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 consultation with Nanyang Technological University [NTU], National University of Singapore [NUS] and Singapore University of Technology and Design [SUTD], ES prepares you well for a wide range of careers and degrees in engineering fields such as aerospace, 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], or Nanjing University of Science & Technology [China]. 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 be exposed to the skills and knowledge in emerging technologies in artificial intelligence and machine learning, and embark on final-year project or R&D-oriented internship.

You may have the opportunity to spend about four days a week either in NTU, NUS, SUTD, 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 and material science.

LEVEL 1.1

Applied Mathematics 1
This module aims to provide students with the fundamental skills in applying mathematics to solve engineering problems. Topics are introduced to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on applications and problem solving. Topics include exponential functions, logarithmic functions, trigonometric functions, plane analytic geometry, complex numbers and applications, differentiation and applications, basic integration and applications. Materials on MOOC platform could be adapted in the module delivery.

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 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 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 a suitable high-level language. The main topics include basic computer programming concepts and fundamental programming constructs such as sequences, selection and repetition.

Integrated Real-World Project 1
This module aims to integrate the knowledge learnt in the semester and apply to a real-world project and further enhanced through relevant contextualization. Students will work in teams and undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to apply the skills and develop confidence in tackling projects. Data analytics will be introduced using case-based approach and applied in the integrated real-world project.

The Career & Professional Preparation 1 will be incorporated 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

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

Applied Mathematics 2A
This module aims to provide students with the fundamental skills in applying mathematics to solve engineering problems. Topics are introduced to keep abreast of the application requirements in engineering modules. The emphasis in each topic is on applications and problem solving. Topics include further techniques of integration, applications of using exponential, logarithmic & trigonometric integrals, Fourier series, first-order differential equations, Laplace transform and applications, matrices and determinants. Materials on MOOC platform could be adapted in the module delivery.

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.
Digital Fundamentals
This module introduces the basic concepts of digital systems. It covers the basics of combinational and sequential logic circuits. Flip-flops and their application in counters and registers will also be discussed. This basic knowledge is essential for students to be able to understand, analyse, and design basic digital circuit systems.

Integrated Real-World Project 2
This module aims to integrate the knowledge learnt in the semester and apply to a real-world projects with service learning as the main emphasis. Students will work in teams and undertake the project development underpinned by the design thinking approach. On completion of the module, students will be able to apply the skills and develop confidence in designing solutions to problems faced at service learning partners’ premises.

This module will also imbue in students a sense of civic consciousness in the context of engineering and society. It serves to create awareness amongst students about the impact of engineering on society in general. In the process it introduces the application of cultural quotient (CQ) skills and mould students’ disposition to understand and collaborate across diverse cultures in real world settings.

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

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<th>Module Name</th>
<th>Credit Units</th>
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<tr>
<td><strong>Level 1.1 (20 hours per week)</strong></td>
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<tr>
<td>Applied Mathematics 1</td>
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<tr>
<td>Programming</td>
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<tr>
<td>Electrical Engineering Fundamentals</td>
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<td>Integrated Real-World Project 1</td>
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<td>Innovation Made Possible ^</td>
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<tr>
<td><strong>Level 1.2 (22 hours per week)</strong></td>
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<tr>
<td>Applied Mathematics 2A</td>
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<tr>
<td>Digital Fundamentals</td>
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<td>AC Circuits</td>
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<td>Analogue Electronics</td>
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<td>Integrated Real-World Project 2</td>
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<td>Communication Essentials ^</td>
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<td>Sports &amp; Wellness ^</td>
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Notes:
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.

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