DIPLOMA IN ELECTRONIC & COMPUTER ENGINEERING

You only need to look around to know that electronics and computers are part of your daily lives – from the smart phones and laptops that you use to the vehicles that you travel in. You can play a part in shaping the way people live, work and play with the Diploma in Electronic & Computer Engineering (ECE).

ECE gives you a strong foundation in electronic hardware design, software programming skills and computer networks. With our industry-relevant curriculum, you will be well-placed to meet the needs of the industry when you graduate.

In your first year, you will learn the fundamental aspects of engineering with modules such as Computer Programming, Analogue Electronics and Digital Fundamentals. In your second year, you can choose to deepen your expertise in a particular field by pursuing one of our two specialisation options, Computer Networks or Robotics & Communication. Then in your final year, put your knowledge to the test with a six-month internship with industry leaders such as Creative Technology, ST Engineering and Xilinx.

What's more, you may even get the chance to work on industry sponsored projects at our technology centres. Plus, you will go on local and overseas study trips that will widen your exposure to the exciting world of engineering.

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 a suitable high-level language. The main topics include basic computer programming concepts and fundamental programming constructs such as sequences, selection and repetition.

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 concepts of digital systems. It covers the basics of combinational and sequential logic circuits. Flip-flops and their application in counters and registers will also be discussed. This basic knowledge is essential for students to be able to understand, analyse, 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

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YEAR 2 COURSE MODULES

LEVEL 2.1

COMMON MODULES

Applied Digital Electronics
This module reinforces the concepts learned in Digital Fundamentals through hands on with real digital circuitries. Key digital building blocks like frequency dividers, multiplexer, de-multiplexer and decoder will be introduced. Basic Integrated Circuit Technologies will also be covered. Students will learn to build and troubleshoot basic digital circuit system.

Integrated Real-world Project 3
This module aims to integrate the knowledge learnt in the semester, deepen the skills in the previous semester and apply to a real-world project. Students will work alone to acquire relevant new skills in CAD design and electronics prototyping and also in teams to 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.

Network Fundamentals
This module covers the introduction to the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation knowledge and skills for network infrastructure. Upon completion of the module, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

Quality Systems & Analytics
This module prepares students to apply quality system management techniques and principles in their future workplace. Topics include Quality Systems and Audits, quality tools and techniques including the application of statistical software for process control, Gage Repeatability and Reproducibility, Hypothesis Testing, Design of Experiments, Statistical Process Control, and Mistake Proofing to optimise and improve products and processes. Process Capability Analysis, Lean Manufacturing for waste elimination and Six Sigma initiatives for defect reduction will also be discussed.

COMPUTER NETWORKS SPECIALISATION OPTION

Servers & Cloud Fundamentals
This module covers the basics of Linux operating system, server and an overview of cloud computing. Concepts for Linux include the use of Linux commands to access and manage directories, files, setting of file security and access rights and basic servers' implementation, such as DNS and DHCP in a network. For cloud computing, concepts include virtualisation as a foundation for cloud computing and issues related to implementation of cloud services. It also covers simple architecture, design, implementation, management and security of cloud services.

ROBOTICS & COMMUNICATION SPECIALISATION OPTION

Applied Analogue Electronics
This module covers the fundamentals of analogue electronic circuit design and applications. The operating principles and design of commonly used analogue devices and operational amplifier circuits are taught in this module. The main topics include various types of amplifiers, comparators and filters. Applications in various practical circuits are also illustrated in this module.

LEVEL 2.2

COMMON MODULES

Integrated Real-world Project 4
This module aims to integrate the knowledge learnt in the semester, deepen the skills in the previous semester and apply to a real-world project. Students will work alone to acquire relevant new skills in Printed Circuit Board (PCB) design, assembly, testing, trouble-shooting and reworking and also in teams to 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.

Microcontroller & Interfacing
This module aims to equip students with a basic foundation in microcontroller and Embedded System. Students will acquire the necessary skills and knowledge through meaningful practical exercises and lectures/tutorials. The knowledge and skills that the students acquire in this module will enable them to implement a microcontroller based system.

Object-oriented Programming
This module introduces object-oriented programming to students who already have a foundation in procedural programming. It covers the fundamental concepts of object-oriented programming with introduction to basic web and database applications.

COMPUTER NETWORKS SPECIALISATION OPTION

Routing & Switching
This module describes the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality. By the end of this module, students will be able to configure and troubleshoot routers and switches and resolve common issues with virtual LANs and interVLAN routing in both IPv4 and IPv6 networks.

ROBOTICS & COMMUNICATION SPECIALISATION OPTION

Communication Systems
This module covers the fundamentals of analogue communication principles. Key topics covered in this module include components of a basic communication system, and factors that affect communication performance. The techniques of modulation and demodulation will be explained to allow students to understand and relate important concepts, including signal representation, performance measurements and system applications.

YEAR 2 COURSE CURRICULUM

Module Name	Credit Units
Level 2.1 (18 hours per week)	
Computer Networks Specialisation Option	
Applied Digital Electronics	3
Integrated Real-world Project 3	4
Network Fundamentals	4
Quality Systems & Analytics	3
Servers & Cloud Fundamentals	4
Robotics & Communication Specialisation Option	
Applied Digital Electronics	3
Integrated Real-world Project 3	4
Network Fundamentals	4
Quality Systems & Analytics	3
Applied Analogue Electronics	4
Level 2.2 (20 hours per week)	
Computer Networks Specialisation Option	
Integrated Real-world Project 4	4
Microcontroller & Interfacing	5
Object Oriented Programming	5
Routing & Switching	4
World Issues: A Singapore Perspective^	2
Robotics & Communication Specialisation Option	
Communication Systems	4
Integrated Real-world Project 4	4
Microcontroller & Interfacing	5
Object Oriented Programming	5
World Issues: A Singapore Perspective^	2

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YEAR 3 COURSE MODULES

LEVEL 3.1

COMMON MODULES

Integrated Real-world Project 5
The aim of this module is for students to apply the knowledge learnt, their initiative and creative ability and practical skills to real-world engineering projects. These projects may take the form of an investigation or the development of engineering hardware, software or both. Students will work in teams to undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to communicate their results, concepts and ideas of the engineering projects they have undertaken and develop confidence in tackling projects at higher levels.

Internet of Things
This module aims to equip students with a basic knowledge about Internet of Things (IoT). Students will learn the system architecture of a typical IoT system with a good understanding on functionalities of its building blocks. They will acquire the necessary skills and knowledge through practical exercises and lectures/tutorials. Upon completion of the module, students are equipped with knowledge and skills to design and implement a simple IoT system prototype with off-the-shelf equipment/platforms/services.

Mobile Application Programming
This module aims to provide students with hands-on training on basic mobile applications development using an open-source platform. Students will learn basic mobile app architecture and design concepts. They will also have a good understanding of the different building blocks in a mobile app.

COMPUTER NETWORKS SPECIALISATION OPTION

Scaling & Connecting Networks
This module describes the architecture, components, and operations of routers and switches in larger and more complex networks and on the WAN technologies and network services required by converged applications in a complex network. Students learn how to configure routers and switches for advanced functionality. By the end of this module, students will be able to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, and STP in both IPv4 and IPv6 networks. Students will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network, configure PPPoE, GRE, single-homed eBGP, extended IPv4 and IPv6 ACLs., SNMP and Cisco SPAN, QoS and the trends in networking including Cloud, virtualisation, and SDN.

ROBOTICS & COMMUNICATION SPECIALISATION OPTION

Embedded Robotics
This module provides an introduction to the fundamental analysis of various mechanisms and electrical circuits within the context of robotics discipline. It also covers different types of sensors used in robotics applications. The operating principles of sensors (infrared light, ultrasonic sound and embedded vision) as well as the basic signal conditioning such as signal amplification and noise filtering.

Level 3.2

6-Month Internship (Local/Overseas)
6-Month Internship is a module whereby students will be attached to sponsoring companies for a period of approximately 22 weeks. During their internships, they will undertake projects assigned by the companies or be involved in operations or maintenance-related work. Student internships may be undertaken locally or overseas.

6-Month Final Year Project
In this module, students work full-time on their final year projects for 20 weeks. Students will work on project titles ranging from system design and integration, research and development, computer applications and others. Students will also be given training in relevant technologies and skills at the beginning of the programme to build their knowledge. They learn and apply project management to enable them to complete their projects in time. They work closely with their supervisors on research, design, implementation, problem solving, testing, and analysis of results and modify the prototype to meet design requirements; and develop a good standard of technical skills in construction of systems or circuit boards and operating measuring instruments, equipment and tools. Project work cultivates a sense of positive work attitude, team spirit and co-operation among the students. They will also write the project reports; prepare for project presentations and project inspections.

YEAR 3 COURSE CURRICULUM

Module Name	Credit Units
Level 3.1 (20 hours per week)	
Computer Networks Specialisation Option	
Integrated Real-world Project	4
Internet of Things	4
Mobile Application Programming	4
Project ID: Connecting the Dots^	4
Scaling & Connecting Networks	4
Robotics & Communication Specialisation Option	
Embedded Robotics	4
Integrated Real-world Project	4
Internet of Things	4
Mobile Application Programming	4
Project ID: Connecting the Dots^	4
Level 3.2 (20 hours per week)	
6-Month Internship (Local/Overseas) OR 6-Month Final Year Project	20

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