microcontroller functional blocks, input output interfacing, timer, serial communication and interrupt. The focus is on how programming techniques of different interfaces can be applied, extended and integrated in the development of a microcontroller-based system. This will give students the knowledge for designing and developing an intelligent system product.

**EG2954****Network Technology [60 hours]**

This module starts with the fundamentals of network technology by referencing the layering models in communications. The module goes on to focus on the Ethernet LAN including commonly used network devices, the IP addressing scheme and routing protocols. The module includes hands-on sessions on IP address configuration, IP subnetting, setting up and configuration of routers and switches. Students will also learn the standard implementation of an energy management, as well as understand the switching and routing infrastructure to measure, manage and control the energy consumption of IP-based devices.

**EG2955****Electrical Installation Project [30 hours]**

This module focuses on developing students' know-how in implementing electrical installation design projects by applying the knowledge and concepts learned in Electrical System & Distribution Practices and Electrical CAD. Through this design project, students will be able to design layout plans and implement lighting and power circuits, meeting power specifications/ requirements and complying with the relevant codes of practices. The module also covers preparation of technical drawings and reports including statistical information required by managers within the organisation, to make day-to-day and short-term decisions.

**EG2957****Research & Presentation Skills [30 hours]**

This module is designed to provide students with knowledge and skills in marketing research and presentation. Topics include research process, research methods, analysis of research data and presentation skills to communicate research results. It provides students with the knowledge to conduct research in the areas of emerging technological products in the industry.

**EG2958****Eco-Design and Sustainable System Development [30 hours]**

This module is designed to foster a comprehensive understanding of the eco-design process and principles of sustainability in system development. It integrates teaching and learning of sustainability concepts and issues in tandem with the design process, emphasising that sustainability issues be addressed at the design stage, in line with the best practices in the industry. Topics include eco-design principles, sustainable design concept, renewable energy sources, guidelines and regulatory requirements in product development for efficient resource utilisation and energy industries as well as financial costs and benefits of eco-design. Such an understanding is valuable for prospective engineers, managers of sustainable energy technology and decision makers.

**EG2961****Engineering Mathematics 2B [60 hours]**

This module provides students with the necessary mathematical training that will assist and expand their experiences within their discipline of study. The module contains two parts. The first part focuses on Fourier analysis and discusses how periodic signals in the time domain can be represented in the frequency domain. The aim of the second part is to give students a working knowledge of statistical concepts so that statistical reasoning can be correctly applied to experimental results and their statistical significance discussed. Topics include Fourier series, probability concepts, probability distribution (Binomial, Poisson and Normal), sampling distributions, estimation and linear regression. At the end of the module, students will be able to demonstrate a sound knowledge of the mathematical training and apply them to solve real-life problems in engineering.

**EG2962****Power Devices & Applications [60 hours]**

This module is designed to provide students with a comprehensive understanding of semiconductor power devices and their applications in power conversion circuits. It covers the electrical characteristics of power device families, namely diodes, transistors, and thyristors as well as the working principles of various power converter circuits. Knowledge gained from this module enables students to analyse and implement power conversion solutions for modern electrical installations.

**EG2963****Electrical Machines & Drives [60 hours]**

This module covers the operation of electrical machines and its applications. Topics covered include the three-phase system, electromagnetic induction, transformers, DC machines, induction machines, synchronous generators and motor drive systems. The module also covers preparation of technical reports and statistical information required by managers within the organisation to make day-to-day and short-term decisions.

**EG2964****Automation Control [60 hours]**

This module aims to equip students with the knowledge of electro-mechanical relays, sensor technology and Programmable Logic Control (PLC) used in various automation control systems. Students will learn to design electrical circuits using relays, sensors and actuators and PLC programmes relevant to its industrial applications.

**EG2965****Control System Project [30 hours]**

This module focuses on developing students' know-how in implementing automation control projects by applying the knowledge and concepts learnt in Automation Control, Electrical CAD and Electrical Machines and Drives. Through this project, students will be able to design and plan electrical wiring for PLC interfaces, understand and apply the concepts of project management, commission an automated system according to specifications and programme the automated system to meet requirements. Such an understanding is valuable in the industrial automation and control sector of the industry.

**EG2967****Service Management [30 hours]**

This module is designed to focus on the service industry – the service delivery, management processes and customer satisfaction methods. The module will examine how to resolve customer complaints, provide service recovery, customer relationship, attractions and other major service environment with suitable service inputs such as product and information support. This module provides students with current knowledge and skill sets to support the needs of the electrical and its related industries.

**EG2968****Innovation & Entrepreneurship [30 hours]**

The module aims to sharpen students' critical thinking and problem-solving skills to innovate solutions and to develop marketable products and services. Topics covered include innovative process framework, business venture creation, strategic planning, intellectual properties, business structure, finance, marketing and business plan. It aims to simulate business management experiences by requiring students to innovate, communicate and defend their ideas through a simulated business environment. Case projects from the industry will be discussed and analysed.

**EG3952****Professional & Interpersonal Communication Skills [30 hours]**

This module aims to help students understand and acquire communication skills for entry into the job market as working professionals. It focuses on job search skills and includes resume and cover letter writing, as well as interview skills. Students will gain insight into change management, organisational structure and corporate culture. They will also learn about business correspondence. In all, students will gain competency in job searching skills and adapting to the work environment of their relevant industry.

**EG3954****Solar Photovoltaic Systems [60 hours]**

This module covers design, operation and maintenance of solar photovoltaic (PV) systems. Topics include solar photovoltaic fundamentals, PV system components, system design and configuration, as well as building-integrated PV systems. The relevant industry code of practice will also be covered. Such an understanding is valuable in the clean energy sectors of the clean technology industry.

**EG3957****Distributed Control Systems [60 hours]**

This module instils the fundamental knowledge of control networking in Distributed Control Systems (DCS). It gives insights into the technologies of the different kinds of control systems such as centralised, hierarchical, fieldbus, distributed control network and other essential theories like field device node, Input/Output (IO), communication, control network-to-IP interfacing and network management and design.

**EG3958****Intelligent Enterprise Systems [60 hours]**

This module provides students with knowledge and understanding of enterprise-connected building system based on the convergence of building control and IT infrastructure technologies. An enterprise-connected building system is able to monitor, generate reports and control the building environmental, equipment and security through web-software to achieve optimal business operation and decision. This module also covers the application of software-as-a service (SaaS) cloud computing and data analytics in enterprise building management.

**EG3959****Instrumentation & Control [60 hours]**

This module will train students to model, analyse and develop practical solutions to typical situations in the control engineering industry. Topics covered include the fundamentals of measuring elements, transducers and actuators commonly used in process control. Signal conditioning, data acquisition and control techniques such as PID control will also be covered. Software analytical tools will be utilised to enhance selection and tuning of controller. Case studies on design, simulation and implementation of controller will also be covered. This module will provide students with the knowledge pertinent to instrumentation and control in industrial process control.

**EG3962****Power Systems Analysis & Management [60 hours]**

This module aims to equip students with the various analytical techniques used in power system planning and operation. Topics covered include power system modelling, power flow analysis and management, symmetrical and unsymmetrical faults and power system protection. Students will need these techniques to analyse power system behaviour under steady state and fault conditions.

**EG3963****Enterprise Development [60 hours]**

This module provides students with the knowledge and skills required in starting and managing a business. Students will learn about the types of business entities, the business registration process, as well as the relevant licences and permits required in the Singapore context. In addition, students will learn about employment-related matters, taxation issues as well as avenues for dispute resolution. This module will also integrate the basics of business law with business ethics. Students will also be able to experience and understand the challenges and recovery issues faced by a typical entrepreneur through research and case studies.

**EG3967****Sustainable Design Project [60 hours]**

This module aims to deepen the student's knowledge of eco-sustainability with reference to the design and development of an engineering application. Emphasis is placed on the development of creative skills and problem-solving strategies for designing within constructed environments with a sustainable approach. Students are to demonstrate critical thinking skills required to analyse problems in the social and environmental context, and learn how to make economically, environmentally and socially sound sustainable decisions while working on their projects.

**EG3968****Smart Grid [60 hours]**

This module covers the motivations, goals and attributes, systems and enabling technologies of the modern power grid. Topics will include smart grid overview, renewable energy systems, micro-grids, smart grid enabling technologies and the electricity market. Smart grid solutions for delivery and asset optimisation, as well as shaping of consumer demand will be discussed.

**EG3969****Energy Systems & Power Distribution [60 hours]**

This module covers the distributed energy resources and power distribution. Topics include electrical power system overview, HV & LV distribution networks, various distributed energy resources, fault analysis and protection, switchgear and switchboard. Students will acquire the knowledge and skills needed to analyse, interpret and solve engineering problems in the electrical and related industries.

**EG3970****Power Transmission & Distribution [60 hours]**

This module aims to equip students with the principles and concepts of power generation, transmission and distribution. The topics covered include generation of electrical energy, transmission and distribution of electrical energy, power transformers, fault analysis and protection and electricity market and industry structure. Such an understanding is relevant for the power industry, from generation to distribution of electrical power.

**EG3971****Internship Programme [12 weeks]**

This module enables students to put into practice the knowledge and skills that they have acquired from the course in real-life work environments. The students will be assigned work tasks or projects, with clear learning outcomes that are relevant to their courses and intended job roles, during the internship. The students will be guided by mentors from the industry and NYP to help them perform on the job and to achieve the learning outcomes. This will allow students to gain work-centred knowledge and skills, and work-related experiences. In addition, they will acquire important work values and ethics which include being responsible and positive, as well as taking initiative and exercising integrity. Through this work-based experiential programme, students will be better prepared for work and life.

**EG3972****Full-Time Semestral Project [12 weeks]**

This module enables students to put the knowledge and skills they have acquired from the course into practice, to develop solutions for real-life applications. Projects will be assigned to students who will work under staff supervision to develop and produce the desired project deliverables. In addition to equipping the students with technical and soft skills for project development, this module will enable students to develop problem-solving skills and instil the habit of lifelong learning to prepare them for entry into the workforce.

**EG3974****Overseas Internship Programme [24 weeks]**

This module enables students to put into practice the knowledge and skills that they have acquired from the course in real-life work applications. The students will be assigned work tasks or projects that are relevant to their courses and intended job roles, during the overseas internship. The students will be guided by mentors from the industry, company or institution to help them perform on the projects or tasks. This will allow students to gain project or task related knowledge, skills, and experiences. In addition, they will acquire important work values and ethics which include being responsible and positive, as well as taking initiative and exercising integrity. This module will also enable students to develop problem-solving skills, instil the habit of lifelong learning and develop a global mindset to prepare them for entry into the workforce.

**EG3975****Green Design Practices and Technologies [60 hours]**

This module integrates eco-friendly design and technologies in green buildings, intelligent facilities and energy management. Green design concepts and practices will be taught and elaborated with application examples drawn from the various green technologies. Case studies will be used to demonstrate how design concepts can be implemented with technologies to improve energy efficiency through choice of materials and effective energy management. Students will learn energy auditing that covers energy management policy, energy management monitoring system, benchmarking and energy indicators.

**EG3976****Internship Programme [24 weeks]**

This module enables students to put into practice the knowledge and skills that they have acquired from the course in real-life work environments. The students will be assigned work tasks or projects, with clear learning outcomes that are relevant to their courses and intended job roles, during the internship. The students will be guided by mentors from the industry and NYP to help them perform on the job and to achieve the learning outcomes. This will allow students to gain work-centred knowledge and skills, and work-related experiences. In addition, they will acquire important work values and ethics which include being responsible and positive, as well as taking initiative and exercising integrity. Through this work-based experiential programme, students will be better prepared for work and life.