

ELECTRONIC & COMPUTER ENGINEERING COURSE MODULES

You only need to look around to know that electronics 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 electronics, computer and communication engineering. With our industryrelevant 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 five specialisation options. Then in your final year, put your knowledge to the test with a six-month internship with industry leaders such as Xilinx, STATS ChipPac, ST Kinetics, M1 and Singtel.

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.

LEVEL 3.1 & 3.2

Fundamentals of Control Systems

This is a core module for Level 2 Diploma in BME and Level 3 Diploma in ECE, AE but it is an elective module for the Level 3 Diploma in ES. At the end of this module, students will gain an insight into the basic concepts of control systems and its analysis.

Key topics covered in this module include basic concepts of automatic control, control systems components, simple analytical tools and stability analysis of systems. Students are also introduced to the use of Matlab/Simulink as a computer tool in control systems analysis. A brief overview of programmable logic controllers is also included.

Six-month Internship (Local/Overseas)

Six 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 company or be involved in operations or maintenance-related work. Student internships may be undertaken locally or overseas.

Six-month Project Design & Development

In this module, students work full-time on their final-year project 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 project in time. They work closely with their supervisor(s) 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 report; prepare for project presentation and project inspection.

Project ID - Connecting the Dots (IS Module)

This module aims to prepare students for an increasingly globalized and interconnected world where problems are multi-faceted and require interdisciplinary research and collaboration to solve. Using a project-based learning approach, students will have the opportunity to work in a multi-disciplinary team to investigate and propose comprehensive recommendations for a pressing real-world problem affecting Singapore. They will be guided to step out of their disciplinary silos and effectively communicate and collaborate with peers from different backgrounds. Ultimately, the module seeks to develop independent learning skills and the ability to synthesize diverse strands of

knowledge to solve a complex problem, while impressing on students the importance of being a responsible global citizen.

COMMON MODULES:

Aerospace Electronics, Computer & Mobile Technology, and Microelectronics Options

Data Communications

This is a core module for Level 2.2 / 3 Diploma in ECE. This module provides the foundation for understanding principles in data communication. It will train students to understand and apply key concepts and processes associated with:

- Data transmission of information
- Network topologies
- Transmission media
- OSI reference model & TCP/IP protocol suite
- IP addressing and Subnetting

This module also introduces students to the mobile data communications.

Digital Communications

This is a core module for Level 2/3 Diploma in ECE. This module is intended to provide the foundation for understanding principles in digital communications. Students will acquire understanding of and be able to apply key concepts and processes associated with digital transmission of information and transmission media.

Key topics covered in this module includes channel capacity of a noiseless and a noisy communication channel, pulse modulation techniques, types of sampling, sampling criterion, Pulse-code-modulation system, frequency and time multiplexing techniques, T1 PCM-TDM system, asynchronous and synchronous transmission format, line codes waveforms in digital baseband signaling.

AEROSPACE ELECTRONICS OPTION

Aerospace System Design

This module aims to provide students with the basic understanding of the process of avionic system design, analysis and integration. Concept and fundamental understanding of flight control, avionic instruments, closed loop control system and PID Controllers will be introduced. Apart from the concept and theory introduced, another aspect of the learning experience will be through hands-on practical sessions and mini project.

Aircraft Navigation & Communication Systems

This module introduces the theory of operations and functional descriptions of airborne navigation, surveillance and communications systems. At the end of the module, students will acquire content knowledge and understanding of a range of air navigation, surveillance and communications systems deployed on the commercial and general aviation aircraft.

Key topics in this module include ADF, VOR, DME, ILS and MLS, Radar, ELT, TCAS, INS and GPS and avionics digital databus standards. The communication systems include HF and VHF communication systems. The standard digital databus communications protocol such as ARINC 429, ARINC 629 and AFDX used by the modern commercial aircraft will be covered.

COMPUTER & MOBILE TECHNOLOGY OPTION

Computer Systems Architecture & Administration

This module will equip students with competencies to describe the architecture of a general purpose computer system, explain the function of its hardware and be able to administer the software to operate it in a server-based computing environment.

Mobile Device Technology

This is a module for the Computer & Mobile Technology Specialization. This module introduces the essential elements of a mobile computing platform. Key topics include single-board computers, high-performance embedded systems, mobile operating systems, sensory devices (such as GPS, accelerometer, compass and camera), and wireless sensor networks. Student will apply the knowledge to integrate the various elements and develop different real-life applications.

DIGITAL MEDIA & COMMUNICATION OPTION

Digital Audio, Video Processing & Applications

This module is offered to students in the Digital Media and Communication option. It covers the fundamentals of human hearing and visual systems in relation to the development of digital audio, image and video processing and coding techniques. A detailed coverage of audio, image and video compression techniques and standards are included. Examples of applications in digital audio & video storage and processing standards used in digital radio and TV, portable media devices e.g. MP3 players and home digital entertainment systems will also be included.

Digital Media Technologies & Communication

This is a Level 3 module for students in the Digital Media & Communication (DMC) option in ECE. This module is intended to introduce students to the basic techniques involved in digital media processing and transmission. At the end of this module, students will acquire content knowledge and an understanding of the fundamentals required in working with digital media content.

Key topics covered in this module include the acquisition of digital media signals from analog inputs, and the basic techniques used for their processing. Students will learn the concepts of modulation and demodulation, and of channel coding and decoding, which are widely used in digital communication systems for the distribution of digital media content. Applications in the area of cellular networks and satellite communications are also discussed.

Digital Signal Processing

This is a third year core module for Diploma in Electronic & Computer Engineering, DMC Option, and an elective for Diploma in Engineering Science. The main objective of this module is to provide the students with the knowledge of digital signal processing (DSP) technology and also to equip them with the practical skill in DSP software and hardware implementation. It will also provide the students with the ability to work on various advanced digital signal processors.

Key topics covered in this module include Discrete-Time Fourier Transform, Discrete Fourier Transform, z-Transform, and digital filter design for FIR, and IIR filters.

MICROELECTRONICS OPTION

Advanced Wafer Fabrication Technology

The Advanced Wafer Fabrication Technology is a third year module for students taking Microelectronic Option in the Electronic and Computer Engineering Division, Ngee Ann Polytechnic. Students taking this module have already been taught the basics of wafer fabrication technology during their second year. The AWFT module will focus on the silicon wafer fabrication process with emphasis on hands-on training in the NP cleanroom. Liquid crystal display fabrication technology will also be covered in this module. At the end of this module, students should be able to understand the individual fabrication processes that produce a microchip. Topics cover include Oxidation, Diffusion, Photolithography and Etching. Students will be assessed based written tests assignment and practical test.

Integrated Circuit Packaging, Assembly & Test

This is a core module taken by Microelectronics Option students in Level 3. It aims at providing students with an introductory knowledge in Integrated Circuit (IC) Packaging, Assembly and Testing technology so as to prepare them for the manufacturing environment in their careers. It covers basic IC packaging, surface-mount board assembly, statistical process control, IC testing methodology and reliability as well as failure analysis of IC.

NETWORK SYSTEMS & SECURITY OPTION

Basic Routing & Switching

This module introduces the architecture, components, and operations of routers and switches in medium-size network networks. It also provides extensive coverage of networking topics, from fundamentals to advanced IP applications and services. Students would acquire knowledge and skills in configuring LAN switches and IP routers, identifying basic security threats, virtual LAN (VLAN) and inter-VLAN routing operations, dynamic & static routing concepts, configuring OSPF in both IPv4 and IPv6, understanding and configuring Access Control List (ACL), configuration and troubleshooting DHCP & network address translation (NAT) operations.

Cloud Computing & Data Centres

This module provides students with the required technology essential across all domains- including server, storage, and networking - to help develop data centres awareness. A strong knowledge and skills in cloud computing technologies and services are developed. Key topics covered in this module include public cloud deployment, service models, infrastructure on high availability and resilient design. The assessment modes / performance tasks are hands-on practical, written tests and exam.

Linux Servers

This module covers the basics of the Linux operating system and server. Concepts include the use of Linux commands to access and manage directories, files, setting of file security and access rights, usage of key Linux tools and commands, management of users, processes and software in the system, and basic implementation of servers such as LAMP, DNS and DHCP, in a network. With lab-based and project-based learning as its signature pedagogies, the hands-on practical sessions and tests coupled with project work will assess students on their technical knowledge, problem-solving/troubleshooting skills, project management, documentation, presentation and teamwork.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 3	
INTERNSHIP	
Level 3.1 (23 to 25 hours per week)	
Common Modules	
Fundamentals of Control Systems	5
Project ID: Connecting the Dots ^	4
COMPUTER & MOBILE TECHNOLOGY OPTION	
Computer Systems Architecture & Administration	5
Data Communications	3
Digital Communications	3
Mobile Device Technology	5
DIGITAL MEDIA & COMMUNICATION OPTION	
Digital Audio, Video Processing & Applications	5
Digital Media Technologies & Communication	5
Digital Signal Processing	5
MICROELECTRONICS OPTION	
Advanced Wafer Fabrication Technology	5
Data Communications	3
Digital Communications	3
Integrated Circuit Packaging, Assembly & Test	3
NETWORK SYSTEMS & SECURITY OPTION	
Basic Routing & Switching	5
Cloud Computing & Data Centres	5
Linux Servers	5
Level 3.2 (22 hours per week)	
6-Month Internship (Local/Overseas)	22

NON-INTERNSHIP

Level 3.1 (23 to 25 hours per week) Common Modules

Fundamentals of Control Systems	5
Project ID: Connecting the Dots ^	4

AEROSPACE ELECTRONICS OPTION

Aerospace System Design	4
Aircraft Navigation & Communication Systems	5
Data Communications	3
Digital Communications	3

COMPUTER & MOBILE TECHNOLOGY OPTION

Computer Systems Architecture & Administration	5
Data Communications	3
Digital Communications	3
Mobile Device Technology	5

DIGITAL MEDIA & COMMUNICATION OPTION

Digital Audio, Video Processing & Applications	5
Digital Media Technologies & Communication	5
Digital Signal Processing	5

MICROELECTRONICS OPTION

Advanced Wafer Fabrication Technology	5
---------------------------------------	---

Data Communications	2
Digital Communications	2
Integrated Circuit Packaging, Assembly & Test	4
NETWORK SYSTEMS & SECURITY OPTION	4
Basic Routing & Switching	4
Cloud Computing & Data Centres	4
Linux Servers	4

Level 3.2 (22 hours per week)

6-month Project Design & Development	22
--------------------------------------	----

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.