AUTOMATION & MECHATRONIC SYSTEMS COURSE MODULES

A bionic arm, a self-driving car and an autopilot train system - these are some icons of the amazing world of automation technology that are brought about by integrating various fields of engineering. If you want to engineer the next generation of smart machines, the Diploma in Automation & Mechatronic Systems [AMS] is your ideal choice.

AMS prepares students for exciting careers in diverse fields ranging from aerospace, marine, industrial systems and healthcare to surgical and consumer product industries. You will learn to use automation and mechatronic technology to develop high-tech solutions for consumer products and industrial applications. What's more, AMS's strong emphasis on De sign Thinking and Practice will give you an edge in creating innovative solutions for using clean energy, developing new materials and processes, and designing high-tech consumer and industrial products.

In the first two years, you will build a strong grounding in the various disciplines of engineering - electrical, electronics, mechanical and computer programming. You will also be equipped with applied design thinking skills.

In your third year, you will learn how to integrate automation systems and manage projects. You will also go on a six-month internship with companies such as ST Kinetics, PSA Singapore, Keppel Offshore & Marine and A*STAR. Or you can choose to work on a final-year project to design and develop a "smart" product prototype. Depending on your interest, you can choose to specialise in one of our three specialisation options: Industrial Systems, Aerospace Systems and Marine & Offshore Systems.

SPECIALISATION OPTIONS

Industrial Systems

You will develop skills and expertise in automation techniques, systems design and integration skills as well as problem -solving techniques used in the design and integration of industrial systems.

Aerospace Systems

You will learn how to apply knowledge in mechanics, structure propulsion and electronics to the design and development of aerospace systems and appreciate the use of automation systems in the aerospace industry**.**

Marine & Offshore Systems

You will be taught the fundamentals of marine engineering, propulsion, as well as ship and oil production to gain an understanding of the various systems used in ship production and offshore facilities.

LEVEL 2.1

Applied Thermofluids

Thermo-fluids is a module of science and engineering encompassing 2 intersecting fields namely Thermodynamics and Fluid mechanics. In relation to mechanical engineering, Thermodynamics is the science of converting energy involving heat to mechanical work and Fluid Mechanics is the study of physical forces in a system in the presence of fluid when at rest or in motion. Heat energy had to be transported by fluid in order to undergo various thermodynamic processes and becomes mechanical work eventually. The way fluid would flow ultimately dominates the entire thermal energy conversion process.

This module extends the coverage of Thermofluids in year 1, which further the basic concepts and principles of Thermodynamics and Fluid mechanics concepts. Behaviour of fluids under different conditions like static, dynamic and under the influence of heat will be covered in further details. The most important 2nd law of Thermodynamics will be introduced. Subsequently, Basic Engineering cycles developed from the 2nd law including Steam power cycles and Gas power cycles will be discussed. Students will also be taught on the methods of Engine performance testing.

Automation in a Mechatronic World

This module consists of two main components: assembly and programming. Students will first learn the assembly of drive mechanisms and mechatronic products, such as NXT robots and various drive mechanisms. Through these practical exercises, students will learn about mechanical designs, assembly skills, commissioning, troubleshooting and diagnostic techniques of mechatronic systems. Students will then learn how to build and program robots to perform a number of automation-related tasks using tools such as Lego Mindstorms NXT and Logicator for PIC microcontroller. They will also learn interfacing of simple input and output devices to the microcontroller to simulate real-life applications in the field of automation control.

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.

Computer-Aided Design & Drafting

This practice-oriented module is designed to give students an appreciation of the scope of computer graphics and hands-on practice in the applications of CAD (Computer-Aided Design) in engineering design. This module aims to help students in the application of the drafting concepts and modelling techniques for development of product models in the design process. Students will learn the principles and capabilities of CAD through three dimensional (3D) solid modelling of engineering components and assembly. A project is used to consolidate the concepts and techniques learnt in the CAD module and EDA (Engineering Design Analysis) module. An appreciation of finite element analysis is also included in the module.

Engineering Design Analysis

Students systematically apply engineering principles to the selection and design of mechanical elements and systems. Through short design projects and case studies, students learn the design process, the use of Computer-Aided Design (CAD) tools, code of practice and engineering judgment in design. Topics include the selection and design of common engineering elements and systems such as electric motors, coupling, gears, bearing, shaft, key and chain drives.

Engineering Mathematics 3B

This module is a continuation of Engineering Mathematics 2. Topics include integration techniques and applications, first order differential equation, Laplace transform, probability and statistics.

LEVEL 2.2

Applied Mechanics

This is a follow-on module from Engineering Mechanics. It will equip students with the necessary skills to analyse problems of rigid bodies at rest and in motion. Topics include trusses, friction, work energy method, power and efficiency and impulse momentum method. This knowledge plays an important role in many diverse engineering applications in the modern world, such as the design of cars, structures, airplanes, and various types of machines. Students will be guided to solve engineering problems using these mechanics principles.

Industrial Automation

Students will explore the concepts of logic and sequential control, and their applications in industrial automation. They are introduced to a spectrum of technologies, ranging from pneumatics and electro-pneumatics to programmable controllers with emphasis on component technology leading to circuit design and implementation. Topics include automated mechanisms, ladder diagrams, basic and advanced features of programmable controllers, design techniques and applications.

Mechatronic Design Practice
This is a hands-on module that aims to provide students with the opportunities to translate the knowledge and skills learnt from module Engineering Design Thinking into practice through the detailed design, fabrication and testing of an engineering application prototype. In the process, students will hone their design knowledge and skills required for their final-year project or internship.

Microcontroller & Interfacing
This practice-oriented module aims to equip students with a working knowledge of microcontroller applications and interfacing techniques, the backbone of typical industrial process control operations. Major topics include basic numbering system, microcontroller application and programming, sensor interfacing and motor control. Students will gain a practical insight into applying digital techniques over a wide range of automation and control applications.

Strength of Materials
This module aims to provide students with 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.

COURSE CURRICULUM
Curriculum structure is currently under review and changes are still pending.

YEAR 2
Level 2.1 (24 hours per week)

Applied Thermofluids	5
Automation in a Mechatronic World	3
Career & Professional Preparation II	2
Computer-Aided Design & Drafting	4
Engineering Design Analysis	4
Engineering Mathematics 3B	4
Interdisciplinary Studies (IS) elective ^	2

Level 2.2 (25 hours per week)

Applied Mechanics	5
Industrial Automation	5
Mechatronic Design Practice	3
Microcontroller & Interfacing	5
Strength of Materials	5
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.