

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (25.5 hours per week)	
Career & Professional Preparation I	1.5
Clean Energy & Sustainable Environment	3
Computer Programming	4
Electrical Technology	4
Engineering Mathematics 1	5
Engineering Mechanics	4
Innovation Toolkit 1 ^	2
Sports & Wellness ^	2
Level 1.2 (27 hours per week)	
AC Circuits	5
Analogue Electronics & Applications	5
Digital Electronics & Practice	2
Electrical & Electronic Practical Skills	4
Engineering Mathematics 2	5
Communication & Contemporary Issues^	4
Innovation Toolkit 2 ^	2

Notes:

^ For more details on Interdisciplinary Studies (IS) electives, 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

Career & Professional Preparation 1

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

Clean Energy & a Sustainable Environment

This module introduces students to the causes and impacts of global warming and climate change, and the urgency for clean energy alternatives to current sources of energy. It covers fundamental knowledge on energy, environmental sustainability and the interrelations among energy, environment and society.

Computer Programming

This practice-oriented module equips students with the basic knowledge and skills in computer programming using C language. The main topics include basic computing concepts, fundamentals of C, branching, loops, and C functions. On completion of the module, students will be able to explain and write C programs for simple engineering applications.

Electrical Technology

This module provides the foundation in electricity to prepare the students for more specialised subjects. It deals with the 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, ac circuit theory and transformer fundamentals.

Engineering Mathematics 1

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

Engineering Mechanics

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 and at simple linear motion. 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, plane friction, kinematics and kinetics of linear motion.

Innovation Toolkit ^

Innovation Toolkit is designed to help you develop the innovative mindset and build up your confidence as a creative thinker. You will learn how to spot opportunities from problems through a user-centric approach - observing and interacting with different stakeholders. You will also be challenged to generate groundbreaking ideas to add value to the lives of users.

Sports & Wellness ^

This module helps you to learn a sport as a recreational activity to keep you fit and healthy. Team building and collaboration skills are developed as you network with other students. There are a total of 19 sports electives to choose from: Aerobics, Badminton, Basketball, Cheerleading, Dance Movement, Dancesport, Flag Football, Hip Hop, Life Saving / Swimming, Netball, Orienteering, Street Soccer, Soccer, Softball, Tennis, Touch Rugby, Volleyball, Wellness Programme and Yoga. Outstanding students are awarded a Pass with Merit.

LEVEL 1.2

AC Circuits

Students will learn the basic principles of electrostatics, capacitance, electromagnetic inductance and the transient behaviours of R-C and R-L circuits. This module also covers basic principles of alternating current voltage generation, the characteristics of an A.C. sine wave and its mathematical representation, and the basic theory of alternating current applied to R, L and C series, parallel and series-parallel circuits. Concepts on AC power, power triangle and power factor will also be discussed.

Analogue Electronics & Applications

This module expounds on the fundamental concepts of analogue electronic devices and circuits. It covers semiconductor physics as well as the device characteristics, operating principles and common applications of diodes and transistors. The module will equip students with a thorough understanding of DC biasing and AC operation of

transistor amplifier circuits. This will be achieved through worked examples, tutorials, laboratory sessions and e-learning materials.

Digital Electronics & Practice

This module covers basic principles of digital electronics. Topics include Number Systems and Codes, Logic Gates and Boolean Algebra, Combinational Logic Circuits, Counters, Flip-Flop and Data Handling Circuits. Students will be able to explain and analyse the workings of digital circuits through hands-on experiments in the laboratory.

Electrical & Electronic Practical Skills

This module provides students with hands-on practical skills in basic electrical wiring and installation, industrial control using relays, sensors and programmable logic controllers. They learn to assemble, solder and test electronic circuits on breadboard, strip-board, and printed circuit board, and use test and measurement equipment such as the oscilloscope, function generator and digital multi-meter.

Electrical & Electronic Practical Skills

This module provides students with hands-on practical skills in basic electrical wiring and installation, industrial control using relays, sensors and programmable logic controllers. They learn to assemble, solder and test electronic circuits on breadboard, strip-board, and printed circuit board, and use test and measurement equipment such as the oscilloscope, function generator and digital multi-meter.

Engineering Mathematics 2

This module provides students with further mathematical skills to solve engineering problems. Topics include trigonometry, coordinate geometry, differentiation and integration with applications.

Communication & Contemporary Issues ^

Many people fear public speaking more than heights or even death. This module helps you pick up skills to express yourself confidently and effectively, both orally and in writing. At the same time, you will develop a greater awareness of self in relation to society by exploring a wide range of contemporary and community issues ranging from consumer culture to racial prejudice and global citizenry.

Innovation Toolkit 2 ^

Innovation Toolkit is designed to help you develop the innovative mindset and build up your confidence as a creative thinker. You will learn how to spot opportunities from problems through a user-centric approach - observing and interacting with different stakeholders. You will also be challenged to generate groundbreaking ideas to add value to the lives of users.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 2	
Level 2.1 (26 hours per week)	
Career & Professional Preparation II	2
Clean Energy Mini Projects 1	3
Electric Circuit Analysis & Measurement	6
Electrical Installation Design	5
Power Electronics & Applications	3
Wind, Hydro & Fuel Cell Technologies	5
Interdisciplinary Studies (IS) elective ^	2
Level 2.2 (26 hours per week)	
Clean Energy Mini Projects 2	3
Computer-Aided Drawing	2

Electrical Controls & Drives Practices	3
Electrical & Mechanical Systems	5
Energy Management in Electrical & Mechanical Systems	5
Photovoltaic & Cell Fabrication Technology	6
Interdisciplinary Studies (IS) elective ^	2

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COURSE MODULES

LEVEL 2.1

Career & Professional Preparation 2

The module prepares students to write effective cover letters and resumes. Preparation and enhancement of portfolio to meet professional standard as well as development of presentation skills, and improvement of job-seeking techniques will also be covered in the module.

Clean Energy Mini Projects 1

The module aims to guide students to build an electrical or electronic application using clean energy at the end of the module. Students are guided in each lab to learn about various practical electronics and electrical circuits, batteries and their charging circuits, microcontroller and microcontroller interfacing with sensors, relays, switches and serial and network devices.

Electric Circuit Analysis & Measurement

This module covers the concepts, theorems and measurement techniques needed in electrical engineering including three phase system analysis, power measurement and power factor correction, harmonics, transient and steady-state analysis, and measurement procedures and techniques.

Wind, Hydro & Fuel Cell Technologies

This module provides students with fundamental knowledge on the characteristics of wind, hydropower and fuel cell systems. Topics include the principle of operation and energy conversion of fuel cells, types of fuel cells, wind and hydropower sources, turbines characteristics and aerodynamics of wind turbines, operations of wind and hydro power systems.

Electrical Installation Design

Students will learn how to design electrical systems for residential, commercial and industrial installations. Topics include the design of artificial lighting systems, selection of protective devices for various distribution networks, sizing of cables and circuit protective conductors, and estimation of load requirements for large buildings. On completion of the module, students will be able to design electrical distribution systems in compliance with statutory requirements.

Power Electronics & Applications

This module covers principles of operation and analysis of power conversion circuits such as AC to DC converters, DC to DC converters, DC to AC converters and AC power controllers. Students learn to apply their knowledge in power semiconductor applications to the control and conversion of electric power.

Any 1 Interdisciplinary Studies module [^]

Students can choose any 1 Interdisciplinary Studies (IS) module. For more details, please visit the IS website at www.np.edu.sg/is.

LEVEL 2.2

Clean Energy Mini Projects 2

Students would deepen their knowledge and skills in developing a clean energy application or an energy management system. Students work on mini-projects using skill-sets learnt in Clean Energy Mini Projects 1 to gain hands-on experience and understand how different clean energy technologies are deployed and managed to convert clean energy sources to electrical power.

Computer-Aided Drawing

This workshop-based module introduces the basic concepts of engineering drawing such as the construction of basic lines and shapes, dimensioning, editing and drawing manipulation. Commonly used engineering drawing layouts are included.

Electrical Controls and Drives Practices

This module focuses on the operation, control and other practical aspect of motor controls and drives. As motors and drives are the main energy using components in most electrical and mechanical systems, this module will provide students with the required foundation in understanding how the proper design and operation of electrical controls and drives is essential for efficient energy usage in electrical and mechanical systems.

Energy Management in Electrical & Mechanical 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, drive systems, compressor air system, boilers, fans and blowers, and HVAC & refrigeration system.

Engineering Mathematics 3A

This module is an extension of the Engineering Mathematics 2 module. Topics include Integration Techniques & Applications, First Order Differential Equation, Fourier series and Laplace Transform.

Photovoltaic & Cell Fabrication Technology

This module provides students with fundamental knowledge on the operation principles and behaviour of solar cells and modules including spectral response, effect of temperature and cell efficiency. Students learn about PV cells interconnection, module fabrication and circuit design. This module also provides hands-on training for students in the NP cleanroom as well as the opportunity to learn how to fabricate solar cells in the laboratory.

Any 1 Interdisciplinary Studies module [^]

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COURSE CURRICULUM

Module Name	Credit Units
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YEAR 3

Level 3.1 (23 hours per week)

Building Energy Studies	4
Clean Energy System Integration & Protection	5
Design & Operation of PV Systems	5
Energy Audit & Measurement	5
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2

Level 3.2 (22 hours per week)

6-Month Local/Overseas Internship	22
or	
Project Design & Development	22

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COURSE MODULES

LEVEL 3.1

Building Energy Studies

This module will introduce the students to the subject of building energy modelling and simulation, and will cover the rationales behind the need for energy modelling, be it for environmental or legislation/industrial needs. The module will also detail the measurable quantities involved in the quantitative analysis during the energy modelling simulations.

Clean Energy System Integration and Protection

This module equips the students with the knowledge in the technical and economical concept of clean energy system integration. It covers basic fundamentals of power system. Furthermore, students will learn power flow and fault studies pertaining to distributed generation. In addition, case studies will be used to demonstrate the concept of clean energy system modelling, simulation, optimisation and sensitivity analysis for both stand-alone and grid-connected micropower system. Students will also learn the integration of photovoltaic and wind-turbine grid-connected systems.

Design and Operation of PV System

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. Topics include the concept of PV stand-alone and on-grid systems, sizing of cables and batteries, lightning protection, power protection and power quality issues.

Energy Audit and Measurement

This module introduces students to the energy audit process and measurement techniques. Students learn to use modern energy measuring equipment and software tools to conduct the audit. Utility data analysis, energy performance profiling, development of benchmarking system, environment management standards ISO 14000, and financial analysis for predicted savings will be covered.

World Issues: A Singapore Perspective ^

You've heard it. You've been told. The world is changing rapidly at a pace that dazzles the mind. Not merely a history lesson, WISP equips you with an understanding of current, major global issues. It looks at how city-state Singapore defied the odds and witnessed close to half a century of rapid economic growth, strong political ties and social harmony. WISP invites you to embark on a journey beyond knowledge, a journey that will change your life. Highlights of previous WISP activities include the 2013 Heroes Seminar, the 2012 Heroes Seminar, the SAF camp visits, a dialogue session with the Law Minister, and a discussion session with the Manpower Minister.

Any 1 Interdisciplinary Studies module ^

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Level 3.2

6-Month Local/Overseas Internship

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 and Development

Working on a design project, students will learn essential traits like leadership, team spirit, positive work attitude, independence, good presentation and management skills, and an innovative spirit. It promotes project management capabilities through project planning, scheduling, group discussions, project load balancing and planning project milestones using the Gantt chart. Students get to practice and improve their oral and written communication skills by submitting reports and making presentations.