DIPLOMA IN ELECTRICAL ENGINEERING

With the launch of the Open Electricity Market and the push for greater solar photovoltaic (PV) generation capacity, exciting developments are happening in Singapore's electrical engineering industry. Smart grid technologies are being trialled and tested to integrate modern information and communication technology with our power system. At the same time, engineers are continuing to explore more innovative methods of deploying solar PV panels to make best use of Singapore's limited space. You can be part of these exciting and meaningful developments by pursuing the Diploma in Electrical Engineering.

The electrical engineering course gives you a strong foundation in the areas of smart energy management and electrical power systems, and will expose you to skills and knowledge in emerging technologies to meet the challenges of the fast-changing energy and power sector. In addition, the broad-based curriculum will also prepare you for a wide range of careers in other industries such as robotics and transportation.

In your first semester, you will learn the fundamentals in mechanical and electrical engineering, mathematics and programming. In your second semester, you will be equipped with skills and knowledge in the areas of electrical and electronic engineering.

In your second year, you will deepen your engineering skills and knowledge through modules covering electronic devices, programmable logic controller (PLC), microcontrollers and electrical installation design. You will also gain a good grasp of the methods for analysing electrical systems and energy management systems. Through a series of Integrated Real-world Projects, you will gain practical hands-on skills like computer-aided design, deploying IoT devices, creating user interface and data analytics.

In your final year, you can choose to specialise in either Power Engineering or Clean Energy Management. You will also get to put your skills and knowledge into practice with a six-month enhanced internship with industry leaders such as SP Group, ST Engineering, Singtel and Sembcorp. Or you can work on a design project to develop your very own products and patents in diverse fields such as robotics and healthcare engineering applications.

SPECIALISATION OPTIONS

Clean Energy Management
This specialisation prepares you for the sustainable energy sector with a strong focus on energy management and clean energy technologies. Key areas covered include solar photovoltaic (PV) systems and energy audit process and measurement techniques.

Power Engineering
This specialisation prepares you for exciting careers in diverse sectors such as power and energy, as well as transportation. You'll also get a head start to practise licensed electrical work. Discover more about electrical system design and smart electricity systems.

YEAR 1 COURSE MODULES

LEVEL 1.1

Electrical Engineering Fundamentals
This module provides a foundation in electricity covering basic concepts of electrical circuits and the methods used to analyse them. The module emphasises the understanding of the basic electrical circuit laws (Ohm's Law, Kirchhoff's Voltage and Current Laws) and network theorems, and their application to electrical network analysis. Topics covered include fundamentals of electricity, network theorems, capacitance, electromagnetic induction and inductance.

Engineering Mathematics 1
This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Topics include algebra, trigonometry, logarithms, plane analytic geometry, matrices and complex numbers. Throughout the module, there is appropriate use of a Computer Algebra System.

Integrated Real-world Project 1
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and further enhanced through relevant contextualisation. Students will work in teams and undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to apply the skills and develop confidence in tackling projects. Data analytics will be introduced using case-based approach and applied in the integrated real-world project.

Mechanical Engineering Fundamentals
This module introduces students to the study of external forces in two dimensions and their effect on particles and rigid bodies that are at rest. Students learn the skills to analyse the forces acting on the bodies by drawing free-body diagrams and applying the conditions of equilibrium. Topics include forces and resultants, moments and couples, equilibrium and the concepts of plane friction. This module also aims to equip students with the skills to analyse problems of rigid bodies in motion. Only linear motion in two dimensions will be covered. Topics include kinematics and kinetics of linear motion.

Programming
This practice-oriented module equips students with basic knowledge and skills in computer programming using C language. The main topics include basic computer programming concepts, fundamentals of C programming including branching, loops, and functions.

LEVEL 1.2

AC Circuits
The aim of the module is to provide first year students with a basic knowledge of the fundamental principles in electric circuit analysis. The module first explores DC network theorems such as Kirchhoff's Laws, Thevenin's Theorem and Principle of Superposition. Application of the theorems are then extended to AC circuits which involve impedances such as capacitance and inductance. The module also includes analysis of simple AC series, parallel and series-parallel combination circuits, concept of AC power and understanding of power factor and its effect on electrical energy usage.

Analogue Electronics
The aim of this module is to lay the foundations in analogue electronics. At the end of this module, students will acquire content knowledge and understanding on the basic concepts of analogue electronics and some applications. Key topics covered in this module include operating characteristics, working principles and applications of discrete electronic devices such as various types of diodes, MOSFETs and BJTs. Practical circuits will be used to enhance and strengthen the learners' knowledge so that they will acquire the relevant competencies to move on to more specialised modules.

Digital Fundamentals
This module introduces the basic principles of digital systems. It covers combinational and sequential logics circuits, multiplexers/demultiplexers and decoders. Flip-flops and their application in counters and registers will also be discussed. This basic knowledge is essential for students to be able to analyse, troubleshoot and design basic digital circuit system.

Engineering Mathematics 2
This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, there is appropriate use of a Computer Algebra System. Topics include trigonometry,

differentiation and simple integration with applications.

Integrated Real-world Project 2
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and understand the relevance and application of the modules learnt. Students will work in teams and undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to apply the skills and develop confidence in tackling projects at the higher levels.

YEAR 1 COURSE CURRICULUM

Module Name	Credit Units
Level 1.1 (20 hours per week)	
Electrical Engineering Fundamentals	3
Engineering Mathematics 1	4
English Language Express*	NA
Innovation Made Possible^	3
Integrated Real-world Project 1	4
Mechanical Engineering Fundamentals	3
Programming	3
Level 1.2 (21 hours per week)	
AC Circuits	3
Analogue Electronics	3
Communication Essentials^	3
Digital Fundamentals	3
Engineering Mathematics 2	4
Health & Wellness^	1
Integrated Real-world Project 2	4

Notes:
^ For more details on Interdisciplinary Studies (IS) electives, please log on to www.np.edu.sg/is
* This module is only offered to students who are weaker in the English Language.

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.

YEAR 2 COURSE MODULES

LEVEL 2.1

Electric Circuit Analysis
This module covers the analytical methods and techniques for analysing electrical systems, in particular three-phase electrical systems. Through the module, students will develop confidence to analyse and solve engineering problems in electrical systems.

Electrical Machines
This module covers the basic concepts and working principles behind common types of electrical machines such as motors, transformers and generators. The module also covers industrial applications of electrical machines and introduces the importance and various concepts of maintenance.

Integrated Real-world Project 3
Integrated Real-world Project module aims to integrate the knowledge learnt in the semester and apply to a real-world project and further enhanced through relevant contextualisation. Students will work in teams. Upon completion of the module, students will be able to apply the skills and develop confidence in tackling projects.

Microcontroller & System
This module equips students with knowledge and practical skills to design and build microcontroller-based applications. The module covers the fundamental concepts of microcontrollers and the interfacing with external applications.

PLC & Automation
This module introduces students to PLC-based control systems where they will learn to design and build simple industrial control systems using relays and PLC programmes. The module also explores the concept of inter-connecting control systems to form networks.

LEVEL 2.2

Electrical Installation Design
This module equips students with practical skills to design electrical systems for residential, commercial and industrial installations according to statutory requirements. It covers estimation of load requirements and selection of protection devices, cables and circuit protective conductors.

Energy Management Systems
This module covers the working principles and energy management of common electrical and mechanical systems in commercial and industrial enterprises. Students learn how to define energy conservation measures and assess the economic benefits of such measures. They also learn about practical issues in energy management such as improvement in energy utilisation of power distribution system.

Integrated Real-world Project 4
Integrated Real-world Project module aims to integrate the knowledge learnt in the semester and apply to a real-world project and further enhanced through relevant contextualisation. Students will work in teams. Upon completion of the module, students will be able to apply the skills and develop confidence in tackling projects.

Project Management
This module provides students with an understanding of the various aspects of project management procedures. The module also equips students with various project management tools.

Power Electronics
This module provides students with a broad-based understanding of power semiconductor devices and their applications in power conversion circuits. The module also covers basic principles of control and conversion of electrical power for industrial applications and introduces motor drive systems such as variable speed drives.

YEAR 2 COURSE CURRICULUM

Module Name	Credit Units
Level 2.1 (18 hours per week)	
Electric Circuit Analysis	4
Electrical Machines	4
Integrated Real-world Project 3	4
Microcontroller & System	3
PLC & Automation	3
Level 2.2 (20 hours per week)	
Electrical Installation Design	4
Energy Management Systems	4
Integrated Real-world Project 4	4
Project Management	3
Power Electronics	3
World Issues: A Singapore Perspective^	2

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YEAR 3 COURSE MODULES

LEVEL 3.1

COMMON MODULES

Integrated Real-world Project 5
Integrated Real-world Project module aims to integrate the knowledge learnt in the semester and apply to a real-world project and further enhanced through relevant contextualisation. Students will work in teams. Upon completion of the module, students will be able to apply the skills and develop confidence in tackling projects.

CLEAN ENERGY MANAGEMENT SPECIALISATION OPTION

Clean Energy Technologies
This module provides a hands-on experiential approach for students explore and learn about the fundamental characteristics of clean energy technologies such wind, solar and fuel cell systems. Topics include the principles of operation and energy conversion processes of solar, chemical and wind power sources with special emphasis on PV systems.

Design & Operation of Distributed Power Systems
This module takes students through the design process of photovoltaic (PV) system and operation, identifying appropriate PV applications in power systems and undertaking simple PV system design. It also introduces the concept of distributed power generation and distribution of electricity and the challenges faced. Students will learn about power flow and fault studies pertaining to distributed power generation and network protection required due to the integration of photovoltaic and wind-turbine grid connected systems into the power grid.

Energy Studies & Audit
This module introduces students to the energy audit process and measurement techniques. Students learn to use energy measuring equipment and building modelling and simulation software tools to conduct an energy audit. Utility data analysis, building information management (BIM), energy performance profiling, building energy modelling and simulation, development of benchmarking system, environment management standards ISO 14000, and financial analysis for predicted savings will be covered.

POWER ENGINEERING SPECIALISATION OPTION

Power Systems Design & Operation
This module covers the technical skills and knowledge to perform basic design, installation, testing, operation and maintenance of electrical power systems including grid, PV and rail power systems. The module also introduces the sound engineering practices and the relevant regulations and code of practices explored.

Smart Electricity System
This module introduces students to smart grid technologies which are transforming the electricity landscape to a de-centralised, sustainable and more consumer-interactive model. In this module, the basic concepts of distributed generation, demand management and energy storage will be explored.

System Modelling & Control
The module focuses on modelling the dynamics and servo systems, analysis of system responses and shaping the dynamic response through closed-loop control. Students will learn the principles of systems modelling, simulation, analysis and control, and the application of these principles in systems analysis and synthesis. Major topics include modelling single discipline and mixed systems, Laplace transform, s-plane, standard forms, time-domain specifications, effects of control actions on system performance, and frequency response analysis.

LEVEL 3.2

6-Month Internship (Local/Overseas)
Students have the opportunity to apply the skills and knowledge acquired in the classroom in a real-life environment via on-the-job training. This programme allows students to hone skills in the areas of problem-solving, interpersonal communications, project planning and implementation, industrial liaisons and character building. Participating companies will have the opportunity to assess prospective employees and secure the services of these students in advance.

Project Design & Development
Students will work full-time on a group project and have the flexibility to choose from a wide range of topics related to system design and integration, research and development, computer applications or other engineering areas. Students are required to carry out research, design, implementation, testing and troubleshooting processes from a prototype to a final product or system under supervision. Students will also learn to apply project management and scheduling skills to enable them to complete their project in time. They will be required to document their project development process and present their projects at regular intervals.

YEAR 3 COURSE CURRICULUM

Module Name	Credit Units
Level 3.1 (20 hours per week)	
Clean Energy Management Specialisation Option	
Clean Energy Technologies	4
Design & Operation of Distributed Power Systems	4
Energy Studies & Audit	4
Integrated Real-world Project 5	4
Project ID: Connecting the Dots^	4
Power Engineering Specialisation Option	
Integrated Real-world Project 5	4
Power Systems Design & Operation	4
Project ID: Connecting the Dots^	4
Smart Electricity System	4
System Modelling & Control	4
Level 3.2 (20 hours per week)	
6-Month Local/Overseas Internship OR Project Design & Development	20

Notes:
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