

COURSE CURRICULUM

Module Name	Credit Units
YEAR 1	
Level 1.1 (27.5 hours per week)	
Career & Professional Preparation I	1.5
Computer Programming	4
Electrical Technology & Electronics	6
Engineering Mathematics 1	5
Engineering Mechanics	4
Fundamentals of Aerospace Technology	3
Innovation Toolkit 1 ^	2
Sports & Wellness ^	2
Level 1.2 (25 hours per week)	
Aircraft Manufacturing & Maintenance Practices	5
Engineering Design Drafting	5
Engineering Mathematics 2	5
Thermofluid 1	4
Communication & Contemporary Issues ^	4
Innovation Toolkit 2 ^	5

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 1	
Level 1.1 (22.5 hours per week)	
Career & Professional Preparation I	1.5
Computer Programming	4
Electrical Technology	4
Engineering Mathematics 1	5
Engineering Mechanics	4
Innovation Toolkit 1 ^	2
Sports & Wellness ^	2
Level 1.2 (28 hours per week)	
Aircraft Manufacturing & Maintenance Practices	5
Engineering Design Drafting	5
Engineering Mathematics 2	5
Fundamentals of Aerospace Technology	3
Thermofluid 1	4
Communication & Contemporary Issues ^	4
Innovation Toolkit 2 ^	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.

COURSE MODULES

LEVEL 1.1

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.

Computer Programming

This practice-oriented module equips students with the basic knowledge and skills in computer programming using C language. The main topics include basic computing concepts, fundamentals of C, branching, loops, and C functions. On completion of the module, students will be able to explain and write C programmes for simple engineering applications.

Electrical Technology

This module provides the foundation in electricity to prepare students for more specialised subjects. It deals with the 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, AC circuit theory and transformer fundamentals.

Electrical Technology & Electronics

This module equips students with fundamental electrical and electronics principles, and the necessary practical skills in handling basic test equipment, electrical circuits as well as electronic devices and circuits. Major topics include basic circuit elements, direct current circuits, Ohm's law, Kirchhoff's laws, transistors as well as common analogue and digital integrated circuits. This module provides the background knowledge for students to progress to the module Avionics Systems.

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.

Engineering Mechanics

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.

Fundamentals of Aerospace Technology

This activity-based module introduces students to the principles of flight, and traces the historical development of aerospace technology, its impact on society, and economics, and safety and environmental issues. It highlights the nature and scope of the aerospace industry in Singapore, and the broad technical training for the profession with specific reference to the structure of the course. The module aims to create professional awareness in students.

LEVEL 1.2

Aircraft Manufacturing & Maintenance Practices

The objective of this module is to provide students with a fundamental knowledge of aircraft maintenance practices and the safe handling of aircraft servicing on ground. It will fulfil both current and future requirements for a module in basic Aviation Maintenance Technology. Materials in the module are in accordance to Federal Aviation Administration (FAA) and our Civil Aviation Authority of Singapore (CAAS).

Engineering Design Drafting

This module covers the basic principles of engineering drafting and the application of an industry-standard computer design drafting tool to produce detailed drawings of engineering parts. This practice-oriented module comprises short lectures complemented by hands-on exercises with emphasis on practical examples and industry practices. Topics include orthographic projection, sectioning, dimensioning, conventional representation and assembly drawing.

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.

Thermofluid 1

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 thermofluid applications in aircraft components and systems.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 2	
Level 2.1 (29 hours per week)	
Aircraft Structures & Systems 1	5
Applied Mechanics	5
Avionics Systems	3
Career & Professional Preparation II	2
Engineering Design Thinking	3
Engineering Materials	4
Strength of Materials	5
Interdisciplinary Studies (IS) elective ^	2
Level 2.2 (27 hours per week)	

Aerospace Design Practice	3
Computer-Aided Design & Manufacturing	5
Engineering Design Analysis	4
Engineering Mathematics 3	4
Mechanics of Flight	4
Thermofluid 2	5
Interdisciplinary Studies (IS) elective ^	2

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 2	
Level 2.1 (27 hours per week)	
Aircraft Structures & Systems 1	5
Applied Mechanics	5
Career & Professional Preparation II	2
Engineering Materials	4
Marketing Fundamentals	4
Strength of Materials	5
Business & the Economy ^	2
Level 2.2 (28 hours per week)	
Aircraft Electronics	2
Engineering Design Analysis	4
Engineering Design Thinking & Practice	3
Engineering Mathematics 3	4
Fundamentals of Financial Management	4
Mechanics of Flight	4
Thermofluid 2	5
Effective People Management ^	2

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IS Modules

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COURSE MODULES

LEVEL 2.1

Aircraft Structures & Systems 1

The module provides a firm foundation in the design and operation of an aircraft. It introduces key aircraft design features that range from structures and construction to the various vital systems that make operation of a modern aircraft possible. Design philosophies and concepts and stress and strength analysis are also introduced to provide an analytical dimension to supplement the theoretical aspects of the module.

Applied Mechanics

This is a follow-on module from Engineering Mechanics. It aims to equip students with further knowledge and skills to analyse problems of rigid bodies at rest and in motion. Topics include trusses, further friction principles, centre of gravity, relative motion, work-energy method, power and efficiency, and impulse-momentum method. Students will solve engineering problems using these mechanics principles.

Avionics Systems

This module covers the various avionics instruments and systems used in modern aircraft, the requirement for zero-visibility flying, the functions and operation of various cockpit instruments, flight environmental systems, sensing devices and electrical power systems used in aircraft. Due emphasis is given to electronics for navigation, communications, surveillance and 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.

Engineering Design Thinking

This module aims to teach students the engineering design thinking process that designers adopt to define the problem, do relevant research to acquire information, analyse knowledge and provide creative solutions to the problem in the design and planning fields. With the thinking process, problems can be framed, the right questions can be asked, more ideas can be created, and the best answers can be chosen.

Engineering Materials

This module introduces students to the equilibrium phase diagrams, structures, and properties of common engineering materials with emphasis on mechanical testing methods, heat-treatment, international standard specifications, selection and applications of such materials. Topics include classification of materials, mechanical testing, alloying, steels, non-ferrous alloys, plastics, ceramics, composites, corrosion and selection of materials and shaping processes.

Marketing Fundamentals

The module introduces concepts and principles of marketing of goods and services to enable students to better understand and evaluate the marketing system in which products and services are planned, priced, promoted and distributed. Apart from the four Ps in marketing, topics covered also include segmentation, targeting and positioning, product mix, service marketing, channel decisions and branding.

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.

LEVEL 2.2

Aircraft Electronics

This module equips students with fundamental electronics principles, and the necessary practical skills in handling basic test equipment and electronic devices and circuits. Major topics include common analogue and digital

integrated circuits. This module provides the background knowledge of electronics for students to progress to the module on Avionics Systems.

Aerospace Design Practice

The main aim of this module is for students to apply the knowledge and skills they have learnt from the various modules, into designing an aerospace product that complies with the provided system requirements and eventually illustrate how to integrate their product into the existing aircraft system. Each student takes responsibility for the design and analysis of part of the aerospace design team in a virtual industrial environment. This provides students the opportunity to work as an integrated product team and prepares them well for project based careers in the aerospace industry.

Computer-Aided Design & Manufacturing

This practice-oriented module focuses on the application of CAD/CAM systems in modern manufacturing. Through hands-on projects and assignments, students develop the proficiency in using a parametric, feature-based solid modelling software for the design of engineering parts and assembly as well as the preparation of detailed manufacturing drawings. Simulation and verification of machining operations are carried out followed by the generation of numerically-controlled data.

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 judgement in design. Topics include the selection and design of common engineering elements and systems such as electric motor, coupling, gears, bearing, shaft, key and chain drives.

Engineering Design Thinking & Practice

This module takes a structured approach in the teaching of the use of the design thinking process to solve engineering and technical problems. Students experience an integrated approach to the learning of design concepts, applying design thinking skills in idea creation, prototyping and testing.

Engineering Mathematics 3

This module is a continuation of Engineering Mathematics 2. Topics include Integration Techniques & Applications, First Order Differential Equation, Laplace Transform, Probability and Statistics.

Fundamentals of Financial Management

This module covers basic accounting and financial concepts and principles to enable students to understand and interpret financial statements and reports. Students will also have an understanding of costing concepts and the financial techniques used in making financial decisions and evaluating capital investment projects.

Mechanics of Flight

The module covers the fundamentals of aerodynamics and the principles governing flight and control. Topics include forces and moments acting on an aircraft, the behaviour of the aerofoil at subsonic speeds, aircraft thrust and propulsion, performance characteristics, and factors affecting range and endurance, takeoff and landing, flight manoeuvres, stability and control. Practical sessions include model construction projects, software simulation and wind tunnel experiments.

Thermofluid 2

This follow-on module of Thermofluid 1 covers the application of thermodynamics principles of flow and non-flow process as well as power cycles. Topics include perfect gases and perfect gas laws, the first and second laws, flow and non-flow processes, steady flow energy equation, gas cycles, combustion, rotary expanders and compressors, one-dimensional compressible flow, and dimensionless groups.

COURSE CURRICULUM

Module Name	Credit Units
YEAR 3	
Level 3.1 (23 hours per week)	
Aircraft Propulsion Systems	4
Aircraft Structures & Systems 2	5
Systems Dynamics & Control	4
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2
AEROSPACE DESIGN SPECIALISATION	
Aerospace Computational Analysis	3
Aerospace Computational Design	3
AVIATION MANAGEMENT SPECIALISATION	
Airport Operations	3
Aviation Business & Management	3
MAINTENANCE, REPAIR, OVERHAUL SPECIALISATION	
Aerospace Materials & Processes	4
Airworthiness Legislation	2
Level 3.2 (27 hours per week)	
6-Month Internship	22
Human Factors	2
AEROSPACE DESIGN SPECIALISATION	
Aerospace Computational Simulation	3
AVIATION MANAGEMENT SPECIALISATION	
Aviation Safety & Management	3
MAINTENANCE, REPAIR, OVERHAUL SPECIALISATION	
Quality System & Manufacturing Management	3

MINOR IN BUSINESS MANAGEMENT

Module Name	Credit Units
YEAR 3	
Level 3.1 (25 hours per week)	
Aerospace Materials & Processes	4
Aircraft Propulsion Systems	4
Aircraft Structures & Systems 2	5
Business Management Elective	4

Starting & Managing an Enterprise	4
Interdisciplinary Studies (IS) elective ^	2
World Issues: A Singapore Perspective ^	2
Level 3.2 (27 hours per week)	
6-Month Internship	22
Avionic Systems	3
Human Factors	2

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COURSE MODULES

LEVEL 3.1

6-Month Internship

The six-month internship at an aerospace company provides students the opportunity to apply the knowledge acquired in the classroom to practical work situations and to associate work experience with classroom learning. Students learn to demonstrate their skills in problem solving and communication in an actual work environment. They will work independently and in a team, and have practitioners in the aerospace industry as mentors to enhance their learning process.

Aerospace Materials & Processes

A continuation of the earlier module, Engineering Materials, this module covers aerospace materials and processes as applied to aluminium, magnesium, titanium and nickel-based systems including super alloys, and selected ceramics and composites. Topics include materials specifications, design guidelines and choice of materials for aerospace components, fatigue and creep behaviour, materials degradation by corrosion and corrosion control, materials forming processes, selective surface hardening, surface modification techniques and surface integrity, and composite repair techniques. Students will develop the knowledge and skills for the design and selection of materials, and the supporting key processes to optimise performance of aerospace components.

Aircraft Propulsion Systems

This module equips students with the basic principles of jet propulsion and a general understanding of the key design features of aircraft power plants. The module systematically provides students with an insight into the evolution and importance of the propulsion system to the development of modern airliners. The topics include turbine cycles, various jet and rocket propulsion systems, design features of inlets, compressors, combustion chambers, turbines and other elements of propulsion systems.

Aircraft Structures & Systems 2

The module covers aircraft hydraulic components and their working principles, hydraulic circuits, operating characteristics, hydraulic drives and application circuits, control of landing gears and flight control surfaces. It also

covers environmental control systems encompassing air-conditioning, cabin pressurisation, the oxygen system and the various auxiliary systems such as fire and ice protection system, water and waste system, and rain removal.

Avionics Systems

This module covers the various avionics instruments and systems used in modern aircraft, the requirement for zero-visibility flying, the functions and operation of various cockpit instruments, flight environmental systems, sensing devices and electrical power systems used in aircraft. Due emphasis is given to electronics for navigation, communications, surveillance and control.

Human Factors

This module introduces students to human factors and how they affect performance at work. Topics include social psychology, physical environment, type of tasks, as well as communication and human errors, with special reference to the aerospace industry.

Starting & Managing an Enterprise

In this module, students generate business ideas and propose how these ideas can be developed into a business plan incorporating operational and financial requirements and marketing strategies for a new enterprise. In addition, students will learn how the principles of management can be applied to organise and develop the enterprise. Topics covered include entrepreneurial concepts and issues, business entry and exit strategies, types of business ownership, sources of business financing, venture launch and management principles.

System Dynamics & Control

The module focuses on modelling the dynamic behaviour of systems including vibration in aircraft systems, and shaping the dynamic response through closed-loop control, with case studies on flight control surfaces and single-discipline and mixed systems, Laplace transform, s-plane, time-domain specifications, effects of control actions on system performance, frequency response analysis and introduction to statespace.

AEROSPACE DESIGN SPECIALISATION

Aerospace Computational Analysis

This module focuses on the basic engineering methods and tools for the design and development of aerospace components. It aims to equip students with a good understanding of the fundamental engineering principles of aerospace component design, and an appreciation of the elemental aspects of computational stress analysis using finite element methods.

Aerospace Computational Design

The mechanism design module equips students with computer-aided engineering skills to articulate and perform kinematics analysis of mechanisms. The students will be able to design, assemble and model behaviour of motion generating machine elements. Animated results and data obtained from the analysis will be used for design optimisation.

Aerospace Computational Simulation

This practice-oriented module enables students to perform basic computational fluid dynamic analyses of aerospace component design through the appropriate use of numerical methods and computer applications. In the process, students will hone their engineering analytical skills and apply knowledge acquired from the previous modules to work on interesting aerospace design projects.

AVIATION MANAGEMENT SPECIALISATION

Airport Operations

This module introduces the fundamental concepts and principles involved in the administration and operation of modern international airports. It also covers fundamentals of airside rules, regulations and operations around the aircraft parking apron of an airport. Topics covered include international governance and standards of airports, airfield

layout design, airport terminal design and operations, apron layout design, arrival gate assignments, aircraft refuelling services as well as ramp operations and safety.

Students will learn about air navigation services and the key facilities and systems found at the airside of an airport. Topics covered include aircraft approach and landing aids, airfield lighting systems and aircraft pavement management.

Aviation Business & Management

This module introduces the fundamentals of airline business and management. Topics covered include economics of air transportation, airline organisational structures and business modelling, route planning and development, airline and route profitability, air transport agreements and the regulatory framework of the airline industry, airline alliances, fleet and facilities planning, airline financing, product development and acquisition, as well as key airline performance indicators. Fundamentals of aviation logistics and cargo management will also be covered.

Aviation Safety & Management

This module provides students with a broad understanding of the elements of a safety management system, hazard identification and risk management. Topics cover safety management of aircraft operations, air traffic services and maintenance of aircraft and aerodrome operations, ICAO requirement, Safety Management System (SMS) planning and operation requirements.

MAINTENANCE, REPAIR & OVERHAUL SPECIALISATION

Aerospace Materials & Processes

A continuation of the earlier module, Engineering Materials, this module covers aerospace materials and processes as applied to aluminium, magnesium, titanium and nickel-based systems including super alloys, and selected ceramics and composites. Topics include materials specifications, design guidelines and choice of materials for aerospace components, fatigue and creep behaviour, materials degradation by corrosion and corrosion control, materials forming processes, selective surface hardening, surface modification techniques and surface integrity, and composite repair techniques.

Students will develop the knowledge and skills for the design and selection of materials, and the supporting key processes to optimise performance of aerospace components.

Airworthiness Legislation

The module provides students with basic knowledge of key aviation regulations and airworthiness requirements governing the aerospace industry. Students will gain an appreciation of the roles and organisation of aviation governing bodies responsible for safety standards and aviation regulations. These organisations include the International Civil Aviation Organisation (ICAO), US Federal Aviation Administration (FAA), European Joint Aviation Authorities (JAA), European Aviation Safety Agency (EASA) and, in particular, the Civil Aviation Authority of Singapore (CAAS).

In the context of the local aerospace industry, the module covers in greater depth the Singapore Air Navigation Order (ANO), with a focus on the Singapore Airworthiness Requirements. The latter provides students with an understanding of the rules and regulations governing the local aviation industry.

Quality System & Manufacturing Management

This module prepares students to apply quality system management techniques and principles in their future workplace. Topics include Quality Management Systems (ISO 9000) and Quality Audits for process compliance, Mistake Proofing, Hypothesis Testing, Gage Repeatability & Reproducibility and Design of Experiment. Minitab software is used to enhance students' understanding and perform root cause analysis on troubleshooting and problem-solving systematically, scientifically, and statistically. Lean manufacturing to identify and eliminate wastes and six sigma initiatives in the aerospace industry will also be discussed.

BUSINESS MANAGEMENT ELECTIVES

Students are to choose *one* of the three electives below:

Managing Service Operations

This module introduces the operations in service organisations and the use of techniques for designing, planning, organising and controlling resources for the delivery of goods and services to meet customers' needs and organisational objectives. Concepts covered include service facility, managing facilitating goods, forecasting demand, managing waiting lines, process improvement, inventory management, service supply relationship and service quality.

Supply Chain Management

This module introduces students to the process of planning, implementing, and controlling the operations of the supply chain. It will cover the movement and raw materials, work-in-process inventory and finished goods from point-of-origin to point-of-consumption. The module also emphasises the effect supply chain management has on the success and profitability of the organisation.

Understanding Buyer Behaviour

The module provides students with a basic understanding of buyer behaviour concepts. It explores various influencing factors that affect buyer decisions. Buyers could be consumers or corporate buyers. Topics covered include consumer decision-making processes, perceptions and attitudes, consumer demographics and lifestyles, and cultural and group influences.

DIPLOMA PLUS PROGRAMME

The Diploma Plus Programme (DPP) is designed to provide students with proficiency in a selected domain area, either to broaden or deepen a student's knowledge/skills in his/her main discipline of study, or to equip a student with additional professional knowledge that would better prepare him/her for further study or increase their employability. Students can select elective modules from a wide range of clusters to obtain their Diploma Plus Certificate. DPP is optional and it will not affect the graduating requirement for the award of a diploma.

Students can choose the DPP clusters from the list below. The offer of a DPP cluster is subject to the condition that the minimum class size is met and based on available vacancies.

Engineering Clusters

- Applied Physics#
- Aviation Fundamentals
- Computer-Aided Design Skills (World Skills Singapore)
- Workplace Safety & Health

Other available Diploma Plus Certificates

- Advanced Engineering Mathematics*
- Business**
- Innovation Management
- Foreign Languages

The Applied Physics syllabus is aligned with the NTU's FE1012: Physics A module. NP students who obtain good grades in the Applied Physics modules will be granted exemption from the FE1012: Physics A module.

* The CAEM syllabus is aligned with the 'A' Level H2 Pure Mathematics syllabus. NP graduates who have successfully completed the revised CAEM will be granted exemption from the NUS' MA1301 Proficiency Test.

** Students pursuing the Minor in Business Management cannot take the DPP Certificate in Business (CIB).