

ENGINEERING SCIENCE COURSE MODULES

You're passionate about engineering applications, but also love the sciences. You're strong in both math and physics. You're also keen to explore scientific research and discover new ways to solve real-world problems. You don't have to settle on a compromise - why not let us hone all these interests through the Diploma in Engineering Science [ES]?

With a curriculum designed in collaboration with Nanyang Technological University [NTU], ES prepares you well for a wide range of careers and degrees in engineering fields such as aerospace, nanotechnology, computer, electrical, electronic and mechanical as well as material science.

During the first two years, you will be equipped with a strong foundation in engineering and related domains such as mathematics, physics, applied science and research. You will attend distinguished guest lectures and go on industry visits. You may also be exposed to short stints with research establishments and institutes such as NUS and A'STAR.

In your second year, you may also get to visit top overseas universities such as Tokyo Metropolitan University [Japan], Tokyo Metropolitan College of Industrial Technology [Japan] and Technische Universitat Berlin [Germany]. There, you will interact with students and professors, and be exposed to the latest developments in technology and innovation.

In the third year, you will embark on your final-year project and be exposed to your chosen specialisation that will anchor your learning in one of the 3 engineering fields: Automation & Mechatronic Systems, Electrical & Electronic Engineering and Mechanical Engineering.

You may have the opportunity to spend about four days a week either in Nanyang Technological University [NTU], National University of Singapore [NUS], Singapore University of Technology & Design [SUTO] or a research institute where you will be involved in projects supervised by university professors and researchers. These projects will cover a wide range of topics such as aerospace, robotics, biomedical engineering, green energy, laser technology and material science.

LEVEL 1.1

Engineering Mathematics 1

This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Topics include algebra, trigonometry, logarithms, plane analytic geometry, matrices and complex numbers. Throughout the module, there is appropriate use of a Computer Algebra System.

Mechanical Engineering Fundamentals

This module introduces students to the study of external forces in two dimensions and their effect on particles and rigid bodies that are at rest. Students learn the skills to analyse the forces acting on the bodies by drawing freebody diagrams and applying the conditions of equilibrium. Topics include forces and resultants, moments and couples, equilibrium and the concepts of plane friction. This module also aims to equip students with the skills to analyse problems of rigid bodies in motion. Only linear motion in two dimensions will be covered. Topics include kinematics and kinetics of linear motion.

Electrical Engineering Fundamentals

This module provides a foundation in electricity covering basic concepts of electrical circuits and the methods used to analyse them. The module emphasises the understanding of the basic electrical circuit laws (Ohm's Law, Kirchhoff's Voltage and Current Laws) and network theorems, and their application to electrical network analysis. Topics covered include fundamentals of electricity, network theorems, capacitance, electromagnetic induction and inductance.

Programming

This practice-oriented module equips students with basic knowledge and skills in computer programming using C language. The main topics include basic computer programming concepts, fundamentals of C programming including branching, loops, and functions.

Engineering Skills & Practice

This module aims to provide students with the necessary practical knowledge and engineering skills. Topics covered include computer-aided drafting (AutoCAD), mechanical skills in milling, turning & sheet metal work, electrical & electronic measurement & test instrumentation as well as breadboard fabrication & testing.

Career & Professional Preparation I

This 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.

Innovation Made Possible (IS Module)

This module aims to help students discover and hone their innate ability to think creatively and come up with innovations to tackle problems close to their hearts. Underpinned by the Design Thinking framework, students will be sensitized to the process of user-centric problem solving. They will be introduced to concepts such as empathy, problem-definition, ideation, prototyping and testing through a practical approach featuring engaging out-of-classroom activities, just-in-time master-classes and a hands-on, "learning by doing" delivery format. Ultimately, the module will help students recognize that innovation is attainable and fun and develop creative confidence to explore new ideas in their studies and beyond.

LEVEL 1.2

Engineering Mathematics 2

This module is designed to provide students with the fundamental skills in mathematics required to solve basic engineering problems. Topics are introduced in an order that is intended to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on simple applications and problem solving. Throughout the module, there is appropriate use of a Computer Algebra System. Topics include trigonometry, differentiation and simple integration with applications.

Analogue Electronics

The aim of this module is to lay the foundations in analogue electronics. At the end of this module, students will acquire content knowledge and understanding on the basic concepts of analogue electronics and some applications.

Key topics covered in this module include operating characteristics, working principles and applications of discrete electronic devices such as various types of diodes, MOSFETs and BJTs. Practical circuits will be used to enhance and strengthen the learners' knowledge so that they will acquire the relevant competencies to move on to more specialized modules.

AC Circuits

The aim of the module is to provide first year students with a basic knowledge of the fundamental principles in electric circuit analysis. The module first explores DC network theorems such as Kirchhoff's Laws, Thevenin's Theorem and Principle of Superposition. Application of the theorems are then extended to AC circuits which involve impedances such as capacitance and inductance. The module also includes analysis of simple AC series, parallel and series-parallel combination circuits, concept of AC power and understanding of power factor and its effect on electrical energy usage.

Thermofluids

Students will learn the basic laws governing the behaviour of fluids under the influence of energy transfer. Topics include systems concept, temperature and pressure, fluid statics, fluid in motion, continuity equation, laminar and turbulent flows, ideal incompressible flow, Bernoulli's equation, flow measurement and Pitot tube, external flow and application of thermofluids' principles in simple engineering systems.

Fundamentals of Object-Oriented Programming

This module builds on the earlier module (Computer Programming) and brings students into the realm of Object Oriented Programming. Students learn how to encapsulate data and behaviour, apply polymorphism, and reuse codes through inheritance mechanism.

Sports and Wellness (IS Module)

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.

Communication Essentials (IS Module)

This module aims to develop written and spoken communicative competence in students by exposing them to a range of contemporary issues. Through researching on and discussing different topics from different disciplinary perspectives, students acquire lexis and syntax through critical reading and writing while developing awareness of self in society. The integration of critical thinking and analysis will enable students to articulate their thoughts and perspectives through oral presentations and written texts. The module will also develop an awareness of cultural intelligence with global viewpoints.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (23 hours per week)	
Career & Professional Preparation I	2
Programming	4
Electrical Engineering Fundamentals	3
Engineering Mathematics 1	4
Mechanical Engineering Fundamentals	3
Engineering Skills & Practice	4
Innovation Made Possible ^	3
Level 1.2 (25 hours per week)	
Analogue Electronics	4
Engineering Mathematics 2	4
Fundamentals of Object-Oriented Programming	4
AC Circuits	4
Thermofluids	4
Communication Essentials ^	3
Sports & Wellness ^	2

Notes:

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

IS Modules

The School of Interdisciplinary Studies (IS) delivers a broad-based curriculum, which nurtures a new generation of professionals with multidisciplinary skills and an innovative and entrepreneurial spirit to meet the challenges of a knowledge economy. IS offers both prescribed modules and electives to challenge boundaries. Prescribed modules develop students' competencies in core areas such as Communication, Innovation and Enterprise, Culture and Communication, and Personal Mastery and Development, while elective modules provide insights into Arts and Humanities, Business, Design, and Science and Technology.