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 2.1

Engineering Mathematics 3A

This module is a continuation of Engineering Mathematics 2. Topics include integration with applications, differential equations, Laplace transform and Fourier Series.

Physics 1

This module covers the topics of Classical Mechanics. Students learn the laws of motion in both one and two dimensions. They also study concepts of work and energy for linear systems including linear momentum and collision. The practical sessions will introduce students to system modelling and simulation using MATLAB.

Digital Electronic Circuits

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 higher level modules involving microprocessors and microcomputers. The main topics covered are number systems, Boolean algebra, combinational logic circuits and minimisation techniques, flip-flops and multi-vibrators, Integrated Circuit (IC) counters and data handling devices. IC electrical characteristic including TTL & CMOS devices and application of IC buffer/driver will also be covered.

Data Structures & Algorithms

This module introduces the basics of data structures including linked-list, binary search tree and sorting algorithms. Various sorting algorithms will be discussed and compared.

Strength of Materials

This module aims to provide students with the foundational knowledge of strength of materials with emphasis on applications and problem solving. Topics include simple stresses and strains, torsion in shaft, shear force and bending moment diagrams, stresses in beams, combined stresses and experimental stress analysis.

LEVEL 2.2

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.

Career & Professional Preparation II

This module helps to equip students with skills necessary to seek and secure work. They will also be equipped to communicate their personal brand in a positive way. As students sharpen their communication skills, they will also learn how to market themselves effectively.

Engineering Design

This module will guide students to integrate various domain knowledge acquired to develop working models of engineering systems (e.g. two-arm robots, autonomous vehicles and DSP-based control systems). Students will work on mini-projects in teams under supervision and formulate and present solutions to the review panel at the end of the semester. The module serves as a stepping stone to prepare students for their Final-Year Projects.

Nanotechnology Fundamentals & Applications

The fundamental principles of nanotechnology applications are largely grounded on basic chemistry and physics. This module aims to illustrate these concepts of chemistry and physics to appreciate the learning when the size goes down to nanoscale. It covers the physical tools and their working principles used to characterize the structures at nanoscale. It also incorporates the fabrication of nanostructures that are important to the overall understanding of nanotechnology.

The module provides an opportunity for students to experience nanotechnology through a range of activities including project, presentation, discussion and virtual lab. It equips students with fundamental knowledge and understanding that are relevant to industries such as semiconductors, solar cells, aerospace and biomedical engineering. Students also gain a level of competency required for further studies or pursuing a career in research & development.

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 inputoutput devices such as switches, LEDs, 7-segment display and keypads helps to demonstrate the behaviour of the application software running on a working system.

Physics 2

This module builds on Physics 1 and extends the coverage into other aspects of Physics such as Angular Kinematics, Universal Gravitation, Fluid Mechanics, Thermodynamics, Electricity and Magnetism.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 2	
Level 2.1 (25 hours per week)	
Data Structures & Algorithms	4
Digital Electronic Circuits	6
Engineering Mathematics 3A	4
Physics 1	4
Strength of Materials	5

Interdisciplinary Studies (IS) elective ^	2
Level 2.2 (26 hours per week)	
Analogue Circuit Design & Applications	5
Career & Professional Preparation II	2
Engineering Design	3
Nanotechnology Fundamentals & Applications	5
Microcontroller Programming & Interfacing	5
Physics 2	4
World Issues: A Singapore Perspective ^	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.