

ENGINEERING WITH BUSINESS MANAGEMENT PROGRAMME

Students who are interested in both engineering and business studies can have the best of both worlds when they enroll in the Engineering with Business Management Programme (EBM).

Traditionally, students who wish to pursue an engineering diploma have to choose a specific engineering discipline during the application process. However, with EBM, students can choose their preferred engineering discipline towards the end of their first semester in Year 1. This allows them to gain a better understanding of the various disciplines before making a more informed decision.

Besides enjoying this flexibility, EBM students also take business management modules delivered by the School of Business & Accountancy. The broader curriculum is geared towards training students to be new age engineers with a vision for business leadership.

Under this EBM programme, students will have a choice of nine diplomas to graduate in:

- Aerospace Electronics
- Aerospace Technology
- Audio-visual Technology
- Automation & Mechatronic Systems
- Biomedical Engineering
- Electrical Engineering
- Electronic & Computer Engineering
- Marine & Offshore Technology
- Mechanical Engineering

All first-year students taking the above engineering courses, including those who opt for EBM, will share a common curriculum in the first semester. Towards the end of the first semester, EBM freshmen will choose their preferred engineering courses. Business modules start in level 2.

COURSE MODULES

LEVEL 1

Career & Professional Preparation 1

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

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. Upon completion of the module, students will be able to explain and write C programs for simple engineering applications.

Electrical Technology

This module builds 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 1s

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.

Innovation Toolkit ^

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

Sports & Wellness ^

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

LEVEL 2

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.

Marketing Fundamentals

The module introduces concepts and principles of 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 Ps in marketing, topics covered also include segmentation, targeting and positioning, product mix, service marketing, channel decisions and branding.

Note: Business & the Economy and Effective People Management are IS modules.

LEVEL 3

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.

ELECTIVES

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, and 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 help students with proficiency in a specific domain area, to either enhance their knowledge and skills in their main discipline of study, or equip them with additional professional knowledge that better prepares them for further studies and future careers. SoE students can select elective modules from a wide range of clusters to obtain their Diploma Plus Certificate.

The DPP clusters offered by SoE are:

- Advanced Engineering Mathematics
- Applied Physics
- Aviation Fundamentals
- Biomedical Engineering
- Computer-Aided Design Skills
- Computer & Communication Systems
- Industrial Control
- Mechatronics Application Skills
- Satellite Technology
- Stage Management & Technology
- Workplace Safety & Health

For details on the specific clusters available to different diplomas, please refer to the Course Modules Section of each diploma under the Diploma Plus Programme. SoE students can also pursue Diploma Plus Certificates in Advanced Engineering Mathematics, Business, Innovation Management and Foreign Languages, which are offered by other academic schools in Ngee Ann.

For a description of the modules within each elective cluster, please refer to the information below.

DIPLOMA PLUS PROGRAMMES & ELECTIVE MODULES

ADVANCED ENGINEERING MATHEMATICS CLUSTER

This cluster is designed for engineering students who wish to strengthen their mathematical foundation for university studies. The syllabus is based on the 'A' Level H2 Pure Mathematics syllabus. In consultation with NUS, NP graduates who have successfully completed the revised CAEM will be granted exemption from the NUS' MA1301 Proficiency Test.

Advanced Engineering Mathematics 1

Students will learn topics such as functions and graphs, sequence, inequality, trigonometry, plane analytic geometry and series and matrices.

Advanced Engineering Mathematics 2

Students will learn topics such as complex numbers, vectors and series.

Advanced Engineering Mathematics 3

Students will learn topics such as differentiation and applications, integration and applications, differential equations, sequences and series (e.g. Power Series, Taylor Series, Fourier Series).

APPLIED PHYSICS CLUSTER

Designed in collaboration with the College of Engineering, Nanyang Technological University, this cluster helps to prepare students for university-level physics modules.

The three modules in the cluster enhance the students' knowledge and bridge the gaps to university physics modules.

Physics 1A - Mechanics

This module provides an understanding of the fundamentals of physics. Topics include measurements, vectors, mechanical motions in one and two dimensions, Newton's Laws of Motion, energy of a system, linear momentum and collisions.

Physics 2A - Mechanics and Heat

This module focuses on Mechanics and Heat. Topics include angular kinematics, universal gravitation, fluid mechanics, temperature, heat and the law of thermodynamics, and kinetic theory of gases.

Physics 3A - Electricity and Magnetism

This module focuses on Electricity and Magnetism. Topics include electric and magnetic fields, Gauss's Law, Faraday's Law, capacitance and dielectrics, current and resistance, direct and alternating current circuits.

AVIATION FUNDAMENTALS CLUSTER

Based on the ground school examinations curriculum of the Private Pilot Licence (PPL) as specified in the Singapore Air Safety Publication by the Civil Aviation Authority of Singapore, the Certificate in Aviation Fundamentals cluster is designed for students who are interested in flying as a co-curricular activity or who are considering a career as a pilot. The syllabus is based on the five basic modules offered in the ground school examinations for the PPL. It provides a foundation in aircraft systems and operations with an emphasis on the basic principles of air navigation, meteorology, human performance and aviation technology. The cluster consists of three integrated modules:

Aircraft Rating

This module provides a foundation in aircraft systems and the basic principles of flight with an emphasis on general aviation aircraft. It covers the systems of fixed wing and rotary wing aircraft as well as the operating environment, airworthiness requirements, structural limitations and basic aircraft maintenance mainly from the perspective of a trainee pilot.

Meteorology, Human Performance & Limitations

This module consists of two components: Meteorology as well as Human Performance and Limitations. The meteorology component provides a foundation in the study of weather and its effect on flight operations. The component on human performance and limitations covers the factors and interactions between man and machine, and their impact on aviation safety with an emphasis on air crew performance in the flight environment.

Aviation Law, Flight Rules & Procedures, and Navigation

This module consists of two components: Aviation Law, Flight Rules and Procedures as well as Navigation. The first component provides a foundation in aviation laws and regulations, rules of the air and flight procedures to meet the basic requirements of a trainee pilot. The second component on Navigation covers the use of aeronautical charts with emphasis on basic air navigation including the determination of track, heading, air speed and ground speed. This module provides training in the essential skills and knowledge in flight rules and procedures as well as air navigation required for a basic pilot licence.

BIOMEDICAL ENGINEERING CLUSTER

This cluster prepares students for the exciting field of biomedical engineering. All three modules aim to bridge the gap with university science and mathematics modules in the engineering and science courses.

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, periodic table and law, chemical bonding between particles, mole concept, the balancing of chemical equations, different types of chemical reactions, spontaneous and non-spontaneous processes, the role of catalysts, as well as the structure and properties of various organic compounds.

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.

Further Engineering Mathematics

Students are introduced to the 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.

COMPUTER-AIDED DESIGN SKILLS CLUSTER

This cluster is specially designed to strengthen and deepen the technical knowledge and skills of students in using design software to solve challenging engineering design problems. Talented students will be invited to join the programme. The programme will equip students with strong engineering problem-solving skills and prepares them to participate in World Skills Singapore (WSS) Competition and related events.

Fundamental Mechanical CAD

This module is a practice-oriented module designed to give students strong fundamentals in using Auto Desk Inventor as Computer-Aided Design (CAD) tool in solving engineering design problems. This module covers sketching, 3D solid modelling concepts and techniques.

Advanced Mechanical CAD

This is a practice-oriented module designed to equip students with strong advanced software skills in modelling and solving engineering design problems. This module covers advanced CAD commands and engineering design principles. Topics include geometric dimensioning and tolerancing, assembly techniques and animation.

Mechanical CAD Project

This module is a project-based module designed to hone students' knowledge and skill in solving complex engineering design problems. This module covers advanced engineering design concepts and assembly modelling techniques in a wide range of case studies and design projects.

COMPUTER & COMMUNICATION SYSTEMS CLUSTER

The modules in this cluster 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.

Operating Systems & Networking

This module covers fundamental operating system principles and networking concepts. UNIX/Linux is used as the primary operating system reference model for this module. Network Management and UNIX/Linux networking are included, together with an emphasis on programmes. 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.

Communication Systems & Applications

This module provides the opportunity for students to explore and recognise the developments that are currently used in communication systems. Students will acquire an understanding of wireless technology and be able to apply key concepts and processes associated with transmission fundamentals, high frequency transmission media and wave propagation. They will then be able to appreciate the application of RF technology to radar systems, satellite and mobile communication systems, fibre optical communication and the increasingly popular RFID and Bluetooth technology.

INDUSTRIAL CONTROL CLUSTER

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 & 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 involves digital I/O, analogue I/O, timers, counters, and internal registers. Students will also learn how to simulate, test the PLC programme, and interface of the PLC with inverter, touch screen, sensors, switches, indicating lights, motors starters and other I/O devices.

MECHATRONICS APPLICATION SKILLS CLUSTER

This cluster is specially designed to strengthen the technical knowledge and practical skills of students in the applications of Mechatronic systems. Potential and talented students will be invited to join the programme, which will also equip students with strong engineering problem solving skills and prepare them for the World Skills Singapore (WSS) Competition and related events.

Fundamental Mechatronics & Control

This practice-oriented module is designed to give students strong fundamentals in electrical control systems and principles, characteristics, selection and application of sensors and actuators in typical Mechatronic systems. 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 with Programmable Logic Controller (PLC) using CX- Programmer and perform exercises relevant to industrial applications.

Advanced Mechatronics & Control

This module is a practice-oriented module that is designed to equip students with strong advanced software skills particularly in various industrial scenarios like testing, distribution, processing and sorting with Mechatronic systems. This module covers assembly skills for various Mechatronic systems and commissioning the individual or combined stations. Student will also practice on actual workstations used in the World Skills Competition.

Mechatronics Control Project

This is a project-based module designed to hone students' knowledge and skills in resolving engineering problems in various scenarios. This module covers concepts and techniques on a wide range of case studies and design projects.

SATELLITE TECHNOLOGY

NP is partnering NTU in offering this programme to students from the ECE, EE, ES and ME courses. The programme provides students with a good foundation in space technology to pursue a multidisciplinary satellite project at NTU and/or a career in the space and other related industries. Students will have the opportunity to visit the Satellite Research Centre (SaRC) at NTU, and attend lectures and talks conducted by NTU staff.

Introduction to Spacecraft Technology

This module introduces students to the basic design and development of satellites and the fundamental physics of spacecraft motion. The learning objectives are to provide students with a foundation in appreciating the various engineering aspects involved in the construction and operation of a satellite. In this module, students will be introduced to the concepts of Kepler's Law for planetary motion. The basic subsystems, such as the PV arrays, battery banks as well as communication systems, which make up a satellite will also be covered. The module will conclude with a review of satellite technology developments and growth trends.

Satellite Power Supply Systems

This module aims to equip students with the knowledge of power supply systems for space missions. This includes the photovoltaic and battery technologies. Students will learn about power balance through the sizing of the PV array and battery bank based on satellite orbit and end-of-life parameters. They will learn about battery regulation topologies and monitoring systems. The module will also cover power conditioning and distribution systems to cater for the multi-voltage requirements of satellite payload.

Satellite Communications Systems Engineering

The aim of this module is to introduce the fundamental concepts of satellite communications, satellite administration and systems engineering issues to the students for possible involvements in satellite project collaborations with like-minded organisations. Aspects of antenna design and propagation issues and challenges will be explored. Analogue and digital communication techniques will be briefly covered. The space, ground and user segments of satellite systems will be covered in general.

Thermodynamics and Structural Mechanics for Satellites

The syllabus aims to provide students with an understanding of the heat transfer mechanism and structural mechanics applicable for the design of a satellite's structure. The module covers the application of basic thermodynamics and mechanics principles on actual engineering issues encountered in satellite design and operation in the space environment. Particular attention will be given to thermal radiation, ranging from topics such as the means by which thermal radiation is generated, the specific nature of the radiation, to the manner in which the radiation interacts with matter. Students will also learn the fundamentals of vibration analysis (natural frequency estimation and simple

harmonic motion) of mechanical systems and the effects on a mechanical structure. Examples relating to the structural design of satellites will be covered in this module.

STAGE MANAGEMENT & TECHNOLOGY CLUSTER

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

In this workshop-based module, students learn the roles and responsibilities of the stage manager. Students learn the techniques of successfully managing the numerous aspects of a production, both onstage 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.

WORKPLACE SAFETY & HEALTH CLUSTER

This cluster equips students with knowledge and understanding of workplace hazards as well as control measures for minimising, preventing and managing safety and health risks in workplaces of diverse industrial sectors. The programme develops their capabilities in managing Workplace Safety & Health (WSH) issues related to engineering practices, and prepares them for a career as industrial safety coordinators or officers.

Workplace Safety

This module equips students with the fundamental knowledge of workplace safety. Topics include spotting workplace hazards and various techniques used to control these hazards and minimise risk. In addition, students will learn the various methods that are deployed in the industry to ensure compliance with Ministry of Manpower legal requirements.

Workplace Health

This module equips students with knowledge in occupational health. Topics include identification of workplace health 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 workplace safety management and risk control. Topics include managing WSH hazards and control measures, risk analysis, WSH policy, behavioural safety programmes, WSH legal issues and Work

Injury Compensation Act, WSH incident investigation, WSH performance analysis and safety audit, safety education, training and communication.