

DIPLOMA IN ELECTRICAL ENGINEERING (EE) 3-YEAR COURSE

ELECTRICAL, ELECTRONICS & COMPUTER
CLUSTER

The **Diploma in Electrical Engineering (EE)** offers a broad-based curriculum to prepare students for exciting careers in major industries such as aerospace, chemical, automotive, medical, entertainment, financial services, and other nonelectrical industries, as well as in computers, electronics, communications, power, and other electrical industries.

In the first and second year, students will pick up technical skills in the core fields of electrical, electronic and computer engineering, and related skills in areas such as management, entrepreneurship, communication, innovation.

In the final year, students will be given the flexibility to specialise in areas such as Power Engineering, Solar Technology, Electronics, Engineering Management and Audio-visual Technology. To make learning more interesting and challenging, students have the option to either work on a project or take up a local/overseas internship. Local internships are with leading companies such as PowerGrid Ltd and Singapore Technologies Aerospace, while overseas ones are with companies and institutions of higher learning in China, Australia and Germany.

The full-time design and development project enables students to acquire research and product-development skills, and provides a platform for enterprising students to come up with their own products and patents. Students are also given ample opportunities to take part in competitions to showcase their talents and innovativeness.

Strategic industry collaborations have spawned many specialised training areas. The Electrical Engineering (EE) Division boasts of a host of excellent facilities, including the only High Voltage Training Centre in Singapore, Power Quality Centre, Instrumentation & Control Centre and Solar Technology Centre.

EE forges strong industrial partnership with many leading companies such as National Instruments, Fluke Networks, Tyco Electronics Singapore and Omron Asia Pacific to keep abreast with cutting-edge technologies. Our students enjoy the benefits of learning the latest technologies and working with the most advanced facilities and equipment.

In response to the increasing industry demand for engineering graduates to have skills in the area of business management, a Minor in Business Management was introduced. It aims to nurture graduates who are technically competent and equipped with business knowledge to succeed in the changing industry environment.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examination (or equivalent) results:

Subject	'O' Level Grade
English Language*	1-7
Mathematics (Elementary/Additional)	1-6
Science (with Physics, Chemistry or Biology component) or Computer Studies or Design & Technology or Fundamentals of Electronics	1-6

You must also fulfil the aggregate computation requirements.

* Candidates with English as a second language must have attained a minimum grade of 6.

Candidates with severe vision deficiency should not apply for the course. Those with colour appreciation deficiency may be considered, subject to an in-house test.

CAREER PROSPECTS

EE graduates have an excellent track record of being snapped up by various industries upon graduation. Many graduates have also moved up the corporate ladder to managerial positions, and a number have started their own businesses.

Armed with the Diploma in Electrical Engineering, graduates can look forward to a wide range of challenging and rewarding careers in numerous industries, such as electrical consultancy and contracting, electronics, aerospace, biomedical, communications, process control, high-tech manufacturing, computer networking, and world-class resorts, just to name a few.

EE graduates are recognised by the Energy Market Authority for the application of the Electrical Technician Licence. The licence is an asset if they intend to start an electrical contracting business or work in one.

ACCREDITATION FOR FURTHER STUDIES

Our graduates are granted credit exemptions or direct entry into the second or third year in local and overseas universities. The diploma will also enable our graduates to apply for other degree programmes in the areas of business, accountancy, and arts and sciences at local universities. Some of the universities are:

- National University of Singapore
- Nanyang Technological University
- Singapore Management University
- Singapore University of Technology and Design
- University of Manchester (UK)
- University of Sheffield (UK)
- University of New South Wales (Australia)
- Queensland University of Technology (Australia)

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (27 hours per week)	
Electrical Technology	6
Engineering Mathematics 1	5
Engineering Mechanics	5
Computer Programming	4
Engineering: A Creative Profession	3
Idea Jumpstart^	2
Sports & Wellness^	2
Level 1.2 (25 hours per week)	
Analogue Electronics	5
Engineering Mathematics 2	5
Computer-Aided Drawing	2
Electrical & Electronic Practical Skills	3
AC Circuits	4
Digital Electronics & Practice	2
Communication & Contemporary Issues^	4
YEAR 2	
Level 2.1 (25 hours per week)	
Electric Circuit Analysis & Measurement	6
Electrical Machines & Drives	6
Sensors & Instrumentation	3
Industrial Automation	3
Microcontroller & Applications	3
Idea Blueprint^	2
Interdisciplinary Studies (IS) module^	2
Level 2.2 (23 hours per week)	
Electronic Devices & Circuits	6
Engineering Mathematics 3A	4
Power Devices & Applications	3
PC Networking	3
Programmable Logic Devices	3
Idea Launchpad^	2
Interdisciplinary Studies (IS) module^	2
YEAR 3	
Level 3.1 (Common Modules)	
World Issues: A Singapore Perspective^	2
Interdisciplinary Studies (IS) module^	2
Power Engineering Option (24 hours per week)	
Control & Automation	5
Power Distribution & Protection	5

Module Name	Credit Units
Electrical Installation Design	5
Elective Discipline Module (Engineering Contract & Project Management, Power System Economics & Energy Market, Power Electronics or Design & Operation of Photovoltaic Systems)	5
Audio-visual Technology Option (24 hours per week)	
Stage Lighting	5
Video Conferencing and Streaming Technology	5
Audio Video Systems Integration	5
Elective Discipline Module (Electrical Installation Design, Electronic System Design or Media Transmission System)	5
Engineering Management Option (24 hours per week)	
Engineering Contract & Project Management	5
Power System Economics & Energy Market	5
Electrical Installation Design	5
Elective Discipline Module (Power Distribution & Protection, Design & Operation of Photovoltaic Systems or E-Commerce Technology & Applications)	5
Electronics Option (24 hours per week)	
Electronic System Design	5
Power Electronics	5
Embedded System Design	5
Elective Discipline Module (Engineering Contract & Project Management, Electrical Installation Design or Solar Cell Technology)	5
Solar Technology Option (24 hours per week)	
Solar Cell Technology	5
Photovoltaic Technology	5
Design & Operation of Photovoltaic Systems	5
Elective Discipline Module (Electrical Installation Design, Power Distribution & Protection or Engineering Contract & Project Management)	5

Module Name	Credit Units
Level 3.2 (22 hours per week)	
Six-month Local/Overseas Internship	22
or	
Project Design & Development	22
MINOR IN BUSINESS MANAGEMENT#	
YEAR 2	
Level 2.1 (26 hours per week)	
Electric Circuit Analysis & Measurement	6
Electrical Machines & Drives	6
Sensors & Instrumentation	3
Industrial Automation	3
Marketing Fundamentals	4
Business & the Economy [^]	2
Idea Blueprint [^]	2
Level 2.2 (24 hours per week)	
Electronic Devices & Circuits	6
Engineering Mathematics 3A	4
Power Devices & Applications	3
PC Networking	3
Fundamentals of Financial Management	4
Effective People Management [^]	2
Idea Launchpad [^]	2
YEAR 3	
Level 3.1 (22 hours per week)	
Engineering Contract & Project Management	5
Starting & Managing an Enterprise	4
Business Management Elective	4
Elective Discipline Module (Power System Economics & Energy Market, Electrical Installation Design, Design & Operation of Photovoltaic Systems or E-Commerce Technology & Applications)	5
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2
Level 3.2 (22 hours per week)	
Six-month Local/Overseas Internship	22
or	
Project Design & Business Application	22

Notes:

[^] For more details on Interdisciplinary Studies (IS) modules, please log on to www.np.edu.sg/is/

[#] The Minor in Business Management has the same Year 1 curriculum.

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

Electrical Technology

This module introduces the necessary foundation for electrical circuit analysis covering electrical theorems and techniques for analysing and solving direct and alternating current circuit problems. Laboratory assignments include basic electrical measurement skills and concepts learnt in lectures and tutorials.

Engineering Mathematics 1

This module provides students with mathematical skills for solving basic engineering problems. Topics are organised to keep pace with applications in the engineering modules. They include algebra, trigonometry, logarithms, matrices and complex numbers. A Computer Algebra System will be used where appropriate.

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. 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 and rotational motion in two dimensions will be covered. Topics include Kinematics of linear and rotational motion, and Kinetics of linear and rotational motion.

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.

Engineering: A Creative Profession

This continuous assessment module provides students the opening exposure to engineering analysis, design, and problem-solving through case studies and projects. It excites students with a view of what to expect in engineering, facilitate them with a foundation of essential development tools commonly used, and inspires them in a profession driven by the passion to advance society through technology.

LEVEL 1.2

Analogue Electronics

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.

Engineering Mathematics 2

This module equips students with further mathematical skills to solve engineering problems. Topics include further trigonometry, trigonometric graphs, plane analytic geometry, differentiation with applications, and integration with applications.

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 & 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.

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.

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.

LEVEL 2.1

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.

Electrical Machines & Drives

This module provides students with the basic concepts and working principles of common types of electrical machines and motor drives. They will be introduced to the construction, working principles, performance characteristics of transformers, dc motors, induction motors, synchronous generators and stepper motors, and their applications in the industry. Students will also be introduced to motor drive systems and their applications.

Sensors & Instrumentation

The module provides students with graphical programming skills using LabVIEW and the knowledge to develop virtual instrumentation systems. Students learn the concept of virtual instrumentation, sensor technologies, data acquisition devices, and computer interfaces such as RS232, GPIB and USB.

Industrial Automation

This module will train students in electrical control systems, which cover sequential motor control circuits, direct-on-line and star-delta motor starter circuits. This module also introduces them to programmable logic controllers, control devices and the relevant Window-based programming software. Students will learn to design ladder diagrams for programming the Programmable Logic Controller (PLC) and perform exercises relevant to its industrial applications.

Microcontroller & Applications

This practice-oriented module is designed to equip students with an understanding of the conceptual and operational aspects of a microcontroller embedded system. Students will learn about the hardware and software design of a general purpose computer system, the fundamental concepts of microcontrollers and the interfacing with external applications. Intel's 8051 microcontroller series will be used as a reference example. Assembly and C language will be used in project-based exercises. Students will also learn to use microcontrollers for engineering applications.

Marketing Fundamentals

The module introduces concepts and principles of the marketing of goods and services to enable students to better understand and evaluate the marketing system in which products and services are planned, priced, promoted and distributed. Apart from the four P's in marketing, topics covered also include segmentation, targeting and positioning, product mix, service marketing, channel decisions and branding.

LEVEL 2.2

Electronic Devices & Circuits

This module aims to provide students with a general understanding of some commonly used analogue and digital electronic devices. The module covers the operating principles, characteristics and applications of operational amplifiers, digital-to-analogue and analogue-to-digital converters, integrated-circuit logic families and memory devices.

Engineering Mathematics 3A

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

Power Devices & Applications

This module trains students in the use of power semiconductor devices in the area of electrical power control. Students will learn about the characteristics and application techniques of devices. They will also have the opportunity to construct controllers made from these devices to operate motors, solar power supply, voltage regulators and lighting control circuits. The hands-on sessions will also hone students' skills in the use of electronic workbench instruments and troubleshooting techniques.

PC Networking

Computer networks are essential to organisations. In this module, students will study PC Networking (PCN) that focuses on data networking knowledge. The Open System Interconnection (OSI) reference model and Transmission Control Protocol/Internet Protocol (TCP/

IP) model will be used to explain important networking concepts. Standards and products associated with each OSI layer and data flow in networking devices will be discussed. Premises structured cabling systems standards, media types and performance criteria, system design and installation recommendations are also covered.

Programmable Logic Devices

Students will focus on digital systems design and Programmable Logic Devices (PLD), combining them into an entity useful for designers in the areas of digital systems and rapid system prototyping. All major design description (entry) tools are introduced, including schematic entry tools and hardware description languages. Students will use the complete design procedure, which includes design entry, processing and verification to design a simple digital system. Other topics include the introduction to VHDL, a tool used increasingly in digital system prototyping and design.

Fundamentals of Financial Management

This module covers basic accounting and financial concepts and principles to enable students to understand and interpret financial statements and reports. Students will also have an understanding of costing concepts and the financial techniques used in making financial decisions and evaluating capital investment projects.

LEVEL 3.1

Audio Video Systems Integration

In this module, students will learn the standards, characteristic and specifications of audio video devices such as DVD player, surround sound speaker systems, MP3/MP4 players, HDTV (LCD/Plasma) and HDMI cables & connectors etc. Students will learn how to design integrated audio video systems which covers equipment selection, acoustic & sound proofing, speaker selection and placement and also cable selection & wiring etc. Module will also introduce students to the latest development in the Digital Living Network Alliance (DLNA) software and devices.

Control & Automation

This module examines the characteristics and designs of the industrial automation process. Two main areas will be covered - continuous feedback control and discrete sequential control. Topics in continuous feedback control include system concept and applications, process characteristics, control strategies, system performance, design of controllers/compensators, and modern digital control systems. Topics in discrete sequential control include system concept and applications, and design tools.

Design & Operation of Photovoltaic 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. Topics include concept of PV standalone and on-grid systems, sizing of cables and batteries, lightning protection, power protection and power quality issues.

E-Commerce Technology & Applications

This module begins with a brief history of the Internet and e-commerce, and goes on to cover the planning aspects of setting up an e-commerce site and the factors that attract surfers to return to it. Technical e-commerce topics include Hypertext Markup Language (HTML), VBScript, Structured Query Language (SQL), Active Server Pages (ASP .NET) and mobile Web applications (.NET Mobile). These technologies allow an e-commerce site to be data-driven - a dynamic site that provides relevant and up-to-date information with powerful search capability.

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.

Electronic System Design

In this module, students will learn how to design a basic electronic system in the control of electrical equipment and drive systems. The practical considerations will be emphasised through design examples and case studies. The topics covered include the selection of a wide range of electronic devices such as passive and active discrete devices, and op amps for specific applications and the interpretation of manufacturers' datasheets. There will be hands-on laboratory work and the introduction of software design aids to carry out the electronic design tasks.

Embedded System Design

This module focuses on the fundamentals of embedded system design and will give students hands-on experience in both hardware and firmware. Students will be taught to use modern microcontroller technologies to implement real time control strategies, as well as techniques to interface between the embedded system and the real world. Various components of embedded systems will be introduced together with data acquisition concepts. Serial interface using the I2C bus is also discussed.

Engineering Contract & Project Management

This module provides students with an understanding of the various aspects of electrical contracting and management procedures. Upon completion of this module, they will be able to prepare competitive bids for submission of tenders for projects pertaining to electrical services. They will also be able to apply the knowledge gained in project/contract management. Topics covered include contract arrangements and condition of contracts, cost planning, tendering procedures, specification writing, interim certificates and payments, completion and final payment, as well as variations and their valuation.

Media Transmission System

This module allows students to learn about media data communication, analogue and digital transmission systems that include AM, FM, cable TV, satellite TV, DAB, and DVB. For data communication, students will gain an understanding of the base-band concept,

data encoder and decoder, error detection and correction, routing information, reconstruction and lock synchronisation. For wireless systems, students will study system configurations, transmitters and receivers, error performance, path loss, signal processing, bandwidth, data rate, relative complexity, advantages and disadvantages, and transmission standards.

Photovoltaic 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, parasitic resistance and cell efficiency. Students learn about PV cells interconnection, module fabrication and circuit design.

Power Distribution & Protection

In this module, students will gain a basic knowledge of high voltage and low voltage distribution systems, related equipment and protection devices. Topics include fault calculation, principles of operation of switching devices, switchboards, transformers and cables, and the economical aspects of power distribution systems. Laboratory sessions include the testing of protection devices, operation of electrical equipment, and familiarisation with the safety requirements and precautions to be taken in the operation and maintenance of electrical apparatus.

Power Electronics

This module deals mainly with the applications of power semiconductor devices for the control and conversion of electric power. The objective is to provide students with a broad understanding of the various power conversion circuits and their industrial applications. The 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 are studied in detail together with their applications.

Power System Economics & Energy Market

This module aims to equip students with a basic understanding of the economic principles underlying the introduction of competition in the electricity industry. Students will explore the structure, operation

and regulations of Singapore's electricity market, which was introduced to promote the efficient supply of competitively priced electricity and open up the wholesale and retail market for full competition.

Solar Cell Technology

The Solar Cell Technology module will focus on silicon bulk processes for the fabrication of photovoltaic devices. It aims to give students an understanding of how solar cell functions and fabrication. The module provides students with hands-on training in the NP cleanroom.

Stage Lighting

This module enables students to learn the technical and creative aspects of stage lighting. Topics include basic design, colour and exposure theory, types of lighting instruments, power distribution, control, safety, proper hanging, connection, focus, and control of instruments. Upon completion of this module, students will be able to perform creative lighting layout, install concert lighting, explain colour theory, integrate lighting control instrumentation, and set up a variety of motion lighting instruments.

Starting & Managing an Enterprise

Through this module, students generate business ideas and propose how these ideas can be developed into a business plan incorporating operational and financial requirements and marketing strategies for a new enterprise. In addition, students will learn how the principles of management can be applied to organise and develop the enterprise. Topics covered include entrepreneurial concepts and issues, business entry and exit strategies, types of business ownership, sources of business financing, venture launch and management principles.

Video Conferencing and Streaming Technology

This module provides training in streaming technologies that include local network, internet audio and video streaming technology, web-casting and voice over IP (VoIP). Students will acquire knowledge of hardware configurations, transmitters and receivers, quality of service, routing, re-sequence, signal processing and

streaming standards. The module also includes an overview of the MPEG-4 data compression mechanism; and issues related to shooting video for streaming, editing, quality control, and the formatting of streaming audio and video to fit various applications such as video conferencing, web-casting, pod-casting and mobile entertainment systems.

BUSINESS MANAGEMENT ELECTIVES

(Students to choose one of the four electives below)

E-Business in Practice

The module introduces database concepts, information systems, value chains and the integrated enterprise systems. Students will develop multi-table database applications for e-business, incorporating interactive digital media functionalities and also gain exposure in buying and selling on the Web using auction sites with payment settlement functions. They will learn business workflow modelling through the business value chain to improve business processes using IT systems and tools within an integrated enterprise system.

Managing Service Operations

This module introduces the operations in service organisations and the use of techniques for designing, planning, organising and controlling resources for the delivery of goods and services to meet customers' needs and organizational objectives. Concepts covered include service facility, managing facilitating goods, forecasting demand, managing waiting lines, process improvement, inventory management, service supply relationship and service quality.

Supply Chain Management

This module introduces students to the process of planning, implementing, controlling the operations of the supply chain. It will cover the movement and storage of raw materials, work-in-process inventory and finished goods from point-of-origin to point-of-consumption. The module also emphasises the effect supply chain management has on the success and profitability of the organisation.

Understanding Buyer Behaviour

The module provides students with a basic understanding of buyer behaviour concepts. It explores the different types of buying decision processes and the various influencing factors that affect buyer decisions. Buyers could be consumers or corporate buyers. Topics covered include consumer decision-making processes, perceptions and attitudes, consumer demographics and lifestyles, and cultural and group influences.

LEVEL 3.2

Six-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 & 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.

Project Design & Business Application

In this module, students are expected to integrate the knowledge they gained during the first two years of study and undertake a 6-month long project in the field of Electrical Engineering. They will also be required to develop a business proposal/plan which forms an integral part of the whole project.

DIPLOMA PLUS PROGRAMME

The Diploma Plus Programme (DPP) is designed to provide students with proficiency in a selected domain area, either to broaden or deepen a student's knowledge/skills in his/her main discipline of study, or to equip a student with additional professional knowledge that would better prepare him/her for further study or increase their employability. Students can select elective modules from a wide range of clusters to obtain their Diploma Plus Certificate. DPP is optional and it will not affect the graduating requirement for the award of a diploma.

Students can choose the DPP clusters from the range listed below. The offer of a DPP cluster is subject to the condition that the minimum class size is met and based on available vacancies.

Engineering Clusters

- Applied Physics*
- Electrical Control & Measurement

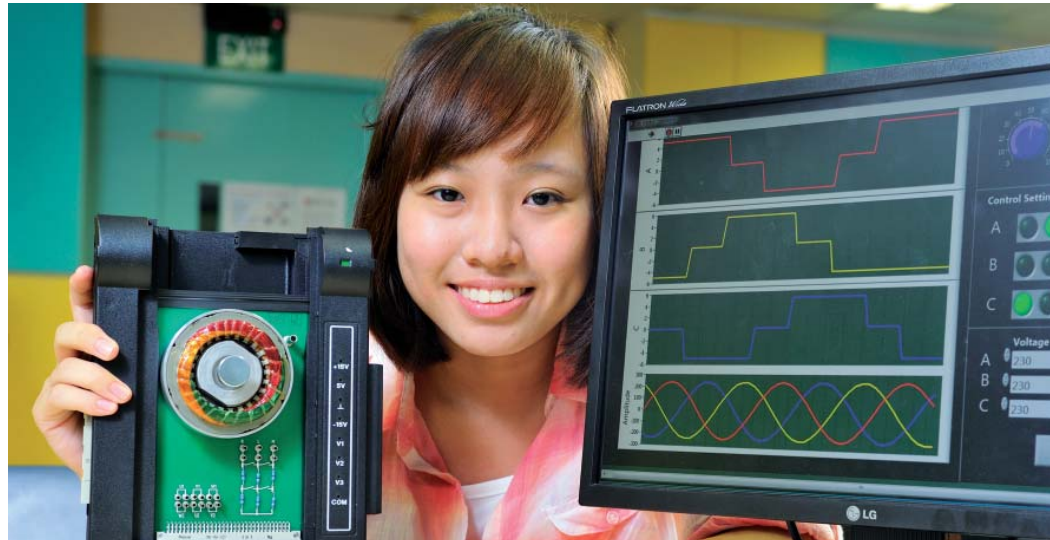
- Industrial Control (World Skills Singapore)
- Leisure & Retail Management
- Stage Management & Technology

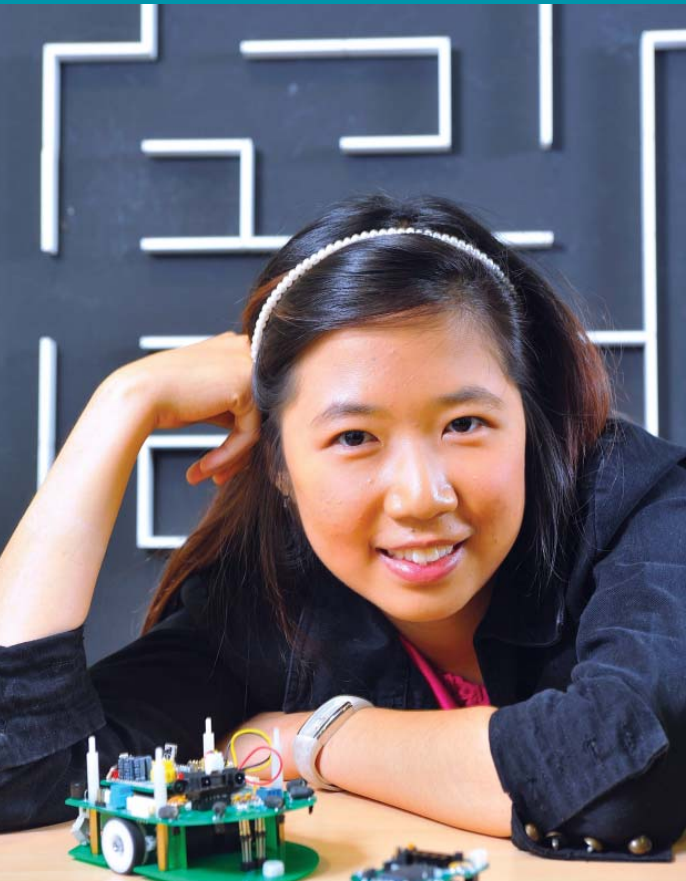
Other Available Diploma Plus Certificates

- Advanced Engineering Mathematics*
- Business
- Innovation Management
- Languages (Japanese)

* Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The programme aims to bridge the gaps between the curriculum of engineering mathematics at polytechnics and that of first-year engineering mathematics in universities.

For detailed module descriptions under each cluster, please refer to page 180.





DIPLOMA IN ELECTRONIC & COMPUTER ENGINEERING (ECE)

3-YEAR COURSE

ELECTRICAL, ELECTRONICS &
COMPUTER CLUSTER

The electronics industry remains one of the major industries behind Singapore's economic growth. It has transformed itself over the years into a world-class player by producing higher value-added products and providing end-to-end Research & Development (R&D) services. To meet market demand, the curriculum of the **Diploma in Electronic & Computer Engineering (ECE)** is continuously revised to support new industry developments. Business knowledge and a global perspective have also been incorporated into the course to prepare students for the changing landscape of the electronics industry.

The course is designed to provide students with a core foundation in electronics, computer and telecommunication engineering in their first two years of study.

In the final year, students can specialise in areas such as Aerospace Electronics, Microelectronics, Computer & Mobile Technology and Digital Media & Communication. These specialisations provide our graduates with an edge in the industry.

In response to the increasing industry demand for engineering graduates to have skills in the area of business management, a Minor in Business Management was introduced. It aims to nurture graduates who are technically competent and equipped with business knowledge to succeed in the changing industry environment.

Six-month local and overseas internships with established universities, research institutes and leading companies such as IBM International and Singapore Telecommunications Ltd, are offered to Microelectronics, Computer & Mobile Technology, Digital Media & Communication options and Minor in Business Management students.

ENTRY REQUIREMENTS

To be eligible for consideration, candidates must have the following GCE 'O' Level examination (or equivalent) results:

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English Language*	1-7
Mathematics (Elementary/Additional)	1-6
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You must also fulfil the aggregate computation requirements.

* Candidates with English as a second language must have attained a minimum grade of 6.

Candidates with severe vision deficiency should not apply for the course. Those with colour appreciation deficiency may be considered, subject to an in-house test.

CAREER PROSPECTS

Singapore's electronics industry has become an important player in the global electronics market. It is the largest manufacturing contributor to Singapore's 2010 GDP, as reported by Singapore Economic Development Board (EDB). EDB forecasted steady growth in the computer, telecommunication, aerospace and microelectronics sectors. The expansion has translated into a high demand for ECE graduates in 2011.

ECE graduates are sought by industry for diverse careers in electronics, software and systems, telecommunications and aerospace sectors. They are involved in product design, development, testing and maintenance, technical sales and support at the middle management level.

ACCREDITATION FOR FURTHER STUDIES

ECE graduates enjoy advanced standing in local and overseas universities when they apply for admission to relevant courses. For instance, National University of Singapore and Nanyang Technological University offer credit exemption equivalent to almost a year of study for courses such as Computer Science, Computer Engineering and Electrical & Electronic Engineering. In addition, graduates may apply for other courses such as Business & Computing and Mathematical Sciences.

Many of our graduates have successfully enrolled in local and overseas universities. Some have even received scholarships and progressed beyond the basic degree to attain their masters and doctorates.

COURSE CURRICULUM

Module Name	Credit Units
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YEAR 1

Level 1.1 (27 hours per week)

Electrical Technology	6
Electronic Practical Skills	4
Engineering Mathematics 1	5
Engineering Mechanics	5
Engineering: A Creative Profession	3
Sports & Wellness [^]	2
Idea Jumpstart [^]	2

Level 1.2 (27 hours per week)

Analogue Electronics	5
Computer Programming	4
Digital Electronics	6
Electrical & Electronic Drawing & Computer-Aided Design	3
Engineering Mathematics 2	5
Communication & Contemporary Issues [^]	4

Module Name	Credit Units
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YEAR 2

Level 2.1 (27 hours per week)

Analogue Circuit Design & Applications	5
Applications Programming	4
Electronic Design & Prototyping	4
Engineering Mathematics 3A	4
Telecommunication Principles	6
Idea Blueprint [^]	2
Interdisciplinary Studies (IS) module [^]	2

Level 2.2 (25 hours per week)

Data Communications & Networking	6
Electronic Project Design Practice	4
Microcontroller Programming & Interfacing	6
Object-Oriented Programming	5
Idea Launchpad [^]	2
Interdisciplinary Studies (IS) module [^]	2

YEAR 3 (INTERNSHIP)

Level 3.1 (19 hours per week)

Computer & Mobile Technology Option

Fundamentals of Control Systems	5
Mobile Device Technology	5
Mobile Application Programming	5
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2

Digital Media & Communication Option

Fundamentals of Control Systems	5
Digital Media Technologies & Communication	5
Digital Audio, Video Processing & Applications	5
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2

Microelectronics Option

Microelectronic Design & Test	5
Wafer Fabrication Technology	5
Fundamentals of Control Systems	5
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2

Level 3.2 (22 hours per week)

Six-month Internship	22
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Module Name	Credit Units
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YEAR 3 (NON-INTERNSHIP)

Level 3.1 (23 to 24 hours per week)

Aerospace Electronics Option

Fundamentals of Control Systems	5
Embedded System Design	4
Project Design & Development 1	10
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2

Computer & Mobile Technology Option

Fundamentals of Control Systems	5
Mobile Device Technology	5
Project Design & Development 1	10
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2

Digital Media & Communication Option

Fundamentals of Control Systems	5
Digital Media Technologies & Communication	5
Project Design & Development 1	10
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2

Microelectronics Option

Microelectronic Design & Test	5
Wafer Fabrication Technology	5
Project Design & Development 1	10
World Issues: A Singapore Perspective [^]	2
Interdisciplinary Studies (IS) module [^]	2

Level 3.2 (22 to 23 hours per week)

Aerospace Electronics Option

Aircraft Electrical & Instrumentation Systems	6
Aircraft Navigation & Communication Systems	5
Project Design & Development 2	12

Computer & Mobile Technology Option

Computer Systems Architecture & Administration	5
Mobile Application Programming	5
Project Design & Development 2	12

Module Name	Credit Units
Digital Media & Communication Option	
Digital Signal Processing	5
Digital Audio, Video Processing & Applications	5
Project Design & Development 2	12
Microelectronics Option	
Fundamentals of Control Systems	5
Advanced Wafer Fabrication Technology	5
Project Design & Development 2	12
MINOR IN BUSINESS MANAGEMENT#	
YEAR 2	
Level 2.1 (25 hours per week)	
Analogue Circuit Design & Applications	5
Applications Programming	4
Electronic Design & Prototyping	4
Engineering Mathematics 3A	4
Marketing Fundamentals	4
Business & the Economy^	2
Idea Blueprint^	2
Level 2.2 (23 hours per week)	
Telecommunication Principles	6
Internet Technology	3
Microcontroller Programming & Interfacing	6
Fundamentals of Financial Management	4
Effective People Management^	2
Idea Launchpad^	2
YEAR 3 (INTERNSHIP)	
Level 3.1 (23 hours per week)	
Data Communications & Networking	6
Fundamentals of Control Systems	5
Starting & Managing an Enterprise	4
Business Management Elective	4
World Issues: A Singapore Perspective^	2
Interdisciplinary Studies (IS) module^	2
Level 3.2 (22 hours per week)	
Six-month Internship	22
YEAR 3 (NON-INTERNSHIP)	
Level 3.1 (28 hours per week)	
Data Communications & Networking	6
Project Design & Business Application 1	10

Module Name	Credit Units
Starting & Managing an Enterprise	4
Business Management Elective	4
World Issues: A Singapore Perspective^	2
Interdisciplinary Studies (IS) module^	2
Level 3.2 (22 hours per week)	
Computer Systems Architecture & Administration	5
Fundamentals of Control Systems	5
Project Design & Business Application 2	12
Notes:	
^For more details on Interdisciplinary Studies (IS) modules, please log on to www.np.edu.sg/is/	
# The Minor in Business Management has the same Year 1 curriculum.	
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

Electrical Technology

This module introduces the necessary foundation for electrical circuit analysis covering electrical theorems and techniques for analysing and solving direct and alternating current circuit problems. Laboratory assignments include basic electrical measurement skills and concepts learnt in lectures and tutorials.

Electronic Practical Skills

This is a hands-on module that aims to equip students with the necessary practical skills in electronic circuit construction, testing, measurement and analysis. Students will also put into practice concepts covered in the level 1 module Electrical Technology.

Engineering Mathematics 1

This module provides students with mathematical skills for solving basic engineering problems. Topics are organised to keep pace with applications in the engineering modules. They include algebra, trigonometry, logarithms, matrices and complex numbers. A Computer Algebra System will be used where appropriate.

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. 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 and rotational motion in two dimensions will be covered. Topics include Kinematics of linear and rotational motion, and Kinetics of linear and rotational motion.

Engineering: A Creative Profession

This activity-driven module introduces students to the vocabulary, skills, applications and excitement of the engineering discipline, creating professional awareness early in their course. Through case studies and projects, students enjoy their first exposure to analysis, design and problem solving. The module offers students an exciting glimpse of what to expect later in their course and provides them with a foundation of the essential tools needed to succeed in this dynamic profession.

LEVEL 1.2

Analogue Electronics

This module aims to introduce 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.

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.

Digital Electronics

This module covers the fundamentals of digital electronics. The basic principles and techniques of digital system and design are covered. It is also intended to prepare students for subsequent modules involving microprocessors and microcomputers. The main topics covered are number systems, Boolean Algebra, combinational logic circuits and minimisation techniques, flip-flops and multivibrators, IC counters, and data handling devices. Characteristics of standard TTL and high speed CMOS are also discussed.

Electrical & Electronic Drawing & Computer-Aided Design

This module introduces the concepts of electronic circuit drawing and printed circuit board (PCB) layout using a modern computer-based electronic design automation (EDA) package. Using the software, students will design PCBs, starting from schematic capture to PCB layout post-processing and library parts creation. The module, which adopts a completely hands-on approach, prepares them for final-year projects that involve electronic circuit design and manufacturing.

Engineering Mathematics 2

This module equips students with further mathematical skills to solve engineering problems. Topics include further trigonometry, trigonometric graphs, plane analytic geometry, differentiation with applications, and integration with applications.

LEVEL 2.1

Analogue Circuit Design & Applications

This module introduces students to the operating principles of commonly used analogue devices and circuits, such as operational amplifiers, oscillators and filters. Applications in various practical circuits are also illustrated.

Applications Programming

This practice-oriented module equips students with the fundamental knowledge and skills required to develop Windows applications. The students will develop conceptual understanding to design and develop applications to solve business and engineering problems. Main topics include branch and loop, array, data files accessing and methods.

Electronic Design & Prototyping

The main objectives of this module are to introduce students to the techniques of PCB computer-aided design, and to provide opportunities for the acquisition of practical skills in electronic project design. Students will learn the planning, development, construction

and testing of electronic prototypes. The focus of the module is on hands-on practice for basic PCB design, PCB fabrication and technical writing skills. Fault finding on electronic circuits, an essential skill in construction, is also introduced.

Engineering Mathematics 3A

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

Telecommunication Principles

This module introduces students to radio communication. It builds an understanding of the basic concepts of analogue communication systems. The characteristics of a basic communication system and the environmental factors that affect communication will be discussed. The concepts that are necessary for an understanding of linear systems will be explained, with an emphasis on resonance and filters. Students will be taught the fundamental concepts of analogue modulation and demodulation techniques such as AM and FM and their applications.

Marketing Fundamentals

The module introduces concepts and principles of the marketing of goods and services to enable students to better understand and evaluate the marketing system in which products and services are planned, priced, promoted and distributed. Apart from the four P's in marketing, topics covered also include segmentation, targeting and positioning, product mix, service marketing, channel decisions and branding.

LEVEL 2.2

Data Communications & Networking

This module provides the foundation for understanding principles in data communications and networking. Students will acquire an understanding of and be able to apply key concepts and processes associated with digital and data transmission of information, transmission media, the OSI reference model, network

topologies, protocols and TCP/IP protocol suite.

Electronic Project Design Practice

The main objective of this module is to enable students to appreciate the importance of project design from theory to practice. Students will learn the correct approach to the development, construction and testing of projects. The hands-on practice involves basic hardware design techniques and implementation. Fault-finding on electronic circuits is introduced to enhance the skills of the students. Hands-on practice, design of printed circuit boards using self-generated component footprints and report writing skills are also essential components of this module.

Microcontroller Programming & Interfacing

This module introduces students to the fundamentals of microcontroller programming and interfacing. C language programming is used to illustrate the operation of the microcontroller. Interfacing the microcontroller to basic input-output devices such as switches, LEDs, 7-segment displays and keypads help to demonstrate the behaviour of the application software running on a working system.

Object-Oriented Programming

This module builds on the foundation of the Applications Programming module and introduces the concepts of Object-Oriented Programming to the students. It covers the area from the fundamental concepts of Object-Oriented Programming to Web forms, database access, and some graphics and animation.

Internet Technology

The module covers the concept of the Web operations and also the tools used for developing Web-based applications. Students will learn the basics of HTML, Java language, JSP, JDBC and JavaScript so that they are able to develop multiple-tier Web-based database applications.

Fundamentals of Financial Management

This module covers basic accounting and financial concepts and principles to enable students to

understand and interpret financial statements and reports. Students will also have an understanding of costing concepts and the financial techniques used in making financial decisions and evaluating capital investment projects.

LEVELS 3.1 & 3.2

COMMON MODULES

Fundamentals of Control Systems

This module provides students with a basic coverage of feedback control systems. The topics cover basic concepts of automatic control, components of control systems, 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.

COMMON MODULES - COMPUTER & MOBILE TECHNOLOGY, DIGITAL MEDIA & COMMUNICATION AND MICROELECTRONICS OPTIONS AND THE MINOR IN BUSINESS MANAGEMENT

Six-month Internship

In this module, students will be attached to sponsoring companies for a period of approximately six months. During their internships, students will undertake projects assigned by the company or be involved in operations or maintenance-related work. Student internships may be undertaken locally or overseas.

COMMON MODULES - AEROSPACE ELECTRONICS, COMPUTER & MOBILE TECHNOLOGY, DIGITAL MEDIA & COMMUNICATION AND MICROELECTRONICS OPTIONS ONLY

Project Design & Development 1

In this module, students will work in teams of three to design and implement a project that demonstrates their engineering skills as well as teamwork over a period of two semesters. The module is structured to encourage

creativity and innovative thinking. This will also help students develop a positive work attitude and good team spirit.

Project Design & Development 2

This module follows on from Project Design and Development 1. Students are required to demonstrate their ability and resourcefulness in implementing their selected project design solution. The scope of work includes printed circuit board fabrication, wiring, assembly and testing of the final prototype according to the specifications and requirements defined in Project Design and Development 1. In addition, software based projects may require database coding, operating system implementation and testing, server and client system design, portable design field test and Web-based integration.

AEROSPACE ELECTRONICS OPTION

Embedded Systems Design

Building on the foundation gained in the Microcontroller Programming & Interfacing (MPI) module, this module introduces students to more microcontroller-based system design and programming. It covers various commonly used hardware and software building blocks of embedded systems.

Aircraft Electrical & Instrumentation Systems

This module examines the theory of operations and the functional description of aircraft instrument and electrical systems found in the modern aircraft. Students will also learn about the auto flight, flight control and management systems, emergency electronics, and cabin entertainment system.

Aircraft Navigation & Communication Systems

This module provides students with the theory of operations and the functional description of airborne navigation and communication systems found in modern aircraft. Systems covered include ADF, VOR, DME, IRS, HF & VHF. The standard digital data-bus communications protocol, such as ARINC 429 and ARINC 629 used by commercial aircraft and MIL-STD-

1553B used by military aircraft, will also be discussed.

COMPUTER & MOBILE TECHNOLOGY OPTION

Mobile Device Technology

This module introduces the essential elements of a mobile computing platform. These 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.

Computer Systems Architecture & Administration

This module aims to equip the students with the 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 Application Programming

This module will train student to develop applications for consumer mobile device platforms. Types of applications covered include those which are standalone, web-enabled, location-aware and client-server in nature. Students will also learn to develop and deploy interactive mobile applications using both client-side and server-side programming techniques with database integration.

DIGITAL MEDIA & COMMUNICATION OPTION

Digital Media Technologies & Communication

This module gives an overview of digital media technologies (online & mobile media, print & publishing, film & video, interactive media, etc.), and techniques for transmission of digital media contents. Students will also learn the application of these techniques in various multimedia systems, such as radio & TV system, satellite communications and mobile media technologies.

Digital Signal Processing

This module provides students with knowledge of Digital Signal Processing (DSP) technology and equips them with practical skills in DSP software and hardware implementation. It will also provide students with the ability to work on various advanced digital signal processors.

Digital Audio, Video Processing & Applications

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

MICROELECTRONICS OPTION

Microelectronic Design & Test

This module introduces students to the concepts and techniques of design verification and test for digital integrated circuits. It equips students with the basic concepts of design flow, design for testability, test generation, fault simulation and built-in self-test.

Wafer Fabrication Technology

This module aims to provide students with a basic knowledge of Integrated Circuit (IC) fabrication. The processes that are required to convert a blank wafer to one that is covered with complex circuits are explored, as well as topics on the various supporting technologies required in the wafer fabrication industry. Finally, process and device simulations are covered, with students undertaking a simulation exercise in building and operating their own virtual transistors.

Advanced Wafer Fabrication Technology

This module focuses on the silicon wafer fabrication process with emphasis on hands-on training in the

cleanroom. Liquid Crystal Display Technology will also be covered.

MINOR IN BUSINESS MANAGEMENT

Data Communications & Networking

This module provides the foundation for understanding principles in data communications and networking. Students will acquire an understanding of and be able to apply key concepts and processes associated with digital and data transmission of information, transmission media, the OSI reference model, network topologies, protocols and TCP/IP protocol suite.

Project Design & Business Application 1

In this module, students are expected to integrate the knowledge they gained during the first two years of study and undertake a year-long project in the field of Electronic and Computer Engineering. They will also be required to develop a business proposal/plan which forms an integral part of the whole project.

Starting & Managing an Enterprise

Through this module, students generate business ideas and propose how these ideas can be developed into a business plan incorporating operational and financial requirements and marketing strategies for a new enterprise. In addition, students will learn how the principles of management can be applied to organise and develop the enterprise. Topics covered include entrepreneurial concepts and issues, business entry and exit strategies, types of business ownership, sources of business financing, venture launch and management principles.

Computer Systems Architecture & Administration

This module aims to equip the students with the 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.

Project Design & Business Application 2

This module is a continuation of Project Design & Business Application 1 where students undertake a year-long project on a topic in the field of Electronic and Computer Engineering. They will also be required to develop a business proposal/plan which forms an integral part of the whole project.

BUSINESS MANAGEMENT ELECTIVES

(Students to choose one of the four electives below)

E-Business in Practice

The module introduces database concepts, information systems, value chains and the integrated enterprise systems. Students will develop multi-table database applications for e-business, incorporating interactive digital media functionalities and also gain exposure in buying and selling on the Web using auction sites with payment settlement functions. They will learn business workflow modelling through the business value chain to improve business processes using IT systems and tools within an integrated enterprise system.

Managing Service Operations

This module introduces the operations in service organisations and the use of techniques for designing, planning, organising and controlling resources for the delivery of goods and services to meet customers' needs and organisational objectives. Concepts covered include service facility, managing facilitating goods, forecasting demand, managing waiting lines, process improvement, inventory management, service supply relationship and service quality.

Supply Chain Management

This module introduces students to the process of planning, implementing, controlling the operations of the supply chain. It will cover the movement and storage of raw materials, work-in-process inventory and finished goods from point-of-origin to point-of-consumption. The module also emphasises the effect supply chain management has on the success and profitability of the organisation.

Understanding Buyer Behaviour

The module provides students with a basic understanding of buyer behaviour concepts. It explores the different types of buying decision processes and the various influencing factors that affect buyer decisions. Buyers could be consumers or corporate buyers. Topics covered include consumer decision-making processes, perceptions and attitudes, consumer demographics and lifestyles, and cultural and group influences.

DIPLOMA PLUS PROGRAMME

The Diploma Plus Programme (DPP) is designed to provide students with proficiency in a selected domain area, either to broaden or deepen a student's knowledge/skills in his/her main discipline of study, or to equip a student with additional professional knowledge that would better prepare him/her for further study or increase their employability. Students can select elective modules from a wide range of clusters to obtain their Diploma Plus Certificate. DPP is optional and it will not affect the graduating requirement for the award of a diploma.

Students can choose the DPP clusters from the range listed below. The offer of a DPP cluster is subject to the condition that the minimum class size is met and based on available vacancies.

Clusters

- Aerospace Electronics
- Applied Physics*
- Computer & Communication Systems^
- Computing Methodology
- Industrial Electronics (World Skills Singapore)#
- Leisure & Retail Management
- Microelectronics
- Robotics#

Other Available Diploma Plus Certificates

- Advanced Engineering Mathematics*
- Business

- Innovation Management
- Languages (Japanese)

* Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The programme aims to bridge the gaps between the curriculum of engineering mathematics at polytechnics and that of first-year engineering mathematics in universities.

DPP cluster in Industrial Electronic and Robotics will be offered to students through invitation.

For detailed module descriptions under each cluster, please refer to page 180.