

ELECTIVE MODULES

SCHOOL OF ENGINEERING

ENGINEERING CLUSTERS

ADVANCED ENGINEERING MATHEMATICS

Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS), this cluster is designed for engineering students who wish to strengthen their mathematical foundation for university studies. The syllabus is based on the first-year engineering mathematics curricula of NUS. The cluster consists of three sequential modules and two elective modules. Gaining direct entry to the second-year university engineering courses, students should be able to apply mathematics effectively.

Introduction to Advanced Maths

Topics included are fundamentals of Algebra, Trigonometry, Plane Analytic Geometry and Complex Numbers.

Calculus

Topics included are Functions, Differentiation, Integration and Vector Algebra. Students will be asked to reflect on their learning experiences regarding the applications of calculus.

Further Calculus

Students will learn Sequences and Series, Calculus on Functions of Several Variables, Vector Calculus and Partial Differential Equations. Emphasis will be placed on mathematical solving skills.

Matrices and Systems of Differential Equations (Elective)

Students will learn First-order Differential Equations, Second-order Differential Equations, and System of Linear Differential Equations. Emphasis will be placed on the techniques of solving engineering applications.

DE and Laplace Transforms (Elective)

Students will learn Matrix Algebra, Matrix Analysis and Laplace Transform. Emphasis will be placed on the techniques of solving engineering applications.

AEROSPACE DESIGN

This cluster equips students with strong CAD/CAM knowledge and develops their technical competency in engineering design and simulation, building up their capability for a design career, especially in aerospace engineering.

Aerospace CAD

A practice-oriented module is designed to give students an appreciation of Computer Aided Design and their roles in engineering design. This module covers drafting concepts and techniques for the development of a product model during the design process.

Aerospace CAM

This module provides students with an appreciation of Computer Aided Manufacturing systems and their roles in engineering design. This module covers simulation and verification of machining followed by the generation of numerically controlled data through post processing.

Aerospace Component Design

This module focuses on the basic engineering methods and tools for the design and development of aerospace components. The objective is to equip students with a good understanding of the various phases of a design development cycle, the fundamental engineering principles of aerospace component design, airworthiness requirements associated with design and production approvals, and a knowledgeable appreciation of the elemental aspects of computational analysis used in design simulations.

Aerospace Design Simulation

This practice-oriented module enables students to perform structural and fluid dynamic analyses of aerospace component design through the extensive use of current computational simulation tools. Students use their skills and knowledge acquired from the previous design modules to work on their various aerospace design projects.

AEROSPACE ELECTRONICS

This cluster is designed for students interested in the aerospace industry. It provides an appreciation of aviation and the aircraft electronics systems in a modern aircraft. The three aerospace fundamental modules are Human Factors, Fundamentals of Aerospace Technology, and Avionics Systems.

Human Factors

This module introduces students to human factors, which refer to the study of human capabilities and limitations and how they affect performance at work. Topics include social psychology, physical environment, types of tasks, and communication and human errors, with special reference to the aerospace industry.

Fundamentals of Aerospace Technology

This activity-based module aims to provide students with an appreciation on the basics of aerodynamics and principles of flight, basic aircraft structures, components and systems, basic aircraft design features and airworthiness legislations requirement for the aerospace industry. It traces the historical development of aerospace technology and examines issues which have an impact on the Singapore aerospace industry.

Avionics Systems

This module provides students with an appreciation of aircraft electronics systems. It includes topics such as cockpit flight instruments, navigation, communication, surveillance and flight control systems, as well as other essential electrical and electronics systems found in a modern commercial airliner.

APPLIED PHYSICS

Designed in collaboration with the Department of Electrical and Computer Engineering, National University of Singapore (NUS), this cluster helps to prepare students for university-level physics modules. The syllabi are

based on the first-year physic curricula in NUS. The three modules in the cluster enhance the students' knowledge and bridge the gaps to university physics modules.

Foundational Physics

This module covers the fundamental knowledge in units and measurement, mechanics, thermodynamics and oscillation.

Classical Physics

This module covers the remaining topics of classical physics at the undergraduate level. The topics are dynamics, gravitation, thermodynamics and electromagnetism. For the last topic, the focus is more on the theoretical fundamentals, as opposed to the applied aspect found in the typical diploma-level module.

Modern Physics

This module covers modern physical concepts that include topics such as atomic structure, quantum concept, wave-particle duality, nuclear physics and radioactivity. Additionally, the study of the applications of modern physics lets the student realise its practical usefulness.

APPLIED TECHNOLOGY

This cluster's modules are offered as standalone electives for students who are interested in exploring different realms of technology and engineering knowledge.

Project Management

This module provides students with a good understanding of Project Management techniques such as Project Planning, Scheduling and Controlling, using network analysis techniques such as Critical Path Method, Gantt Charts, and Program Evaluation & Review Technique.

Applied Biomedical Engineering

This module provides a strong foundation for biomedical engineering and applications. It introduces students to the applications of engineering statics and dynamics to perform simple force analyses of the musculoskeletal system. It also provides an appreciation of kinematics and kinetics of human motion. The module also introduces students to the role of an engineer in rehabilitation under different medical conditions.

Applied Automation Technology

This module enables students to gain a practical insight on applying digital techniques over a wide range of automation and robotic applications. This module covers basic computer control, interfacing techniques and microcontroller operations. Students are also introduced to the applications of Micro Electro Mechanical Systems and Photonics.

Design & Rapid Prototyping

This module covers the basic requirements of a good design which make a product functional and sell well in a competitive market. Topics include history of design, aesthetics and colour theory, ergonomics, design presentation, safety and standards, model making and prototype development. The module will also introduce students to the fundamental knowledge of rapid prototyping techniques and their applications.

Energy Systems

This module is designed to familiarise students with the common energy systems and understand their related energy management and control techniques. Major systems include heating, ventilation and air-conditioning systems. The module will also introduce students to the fundamental knowledge of solar thermal systems, fuel cell technology and their applications and challenges.

Robotics & Machine Vision

This module aims to bring students to a level of competency whereby they will be able to critically appraise the capabilities of robots as typical mechatronic systems. The module also enables students to acquire knowledge of the image processing and analysis techniques used in machine vision.

Data Communication Technology

This module equips students with some key concepts and principles of modern data communication systems like the satellite and fibre optic networks. The students will also learn the operation of physical and wireless LAN in detail.

BIOMEDICAL ENGINEERING

This cluster of modules prepares students for the exciting field of biomedical engineering. The Foundational Chemistry and Further Engineering Mathematics modules aim to bridge the gap with university mathematics and science modules in the engineering and sciences courses. The Biomedical Signal Processing and Medical Imaging Technology modules seek to introduce students to the exciting and promising field of Biomedical Engineering.

Foundational Chemistry

Students are introduced to the concepts of physical, inorganic and organic chemistry. Students will gain a working knowledge of the atomic nature of matter, the periodic table and law, the chemical bonding between particles, the mole concept, balancing of chemical equations, the different types of chemical reactions, spontaneous and nonspontaneous processes, the role of catalysts, and the structure of properties of various organic compounds.

Further Engineering Mathematics

Students are introduced to various types of differential equations and their solutions, as well as their applications in science and engineering. Students will gain a working knowledge of using differential equations in modelling physical and engineering systems. They will develop important skills to obtain the solution of a differential equation by applying analytic, numerical, or graphical techniques.

Biomedical Signal Processing

This module gives an introduction to biomedical signal processing and analysis. Students are introduced to fundamental signal processing techniques to analyse and process signals that originate from biological sources such as ECGs, EMGs, EEGs, and blood pressure signals, and integrate the information with physiological knowledge, useful for physiologic investigation and medical diagnosis and processing.

Medical Imaging Technology

This module aims to expose students to the field of Biomedical Engineering through an understanding and appreciation of medical imaging technology and equipment. Students will be taught the different types of medical imaging principles and their application in diagnostic therapy. Image processing theory and concepts are introduced before the various imaging technologies are taught. Specific areas of radiology including topics such as ultrasound imaging, X-ray and Magnetic Resonance Imaging are taught.

COMPUTER & COMMUNICATION SYSTEMS

This cluster comprises modules that are designed to strengthen students' knowledge in computer and communication systems. Students will acquire knowledge in computer networking, Linux Systems administration, web technologies and tools. In addition, they will also study the latest developments in various modern communication systems, in particular the Digital Audio and Video broadcast systems.

Operating Systems & Networking

This module covers fundamental operating system principles and networking concepts. UNIX/Linux are used as the primary operating system reference model for this module. Network Management and UNIX/Linux networking are included, together with an emphasis on writing basic application programs. This module will prepare students with a suitable background for working in system administration, Local Area Network (LAN) and the internetworking environments.

Internet Technology

The module aims to provide the concept of Web operations and 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.

Digital Audio & Video Technology

This module introduces students to digital audio and video fundamentals and compression standards, together with their applications in multimedia services and broadcasting technology. It also covers the basics of Digital Audio Broadcasting (DAB) and Digital Video Broadcasting (DVB) standards and their capabilities as compared to the current analogue broadcasting systems.

Communication Systems & Applications

This module introduces the latest developments in modern communication systems. Students will learn the key concepts and processes of transmission fundamentals, transmission media and wave propagation. In addition, they will also acquire knowledge on features and operations of wired and wireless technologies. To help students to relate to what had been learnt, actual applications of communication systems such as advanced telephony network, radar systems, satellite and mobile communication systems will be covered.

COMPUTING METHODOLOGY

This cluster is designed for engineering students who wish to strengthen their computer science and programming foundation for university studies. The syllabus is based on the first-year computer science

curricula for engineering degrees of NUS and NTU. The cluster consists of three sequential modules.

Advanced C Programming and Techniques

Topics included are fundamentals of C, Arrays, String, Pointers; File Processing, Bitwise Operations and Serial Communication.

Programming and Data Structures

Topics included are fundamentals of Data Structures, Unions, Advanced Pointers, Stacks and Queues, Linked Lists, Binary Trees and Hashing.

Algorithms and Applications

Topics included are fundamentals of Algorithms, Recursion, Sorting and Searching, Management Sciences and Engineering Applications.

DECISION MANAGEMENT FOR QUALITY

This cluster is aimed at helping students to develop the relevant knowledge and skills for decision-making in the area of Quality Management.

Fundamentals of Customer Service

The aim of the module is to equip students with basic knowledge of strategies in relation to maintaining a high standard of customer satisfaction in an organisation. The module also helps students to understand the buying behaviour of the consumers, and the factors influencing this buying process. The module covers the concepts and techniques of strategy, management, process, people and continual improvement in implementing a quality system to provide excellent customer service, and the technology and interfaces that affect the buying behaviour of a consumer.

Design of Experiments

Students will cover the important aspects of experimental design techniques that enable them to plan and conduct a real industrial experiment. The experiment could be in process characterisation, process optimisation, or product design. Students will learn how to perform the statistical analysis of experimental data to make objective conclusions.

Metrology & Calibration

Students will study the theories behind metrology and calibration. Emphasis is placed on various aspects of measurements such as lengths, angles and geometric properties. Other topics include sources of errors, traceability, repeatability and accuracy. In addition to lectures, practical sessions are conducted to enhance the learning experience in relevant areas using computerised equipment.

E-commerce

This module aims to provide students a guide on how organisations can use the Internet to support their marketing activities, and covers all aspects of the subject from environmental analysis to strategy development and implementation. This module will cover Internet marketing strategy, the Internet marketing mix, relationship marketing using the Internet, delivering online service quality, interactive marketing communications, business-to-consumer Internet marketing and business-to-business Internet marketing.

ELECTRICAL CONTROL & MEASUREMENT

This cluster aims at providing students with the relevant knowledge and skills in the areas of precision electrical measurement, calibration and electrical system control. It also aims to provide students with the basic understanding of power quality.

Electrical Calibration & Measurement

Students are introduced to the theories and practices in metrology and calibrations. This includes precision electrical measurements and the process of selecting and setting up instruments as well as precautionary measures to obtain the best possible measurement results. Students will also learn about the characteristics of instruments, such as the digital multimeter, counter and oscilloscope.

Lighting Technology & Control

This module provides a broad knowledge of lighting in commercial, industrial, residential and theatrical productions. Students will gain a comprehensive overview of the science of lighting design as well as the technical knowledge of lighting in different environments.

Fundamentals of Power Quality

This module introduces the various technical and economic issues of power quality. Topics covered include power interruptions, voltage sags, transient over-voltage, voltage regulation, harmonics, filtering and common grounding problems. Students will also learn about the impact of power quality on sensitive equipment, international standards on power quality, power quality monitoring, and the methods used to mitigate power quality problems.

Power Electronics & Applications

This module aims to provide a broad understanding of the various power conversion circuits and their industrial applications. Students will deal mainly with the applications of power semiconductor devices for the control and conversion of electric power. 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 will be covered together with their applications.

INDUSTRIAL CONTROL

This cluster equips students with knowledge and practical training in the areas of electrical control wiring systems. Students will also acquire skills in programming and designing Programmable Logic Controllers for industrial applications. It aims to train students to compete in the World Skills Singapore Competition (Industrial Control Category).

Electrical Control and Wiring

This module aims to provide students with knowledge and practical training in electrical control wiring system. Students will learn to read and interpret the circuit diagrams and wiring of control panels. The training will include mounting and wiring of control panels, PVC conduits, flexible conduits, connectors, junction boxes, PLC and other electrical components, and termination and numbering of cables according to layout diagrams.

Control Circuit Design & Troubleshooting

Students will learn the IEC Standards and symbols for Power Control and Protection components including relays, contactors, alarm and signal indicators, timers, limit switches, proximity sensors, photosensors, thermostats, protective devices, and motors. Students will also learn how to troubleshoot and locate faults on test panel within an allocated time.

Advanced Programming for Programmable Logic Controller

Students will learn to program and design Programmable Logic Controllers (PLC) and learn about their industrial applications. Programming of PLC on projects involve digital I/O, analogue I/O, timers, counters, and internal registers. Students will also learn how to simulate, test the PLC program, and interface of the PLC with inverter, touch screen, sensors, switches, indicating lights, motors starters and other I/O devices.

INDUSTRIAL ELECTRONICS

The modules in this cluster aim to enhance students' electronic theory and practical skills. It provides in-depth coverage of electronic device properties, circuit theory, and analogue and digital design concepts in various industrial applications.

Fundamentals of Industrial Electronics

This module introduces the general concept of industrial electronics. Students will learn the properties, behaviour and applications of some industrial electronics devices. Topics covered include AC and DC theory, two-port LRC networks, resistive networks, oscillators, coils & transformers, and various kinds of diodes. Introduction to the microcontroller (MCU) and high level compiler are also included to illustrate the use of industrial design tool in electronic product design. Practical skills such as electronic circuit assembly and functionality tests are essential skills that students will develop in this module.

Industrial Electronics Technology

This module builds on the fundamentals of industrial electronics. It covers the analysis and design of analogue and digital circuits. Topics include analogue to digital conversion circuits, combinational logic, sequential circuits, and special functions circuits. Practical skills cover the tools used to design and simulate these circuits.

Advanced Industrial Electronics

This module builds on the foundation acquired in the Industrial Electronics Technology module. It covers the design and applications in various practical circuits. Topics include power electronic devices such as diodes, diac, triac, uni-junction and field effect transistors, amplifiers, comparators, oscillators, and filters. Practical skills cover design and prototype techniques, advanced test and measurements, electronic troubleshooting, and fault rectification techniques.

INFORMATION TECHNOLOGY

This cluster comprises modules which provide exposure to the computing systems. The modules cover the installation and administration of different operating systems. Students will obtain knowledge in this exciting area of technology that will enable them to pursue employment opportunities in the infocomm industry.

Workstation Hardware & Software

This module focuses on the functionality of hardware and software components. Through hands-on sessions, students learn how to assemble and configure a computer, install operating systems and application software, and troubleshoot hardware and software problems. They will also be introduced to basic networking concepts, including how to set up a home office network.

Windows System Administration

This course aims to provide students with the knowledge and skills that are required to manage accounts and resources, maintain server resources, monitor server performance, and safeguard data in a Microsoft Windows Server 2003 environment. It also provides students with the knowledge and skills to design a Microsoft Active Directory service and network infrastructure for a Microsoft Windows Server 2003 environment.

Linux System Administration

The objective of the module is to prepare students for World Skill Competition (IT category - Linux). Students will learn to set up a Linux server and configure common network services and security. Topics include implementing business IT system solutions with servers, workstations and network devices.

INTERNATIONAL FREIGHT FORWARDING & E-LOGISTICS

This cluster aims at providing a general but practical appreciation of the freight forwarding operations. Students will be familiarised with modern transportation systems, documentation, and international trade and customs requirements in the transportation of goods overseas. It also includes an overview of the electronic trade management systems that enable the exchange and sharing of information within the Singapore trade and logistics community.

Electronic Commerce

This module provides the understanding of the role of Electronic Commerce (e-Commerce) in applications, specifically in the logistics industry. The scope of study includes e-Supply Chain Management, EC Order Fulfilment, e-Procurement, and e-Customer Relationship Management. It covers planning solutions such as c-Commerce, Collaborative Planning Forecasting, and Replenishment.

Introduction to Freight Forwarding Management

Students will be equipped with the knowledge of air and sea freight forwarding from a management perspective. Topics covered include industry regulators and associations, aircrafts, types of ships, import and export, transshipment processes, transport and import documents, rates and charges, carriers and port clearance procedures, international conventions and regimes, location of major air and sea ports, and international freight operation flows.

International Trade Management

Students will understand international trade management and acquire knowledge in managing international logistics operations. Topics include international contracts, terms of trade, terms of payment, international commercial documents used in international trade, insurance, shipping declarations, customs clearance, international regulatory bodies and regulations.

Cold Chain

This module discusses local and international regulatory bodies; international handling; storage practices and standards for different pharmaceutical and food products. Students will be provided with the tools for implementation and monitoring of cold chain quality. Hazard Analysis and Critical Control Point, and their implementation in cold chain, will be discussed.

MECHANICAL TECHNOLOGY

This cluster equips students with a strong foundation in mechanics modules, preparing them for further study in engineering programmes, particularly benefiting Product Design & Innovation students who wish to gain exemption in degree programmes in mechanical engineering.

Applied Engineering Mathematics

This module provides students with further knowledge and skills in the mathematics required to solve engineering problems. Topics include integration with applications, differential equations, Laplace Transform, and probability and statistics.

Applied Engineering Mechanics

This module aims to equip students with the necessary skills to analyse problems of rigid bodies at rest and in motion. Topics include Trusses, Friction, and Work energy and Impulse momentum methods. Students will develop skills to solve engineering problems.

Applied Mechanics of Materials

This module studies the effects of external forces and temperature changes on solids in the form of stresses and deformations. Students apply concepts of stresses, stress-strain diagrams, and Hooke's Law in analysing and solving engineering problems. Topics include stresses and strains, torsion, shear forces and bending moments, beam stresses, combined stresses and experimental stress analysis.

Applied Thermofluids

This module covers the fundamental concepts of thermodynamics and fluid mechanics, and their applications in products and systems. Topics include thermodynamic system concepts, the laws of thermodynamics, properties of working fluids, non-flow and steady flow processes with steam and perfect gas, basic heat transfer, principles of fluid mechanics, hydrostatic forces and buoyancy, energies of liquids in motion, and losses of energy in pipelines.

MICROELECTRONICS

This cluster comprises modules which will provide exposure to the principles of microelectronics design, manufacturing and assembly. Students will gain an appreciation of the range of activities and disciplines that are employed in the creation of integrated circuits. Students will obtain a basic foundation in this exciting area of technology that will enable them to pursue employment opportunities in the industry.

Microchip Technology

This module introduces students to various Integrated Circuit (IC) technologies. It provides students with basic concepts of Metal-Oxide-Semiconductor (MOS) digital integrated circuit design. At the end of

the module, students will be able to design and layout simple MOS digital ICs both in theory and in practice. Students will also learn to design circuits using Very High Speed Integrated Circuit Hardware Description Language (VHDL).

IC Layout

The aim of this module is to equip students with basic analogue and digital Integrated Circuit (IC) layout skills. Students will gain an insight into IC layout design methodology and use computer-aided design tools for layout editing and verification.

Microelectronic Manufacturing & Assembly

This module aims to provide students with knowledge of the planning and control aspects of process technology to prepare them for careers in the manufacturing industry. The course also covers basic Integrated Circuit (IC) and surface-mounted board assembly processes, sensor technology and maintenance engineering.

NETWORK SYSTEMS & SECURITY

This cluster offers modules for students who are interested to work in the networking industry. Students will be equipped with knowledge in remote access technologies and apply their knowledge acquired in designing a network. They will also learn how to optimise a converged network comprising of voice, wireless and security applications.

Workstation Hardware & Software

This module focuses on the functionality of hardware and software components. Through hands-on sessions, students learn how to assemble and configure a computer, install operating systems and application software, and troubleshoot hardware and software problems. They will also be introduced to basic networking concepts, including how to set up a home office network.

Internetworking Project Design

This module builds on students' knowledge acquired in the fundamental modules Internetworking 1, Internetworking 2 and Internetworking 3. In this module, students work in teams on three case studies where they will apply their knowledge acquired in the foundational modules to design an internetwork that fulfils the requirements stated in the case studies.

Remote Access Networks

This module introduces techniques and technologies to secure and expand the reach of an enterprise network to tele-workers and remote users with focus on securing remote access and virtual private network (VPN) client configurations.

Optimising Converged Networks

This module describes the converged network requirements within conceptual network models. It provides the student with important knowledge and advanced hands-on skills in optimising and providing effective quality of service techniques for converged networks that support voice, wireless and security applications.

STAGE MANAGEMENT AND TECHNOLOGY

This cluster is aimed at providing students with knowledge related to Technical Theatre: stage technology, which includes lighting, props, theatre settings and layout; and management issues related to show/drama/concert productions. It also seeks to equip students with basic knowledge in managing supporting technology in shows such as sound, light and video controls. In addition, students can have practical sessions on creating, editing and mixing music to produce sound effects such as surround, spatial and other special effects.

Introduction to Technical Theatre

The module will provide students with brief knowledge in the topics of lighting, makeup, production, scene setting, sound for stage, theatrical property and costume. Students will study the effect of lighting for theatre productions including the size, intensity, shape, and colour of light for a given scene, which help to accentuate an actor's features. The production process will be discussed briefly. Scenery, which includes set construction, scenic painting, soft goods (drapes and stage curtains) is described, as well as special effects and sound, such as musical underscoring, vocal and instrument mixing and theatrical sound effects. Finally, the module will briefly study theatrical property, or props, which includes furnishings, set dressings, hand props, and an actor's costume props.

Introduction to Live Performing Arts

The performing arts include theatre, motion pictures, drama, comedy, music, dance, opera, magic and the marching arts. In this module, students will learn to identify, analyse and appreciate the different types of performing arts. Studies include staging, ambience, audio reinforcement, genre of music, costumes, background and storyline.

Stage Management

This workshop-based module enables students to learn the roles and responsibilities of the stage manager. Students learn the techniques of successfully managing the numerous aspects of a production, both on stage and backstage, in the pre-rehearsal, rehearsal, performance, and post-performance phases. This includes: the planning of a master calendar and prompt script; aspects of coordination with production designers; using light, sound and costume plots effectively; coordinating the efforts of the cast to stay on scripts; performing checks on safety, legal issues, lighting and sets; and the smooth coordination of technical and dress rehearsals.

Audio Effect Processing

This workshop-based module offers intensive hands-on sessions where students learn to create, edit and mix music and special sound effects onto multiple audio tracks. It also provides theoretical and practical training on digital audio effects techniques that convert 2-channel stereo audio track to 5.1 surround-sound tracks, the professional use of AC-3, redirection to speakers through digital Dolby and surround sound decoders, and spatial enhancement in theatre and audio entertainment application.

TELECOMMUNICATION DISTRIBUTION TECHNOLOGY

This cluster aims at providing students knowledge and skills in the area of Structured Cabling System, and trains students to compete in the World Skills Singapore-Telecommunication Distribution Technology Category. Students will be trained in the connection, installation, performance testing, and design of a structured cabling system.

Structured Cabling System 1 – Connectorisation and Installation

Students will learn the latest installation and termination techniques for networking and structured cabling systems. This course also includes an overview of structured cabling systems, an in-depth review of the ANSI/TIA/EIA and ISO/IEC industry standards, and a discussion and hands-on practicum on the rough-in, installation, management, and termination of shielded and unshielded twisted pair and optical fibre cabling systems. About 85% of this course is hands-on and is designed using a systems approach instruction method whereby the students will build a rack; install an outlet; and install, terminate and test a cabling link between the rack and the outlet.

Structured Cabling System 2 – Testing and Trouble-Shooting Techniques for Structured Cabling System

Students will learn how to certify the performance of installed cable plants and learn how to troubleshoot them. Students will obtain the experience necessary to certify and document twisted pair and optical fibre cable plants based on established industry standards. The standards studied in the course include ANSI/TIA/EIA-568B, TSB-67, ANSI/EIA/TIA-526-14A and ANSI/TIA/EIA-526-7.

Structured Cabling System 3 – Design for Structured Cabling System

Students will be involved in the design and installation of structured cabling systems. Students will progress through a step-by-step process, from the initial design analysis to the final project presentation. Emphasis is placed on the design parameters and guidelines of the TIA/EIA/ISO standards, and the decisions that the designer has to make regarding network platforms and technologies, cabling architectures, and media selection. Students will design several different premises cabling systems based on actual projects.

WORKPLACE SAFETY & HEALTH

This cluster equips students with knowledge and understanding of the basic elements of engineering controls for minimising, preventing and managing occupational health and safety risks in workplaces of emerging industrial sectors. The programme develops their capabilities in practical aspects of engineering practices for control of Workplace Safety & Health issues, and prepares them for a career as industrial safety officers.

Workplace Safety

This module equips students with the fundamental knowledge in workplace safety and health. Topics include basic elements of engineering and the interaction of machinery, equipment and technology for health and safety controls, industrial safety and hazards, accident investigation methodology, and safety inspection and planning.

Workplace Health

This module equips students with knowledge in occupational health. Topics include identification of industrial hazards and their prevention, implications of industrial noise, chemical hazards, lighting, thermal environment, radiation, confined space, general ventilation, occupational diseases and occupational health management.

Workplace Safety Management & Risk Control

This module introduces students to safety management, WSH policy, the workmen's compensation act, hazard control, safety audit, risk analysis, safety performance analysis, accident costing, safety education, training and communication.

NON-ENGINEERING CLUSTERS

ECONOMICS & FINANCIAL APPLICATIONS

This cluster is designed for students who wish to equip themselves with knowledge outside their core fields, such as in economics and finance. The cluster consists of three core modules, which are Economics, Engineering Economy and Business Finance.

Economics

This module gives an overall view of microeconomics and macroeconomics. It focuses on the microeconomics theory of supply and demand, resource allocation, market demand, production and cost theory, price and output of firms, under conditions of perfect and imperfect competition. The section on macroeconomics will provide students with an understanding of the workings of an economy, the circular flow of income in an economy and the measurement of national income and national output. Macroeconomics issues such as economic growth, unemployment, and inflation will be analysed.

Engineering Economy

Engineering Economy is concerned with the application of technical and economic analysis, with the goal of deciding which course of action best meets the technical performance criteria and uses scarce capital in a prudent manner. This module provides students with a sound understanding of the principles of Engineering Economy, its basic concepts, methodology and applications of such knowledge to practical situations.

Business Finance

This module aims to provide knowledge of financial principles, concepts and applications required for students who enter the business world today. The module will equip students with the basic knowledge of economic factors affecting finance, financial statements and analysis, cost of capital, investment decisions, and long-term and short-term financial decisions. Students will be trained to analyse a company's financial information, evaluate the viability of a project with capital budgeting techniques, and calculate the cost of capital.

GREEN DEVELOPMENT

This cluster is aimed at helping students to understand the different issues related to our environment as we increase the quality of our lives. It helps the students to examine the challenges ahead of us.

Environmental Studies

In this module, basic science will be taught to help learners understand broad environmental issues like global warming and climatic change, upsets in ecological niches, species diversity reduction and extinction, photochemical smog, and acid rain. Students will also analyse qualitatively how economics plays a vital role in tackling the environmental issues; how sustainable development, policies and infrastructure can help to protect the ecological niches in the biosphere; and how mankind can actively ensure the preservation of the environment to prevent catastrophic consequences.

Gardens Design & Park Management

The module aims to give students an overview of the field of garden design and park management, and provide a foundation for further studies and application in landscape design and management. Students will be trained in the areas of garden theory, the design process, design principles, landscape construction, ecological landscape design principles, the history and functions of park, and the various facets of park management, including park typology, park users and visitor management as well as park maintenance.

Sustainable Design & Development

There is a growing universal concern to increase the quality of our lives as well as to preserve the environment for the present and future. This module covers sustainability issues relating to the development of our built environment, which invariably includes buildings and infrastructure. Understanding the present challenges of the industry provides the backdrop for the issues to be addressed. Actions for sustainable design and development of buildings are then discussed. Case studies of exemplary buildings are included.

Water Demand Management

Water demand in urban areas is on the rise due to population growth, change in lifestyle, and the effect of climate change. One of the ways to meet the increasing demand is to manage the consumptive demand. This would avoid the need to develop new water resources. Water demand management involves the measures taken by the authority to achieve efficient water use by all members of the community. In this module, students will be taught various water demand measures such as effective pricing, leakage detection, community education, water saving devices, and the use of reclaimed water.

Solid & Hazardous Waste Management

In this module, students will examine: how solid and hazardous waste is generated; the pollution problems related to waste disposal; and methods of collection, handling, treatment and disposal of waste. Concepts of waste minimisation such as recycling, reusing, reducing and waste exchange will be highlighted as effective tools in waste management. Issues in biomedical waste generation, collection and treatment will be addressed. Local legislation for solid and hazardous waste will be explained in relation to the overall waste management practice.

Water & Marine Pollution

Students will be given an overview of water pollution and the impact of pollution on different types of water bodies like rivers, lakes and seas. They will learn about the characteristics of polluted water bodies, types of waste streams, indicators of water pollution, waste disposal into rivers, and the self-purification of river water systems. Eutrophication of lakes and reservoirs, marine pollution, its sources and impacts, and oil spill control at sea and beaches will also be covered.

LEISURE AND RETAIL MANAGEMENT

This cluster is aimed at helping students to develop the relevant knowledge and skills for managing a variety of service business and special facilities, equipping students with the basic knowledge and insights.

Ecotourism

Ecotourism is considered the fastest growing market in the tourism industry. This module will help students to formulate and develop ecotourism programmes in order to enable people to enjoy and learn about the natural, historical and cultural characteristics of unique environments while preserving the integrity of the sites, as well as meeting tougher environmental requirements.

Retail Management

This module is designed for students who have a strong foundation and interest in Property Management. It delves further into the strategies that will improve the positioning of a shopping mall, leasing issues and its day-to-day management. Case studies will be used extensively for illustration.

Hospitality Management

In this module, students will learn how the effective management of real estates in the hospitality industry (hotels, serviced apartments, lofts and resorts) will contribute to both Singapore's economy and property investors' growth. They will also learn how operating effectiveness and preventive maintenance programmes for the various departments and functions in hotels, serviced apartments, lofts and resorts can save operating costs and increase the values of these real estates.

Space Modeling

Students will learn to develop digital 3D building models, attractive animations and walk-throughs by using advanced modelling software such as Revit Architecture and Autodesk 3ds Max.

Hotel & Recreation Facilities

This module will provide students with an overview of major specialised facilities in hospitality and recreational facilities. It will cover facilities in theme parks, hotels and resorts. Topics covered include rides and simulators, laser shows, musical fountains, air conditioning for hotel guest rooms and function rooms, kitchen equipment and kitchen exhaust system, filtration system for swimming pools, hot water system and steam generation.

Healthcare & Business Park Facilities

This module will provide students with an overview of major specialised facilities in healthcare and business parks that house microelectronic, IT, pharmaceutical and biotechnology companies. Topics covered include the cleanroom environment, the biosafety laboratory, quality power supply, uninterruptible power supply, ultra-clean water supply, and management of hazardous waste.