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 3.1

Project Design & Development

In this module, students will work together in teams of two to design and implement a project that exposes them to engineering skills as well as teamwork, over a period of one semester. 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.

LEVEL 3.2

MODULES UNDER THE OPTIONS:

Applied Thermodynamics

Students will learn the applications of principles of Thermodynamics to energy conversion, energy transformation and energy management. Topics include thermodynamic processes, the second law of thermodynamics, gas power cycles, engine performance testing, nozzles, steam power plant, basic heat transfer and introductory of thermal management.

Circuit Analysis & Design

This module aims to provide students with a sound grounding of the concepts and methods in circuit analysis and design. Topics covered include impedance, transient behaviors of RLC circuits, frequency response, spectrum & resonance, filters and two ports network functions. The practical sessions will introduce students to circuit design and simulation.

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.

Emerging Mechatronic Technologies
The aim of the module is to provide the students with a platform to keep abreast of recent advances and developments in the newly emerging areas of technology, as well as actual and potential applications to industrial and factory automation. Topics include Micro-electro Mechanical Systems (MEMS), Nanotechnology, Photonics and wireless & web-enabled automation systems.

Fundamentals of Control Systems
This module provides students with a basic coverage of feedback control systems. The topics cover the basic concepts of automatic control, the components of control systems, simple analytical tools, and stability analysis of systems. Students are also introduced to the use of MATLAB/Simulink a computer tool in control systems analysis.

Industrial Automation
In this module, students will first be introduced to electrical control systems, which cover sequential motor control circuits, direct-on-line and star-delta motor starter circuits. Students will then be taught the PLC (programmable logic controller) theory of operation, basic functions, the I/O addressing and interfacing, and the design of ladder logic programmes. Students will design PLC-based systems related to industrial applications through numerous hands-on exercises.

Mechanics of Machines & Materials
This module provides students the experience of solving engineering problems based on the principles and theories covered in the earlier Mechanics modules. Topics include velocity and acceleration diagrams, effects of the mass of members of mechanism, friction mechanisms and the effects of friction on screw threads and belt drives, balancing of shafts and its application to gears and pulleys, and the causes and control of machinery vibration.

System Modelling & Control
The module focuses on modelling the dynamics of process and servo systems and shaping the dynamic response through closed-loop control. Students will learn the principles of systems modelling, simulation, analysis and control, and the application of these principles in systems analysis and synthesis. Major topics include modelling singlediscipline systems and mixed systems, Laplace transform, s-plane, standard forms, time domain specifications, effects of control actions on system performance, and frequency response analysis.

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.

COURSE CURRICULUM

Module Name	Credit Units

YEAR 3	
Level 3.1 (22 hours per week)	
Project Design & Development	22
Level 3.2 (24 hours per week)	
Project ID: Connecting the Dots ^	4
AUTOMATION & MECHATRONIC SYSTEM SPECIALISATION	
Digital Signal Processing	5
Emerging Mechatronic Technologies	5
Industrial Automation	5
System Modelling & Control	5
ELECTRICAL & ELECTRONIC ENGINEERING SPECIALISATION	
Circuit Analysis & Processing	5
Digital Signal Processing	5
Fundamentals of Control Systems	5
Telecommunication Principles	5
MECHANICAL ENGINEERING SPECIALISATION	
Applied Thermodynamics	5
Fundamentals of Control Systems	5
Mechanics of Machines & Materials	5
Industrial Automation	5

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.