

DIPLOMA IN

# AERONAUTICAL & AEROSPACE TECHNOLOGY

**B**e a versatile technologist conversant in all aspects of aerospace technology such as aerospace manufacturing processes, composite materials, and aerospace design, analysis and testing. The Diploma in Aeronautical & Aerospace Technology course prepares you for the fast-paced and cutting-edge aerospace industry by providing you with a solid foundation in current and emerging technologies and practices in the industry.

With major aerospace companies setting up base here, and with Singapore

growing as a key regional centre for maintenance, repair and overhaul (MRO), your training will lead to abundant career opportunities upon graduation.

This course is the first in Singapore to be accredited by the Engineering Technology Accreditation Commission of ABET, a worldwide leader in assuring quality and stimulating innovation in applied science, computing, engineering and engineering technology education.

*Полный уровень масла.*



## WHY THIS DIPLOMA?

- Gain broad-based training in this hybrid programme covering aerospace MRO and aerospace manufacturing.
- Get technological knowledge and know-how to support the manufacturing and repair needs of new-generation aircraft.
- Be primed for employment in the aerospace MRO and aerospace manufacturing industries.
- With ABET accreditation, students can be assured that:
  - SEG is committed to improving their educational experience.
  - SEG is committed to using best practices and innovation in education.
  - The course is guided by its industry, government and academic constituents through formal feedback.
  - The course considers the students' perspective as part of its continuous quality improvement process.

## IT WILL ENABLE YOU TO...

- Design, develop and implement solutions for aviation applications.
- Lead, collaborate and communicate with multidisciplinary teams.
- Contribute to innovation and partake in enterprising endeavours.
- Anticipate the welfare and safety needs of the public.
- Enter the aviation industry or a related field, or be accepted into related undergraduate and/or professional training programmes.

## DURATION

Three academic years on a full-time basis.

## FURTHER EDUCATION

You can pursue further studies in varied engineering disciplines at reputable universities in Singapore and overseas. As this is an ABET-accredited course, our graduates have added advantage when applying for further studies in the US.

## CAREER PROSPECTS

You will be well-equipped to embark on careers that involve the design and development of aircraft components, as well as in aircraft maintenance, manufacturing, quality control, testing, advanced materials and planning.

Opportunities in specific industry sectors include:

- Aerospace manufacturing
- Maintenance, repair and overhaul
- Engine maintenance, repair, overhaul and testing
- Advanced aerospace and composite materials
- Non-destructive inspection/testing of airframe and aircraft components
- Quality assurance of aircraft components
- Aircraft fleet and logistics management

Upon further specialised training and practical experience in operating aircraft, you will have the opportunity to be certified by the Civil Aviation Authority of Singapore (CAAS) as a Licensed Aircraft Maintenance Engineer (LAE).

## ENTRY REQUIREMENTS<sup>^</sup>

You must have obtained the following minimum GCE 'O' Level results:

- **English Language (EL1)** Grade 1–7
- **Elementary/Additional Mathematics** Grade 1–6
- **A relevant Science subject** Grade 1–6

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<sup>^</sup> Please refer to the section on entry requirements for diploma courses for more details.

## COURSE STRUCTURE

### YEAR 1 – SEMESTERS 1 & 2

#### Core Modules

- EGF101** Engineering Mathematics 1A
- EGF102** Engineering Mechanics 1
- EGF103** Aerospace Manufacturing Technology
- EGF115** Engineering Drawing & Modelling
- EGF105** Materials Technology
- EGF107** Engineering Mathematics 1B
- EGF108** Electrical Principles & Circuits
- EGF109** Analogue & Digital Electronics
- EGF110** Communication Skills
- EGF111** Computer Programming
- EGF113** Introduction to Engineering
- EGF116** Workshop Practices

#### General Studies\*

### YEAR 2 – SEMESTERS 1 & 2

#### Core Modules

- EGF201** Engineering Mathematics 2A
- EGF202** Aeronautical Science
- EGF203** Engineering Mechanics 2
- EGF214** Aero-Structures
- EGF215** Computer Aided Design & Manufacturing
- EGF216** Aero-Systems
- EGF207** Engineering Mathematics 2B
- EGF208** Mechanical Design
- EGF209** Thermofluids
- EGF210** Metrology & Quality Control
- EGF211** Aircraft Propulsion System
- EGF217** Aviation Legislation & Human Factors

#### General Studies\*

### YEAR 3 – SEMESTERS 1 & 2

#### Elective Programmes (Select one)

#### Aerospace Systems & Testing

##### Core Modules

- EGF301** Aerospace Material & NDT Technology
- EGF302** Aircraft Component and Fixture Design
- EGF312** Aero Maintenance Practices & Projects
- EGF304** Professional & Interpersonal Communication Skills
- EGF324** Full-Time Semestral Project\*\*

##### General Studies\*

##### Internship#

##### Elective Modules (Choose two)

- EGF305** Reliability & Failure Analysis
- EGF313** Computational Analysis and Simulation

#### Aerospace Manufacturing

##### Core Modules

- EGF301** Aerospace Material & NDT Technology
- EGF312** Aero Maintenance Practices & Projects
- EGF304** Professional & Interpersonal Communication Skills
- EGF314** Advanced Metrology & Quality Management
- EGF324** Full-Time Semestral Project\*\*

##### General Studies\*

##### Internship#

##### Elective Modules (Choose two)

- EGF309** Shop Floor Monitoring & Control
- EGF310** Advanced Machining Technology
- EGF311** Aerospace Manufacturing System

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\* To complete a total of 150 hours of General Studies Modules in the course with the aim of promoting a holistic education and learning experience. Choose modules from clusters that include foreign languages, communication and interpersonal skills, leadership and teamwork, values and society, general knowledge and interests, and healthy and active lifestyle.

\*\* Students taking EGF325 or EGF326 would not need to do EGF324.

# Internship (Choose one)

EGF323 Internship Programme (12 weeks)

EGF325 Internship Programme (24 weeks)

EGF326 Overseas Internship Programme (24 weeks)

For detailed module synopses, please refer to the online Prospectus at [www.nyp.edu.sg/prospectus](http://www.nyp.edu.sg/prospectus)

### **EGF101**

#### **Engineering Mathematics 1A [60 hours]**

This module provides students with basic mathematical principles and tools necessary to underpin their education in the engineering discipline. It will enable them to apply mathematical methods, tools and notations proficiently while analysing and solving engineering problems. Topics covered include engineering functions, trigonometry, complex numbers, determinants, matrices and vectors. At the end of this module, students will be able to demonstrate an understanding of, and competence in, the basic mathematics of engineering such as vectors, matrices, exponential and logarithmic functions, functions, and complex numbers.

### **EGF102**

#### **Engineering Mechanics 1 [60 hours]**

This module provides first year students with the fundamentals of engineering mechanics to enable them to analyse and solve problems related to engineering design applications. Topics covered include concepts and principles of mechanics, Newton's three fundamental laws, statics of rigid bodies in 2D, stress and strain, moment of inertia of areas and masses, beams, bending moments and shear forces, torsion of circular sectioned shafts, friction, dynamics, work, energy and power. At the end of the module, apart from engineering statics problems, students will be able to apply knowledge in solving engineering dynamic problems, which will be covered in Engineering Mechanics 2.

### **EGF103**

#### **Aerospace Manufacturing Technology [60 hours]**

This module provides students with basic knowledge of manufacturing technology. It focuses on metal-cutting and metal-forming processes, composite manufacturing, non-traditional machining processes, surface finishing processes and common manufacturing processes in the aerospace industry. The operating principles, applications and economical aspects of the industrial manufacturing processes will be described. At the end of the module, students will have a clear overview and understanding of the basic manufacturing techniques and processes applicable to the aerospace manufacturing industries.

### **EGF115**

#### **Engineering Drawing & Modelling [60 hours]**

This module provides students with the knowledge and skills in the modelling of engineering parts and in interpreting of drawings derived from the 3D models. Topics include orthographic projection, sectional views, assembly drawing, dimensioning, and geometric dimensioning and tolerancing (GD&T). Together, they provide the students with the necessary skills in communicating ideas and concepts through engineering drawings

**EGF105****Materials Technology [30 hours]**

This module provides students with a practical understanding of the physical and mechanical properties of engineering materials. Coverage includes properties and applications of materials including ferrous, non-ferrous materials, plastics and composites. The various material treatment processes to alter material properties and their industrial applications are also included. At the end of the module, students will be able to select the most appropriate materials to use for aerospace components. Skills acquired will serve as a foundation for advanced modules in aerospace materials and component manufacturing.

**EGF107****Engineering Mathematics 1B [60 hours]**

This module provides students with essential knowledge in calculus and analytical skills for solving engineering problems encountered in their course of study. It also serves as a foundation for advanced topics in the second year. Topics include concept of limits; derivatives of polynomial functions, trigonometric and inverse trigonometric functions, exponential and logarithmic functions; indefinite and definite integrals of common engineering functions; and differentiation and integration with engineering applications.

**EGF108****Electrical Principles & Circuits [60 hours]**

This module equips students with the fundamentals of DC and AC electrical circuits. The students will differentiate resistance, capacitance and inductance through practical experiments and theoretical studies. The students will be trained to select appropriate equations to solve problems about the three passive components of different electrical circuits. Students will be taught to effectively use digital multimeters and other equipment to measure AC and DC voltages and currents. Students will be able to apply electrical safety rules and regulations relevant to the aerospace industry and confidently work with various electrical/electronic equipment and tools.

**EGF109****Analogue & Digital Electronics [60 hours]**

This module provides essential knowledge of the characteristics of electronics devices and their applications such as PN junction, Zener diodes, transistors and operational amplifiers. The module will also cover functions of basic logic devices and their applications. Design and analysis of analogue and digital circuits will be taught with emphasis on both theory and practical. At the end of the module, students will be able to apply the basic working knowledge of analogue and digital electronics that are essential in the mechanical, mechatronics, and aerospace industry.

**EGF110****Communication Skills [30 hours]**

This module gives students a broad understanding of the communication process and interpersonal communication skills to interact effectively with others. The module will also cover the various forms of writing skills — technical, proposal and report — required in an engineering environment. In addition to interacting more effectively with others, students' oral presentation skills will also be honed allowing them to become effective presenters.

**EGF111****Computer Programming [60 hours]**

The module teaches students the methodology of good programme development. Students will be able to develop algorithms, draw flowcharts and write structured programmes. The module has a practical orientation with ample hands-on practice.

**EGF113****Introduction to Engineering [60 hours]**

This module aims to promote students' interest in engineering and stimulate them by providing a platform for them to apply the knowledge in practical aviation projects. The module will also equip the students to recognise and relate the importance of having an innovative and enterprise mindset during project engagement. Coverage includes an introduction to principles of flight; major periods in aerospace history; the growth of the aerospace industry; progress in the development of the aeroplane and aerospace industry landscape. At the end of this module, students will gain a better understanding of the development of the aerospace industry from a historical perspective and have the necessary knowledge and exploratory attributes to make informed decisions in the field of aviation.

**EGF116****Workshop Practices****[60 hours]**

This module imparts students with the knowledge and skills required to operate workshop machines to perform various machining processes. The hands-on practical sessions include workshop safety, workshop best practices, correct handling of hand tools and proper techniques of using measuring instruments. On completion of the module, the students will be able to use tools and operate workshop machines to fabricate components for the aerospace industry.

**EGF201****Engineering Mathematics 2A****[60 hours]**

This module provides students with the basic theory of ordinary differential equations and Laplace transform. The module focuses on differential equations that arise in practice, with emphasis on solving these equations and understanding the possible behaviours of solutions. Topics covered include partial derivatives, first and second order differential equations and their applications, numerical approximation to solutions of differential equations and Laplace transform, and applications. At the end of the module, students will be able to demonstrate a sound knowledge of a range of techniques for solving linear ordinary differential equations and apply it to solve real-life problems in aeronautical engineering.

**EGF202****Aeronautical Science****[60 hours]**

This module introduces the fundamental theory and practical aspects of subsonic flight through to supersonic flight. Students will be able to appreciate and understand the application of aerodynamics, flight mechanics, aircraft stability and control, and evaluate aircraft performance. It will provide basic knowledge that is required under the Singapore Airworthiness Requirements SAR-66 pertaining to Basic Aerodynamics and Theory of Flight for Turbine Airplanes.

**EGF203****Engineering Mechanics 2****[60 hours]**

This module builds on the foundation of Engineering Mechanics 1 and covers more practical and complex mechanical analysis. It provides students with the various concepts of dynamics of particles and physical bodies. Upon completion of this module, students will be able to appreciate, analyse and use their knowledge to solve real-life problems related to engineering dynamics.

**EGF214****Aero-Structures****[60 hours]**

This module provides students with the understanding of how an aeroplane is constructed from a structural viewpoint. They will be able to identify the major and sub-assembly components of an aeroplane, understand design philosophy, design concepts and allowables on how these parts are constructed, sized, shaped. The students will also learn about the features that makes the aeroplane safe to fly, durable during its design life, easily maintainable and efficient in operation. The students will also be able to perform simple stress analysis for metallic repair and also appreciate the complexity of composite repairs by performing simple ABD matrix computation and composite repair in the laboratory. In addition, students will also perform calculation on weight and balance of the aeroplane due to a major modification or regulatory requirements.

**EGF215****Computer Aided Design & Manufacturing****[60 hours]**

This module introduces the use of Computer Numerical Control (CNC) and Computer-Aided Manufacturing (CAM) application software. Students will be taught to produce basic design geometries sensitive to Design for Manufacturability (DFM) requirements using manual part programming and generate tool paths from complex CAD models using CAM software package. On completion of the module, the student will be able to explain the interrelation between CNC and CAD/CAM application. The student will also be able to produce manual part programs, generate NC tool path using CAM software and verify the tool path with NC simulation software.

**EGF216****Aero-Systems****[30 hours]**

This module provides students with the knowledge of the various aircraft systems that keeps the aircraft flying and responsible for the functionality of the aircraft. Students will be exposed to topics which include flight controls, cockpit instrumentation, air conditioning, pressurisation, oxygen system, hydraulic system and circuits, operations of landing gear and ice & rain protection systems.

### **EGF207**

#### **Engineering Mathematics 2B [60 hours]**

This module provides students with the necessary mathematical training that will assist and expand their experiences within their discipline of study. The module contains two parts. The first focuses on Fourier analysis and discusses how periodic signals in the time domain can be represented in the frequency domain. The second part gives students a working knowledge of statistical concepts so that statistical reasoning can be correctly applied to experimental results and their statistical significance discussed. Topics include Fourier series, probability concepts, probability distribution (Binomial, Poisson and Normal), sampling distributions, estimation and linear regression. At the end of the module, students will be able to demonstrate a sound knowledge of the mathematical training and apply it to solve real-life problems in aeronautical engineering.

### **EGF208**

#### **Mechanical Design [60 hours]**

This module introduces the students to the fundamental concepts and considerations of mechanical design and the design of machine elements. Topics covered include Engineering Design Process, Fits and Tolerances, Drive Elements, Shaft, Keys & Couplings, Bearing, Cams and Stress Analysis. The module will provide students with the necessary knowledge pertinent to primary mechanical system design. Also, the module introduces students to Design for Additive Manufacturing.

### **EGF209**

#### **Thermofluids [60 hours]**

This module introduces the fundamentals of thermodynamics, heat transfer and fluid mechanics. In the topics of thermodynamics and heat transfer, the properties of pure substances and ideal gases, laws of thermodynamics and processes of heat transfer are introduced. In the topic of fluid mechanics, the properties of fluids, the concepts and basic equations of fluid statics and fluid flow are covered. At the end of the module, students will be able to appreciate, analyse and use their knowledge to solve problems relating to fluid statics, fluids in motion, heat transfer and laws of thermodynamics and properties of pure substance and ideal gases.

### **EGF210**

#### **Metrology & Quality Control [60 hours]**

This module equips students with the fundamental principle of metrology and its effect and impact on the precision and accuracy of manufactured parts. Topics covered include measurement standards, selection of tools and equipment for inspection and control, identification and minimization of errors in a measuring system. The introduction of GD&T will also be included. Hands-on practice is an integral part of the module to apply, enhance and acquire skills in the proper handling and techniques of using precision measuring tools. At the end of the module, the students will be able to work in an aerospace environment that can ensure fitness for use is achieved in manufactured parts.

### **EGF211**

#### **Aircraft Propulsion System [60 hours]**

This module provides students with knowledge and understanding of the propulsion system for modern commercial jet aircraft. Topics include the theory and construction of gas turbine power plants and their auxiliary systems, engine operation and maintenance. At the end of this module, students will be equipped with fundamental knowledge of the aircraft power plants and prepared with competency to pursue careers in the aerospace industry.

### **EGF217**

#### **Aviation Legislation & Human Factors [30 hours]**

Students will understand the main aviation regulations and airworthiness requirements governing the aerospace industry and their applications. Students will also understand the concepts of human factors which affect human performance in aviation industry and aircraft maintenance. In addition, students will be exposed to health & safety and manpower regulations governing the aerospace industry personnel.

### **EGF301**

#### **Aircraft Material & NDT Technology [60 hours]**

This module exposes students to the types and properties of aerospace materials and non-destructive evaluation tools. Topics covered include aluminium alloys, titanium alloys, superalloys and composite materials — their properties and their applications in the aerospace industry. In the area of non-destructive testing, the principles, applications and devices used will be covered. At the end of the module, students will be able to describe the engineering materials and non-destructive evaluation methods used in the aerospace industry.

### **EGF302**

#### **Aircraft Component & Fixture Design [60 hours]**

This module develops students' knowledge and skills for designing jigs and fixtures in the machining industries, particularly in the aerospace industry. Topics include fundamentals of design, datum selection, locating concepts, clamping principles, drill jig design, milling fixture design, modular fixturing, power work holding and materials for jigs and fixtures. Upon completion of this module, students will be able to design drill jigs and milling fixtures in the relevant industries with proper selection of locating elements, clamping elements, loading and unloading of workpieces and ease of handling.

### **EGF312**

#### **Aero Maintenance Practices & Projects [60 hours]**

This module provides the students hands-on skills and working knowledge to perform aircraft and component maintenance. The module covers areas such as sheet metal structural repair, fastening devices, sealant application, aircraft rigging, hydraulic plumbing and best practices for aircraft electrical wiring interconnect system (EWIS). At the end of the module, students will be competent to apply their skills to perform various Maintenance Repair & Overhaul (MRO) related tasks.

### **EGF304**

#### **Professional & Interpersonal Communication Skills [30 hours]**

This module helps students understand and acquire communication skills for entry into the job market as working professionals. It focuses on job searching skills and includes resume and cover letter writing, as well as interviewing skills. Students will gain insights into change management, organisational structure and corporate culture. They will also learn about business correspondence. In all, students will gain competency in job searching skills and adapting to the work environment of their relevant industry.

### **EGF305**

#### **Reliability & Failure Analysis [60 hours]**

This module introduces students to the concepts of safety factors and reliability relating to aircraft structural and systems. Topics covered include probability, risk assessment, maintainability, reliability testing, as well as reliability-based design and evaluation. This module also exposes students to the failure analysis of aerospace components and structures, relating the dependence of failures to the mechanical, micro-structural and loading conditions. Topics covered include types and mechanisms of overload, fatigue, creep, wear and corrosion failures in metallic and composite materials. At the end of the module, students will be able to analyse and solve reliability and engineering failure problems encountered in the industry.

### **EGF313**

#### **Computational Analysis and Simulation [60 hours]**

This module exposes the student to the use of simulation and computational analysis software in an aerospace engineering design and development environment. The topics covered include motion simulation and finite element analysis (FEA). Students will be able to use the different types of simulation software and analysis tool to assist in making engineering decisions.

**EGF314****Advanced Metrology and Quality Management [60 hours]**

This module provides students the theory and applications of the latest metrology equipment and quality management. The focus will cover the working principles of precision measuring equipment, its methodology and techniques for precision measurement. The precision measurement techniques will cover errors of measurement, surface and roughness measurement and assessment, coordinate measuring machine and the interpretation of geometric dimensioning and tolerancing symbols. Topics covered in quality management includes principles, methods and techniques relevant to aerospace manufacturing such as 6-sigma and lean manufacturing. By the end of the module, students will be competent to measure product parts using appropriate metrology equipment and to apply appropriate quality management and techniques for continuous improvement.

**EGF309****Shopfloor Monitoring & Control [60 hours]**

This module aims to equip students with the knowledge and skills for monitoring and controlling manufacturing systems in the shop-floor. Students will learn technology fundamentals related to shop floor monitoring and control, such as material and information flow in shop floor, basic control architectures and control decision making processes, shop floor production data acquisition and presentation. The students will also be exposed to Industry 4.0 concepts and applications. They will also acquire skills in using the latest software tools related to shop floor monitoring and control and apply simulation techniques using software for the manufacturing environment.

**EGF310****Advanced Machining Technology [60 hours]**

This module provides students with knowledge and skills on advanced machining processes such as high-speed machining, ultra-precision machining, multi-axis machining of free-form surfaces, and non-traditional machining processes. The students will go through extensive practical sessions to generate NC tool paths for complex aerospace component manufacturing through the use of machining and simulation software packages.

**EGF311****Aerospace Manufacturing System [60 hours]**

This module equips students with the operating principles and applications of manufacturing systems in the aerospace industry. This includes the classification of production systems, concepts of manufacturing resource planning, JIT, group technology, flexible manufacturing system (FMS), principles and practices of lean manufacturing and the application of computer-aided design/ manufacturing (CAD/CAM).

**EGF323****Internship Programme [12 weeks]**

This module enables students to enhance their learning by relating and applying their knowledge and skills to practice in real-life work environments. This will allow students to gain work-centred knowledge and skills, and work-related experiences. In addition, they will acquire important work values which include being responsible and positive, and exercising integrity, work ethics and interpersonal communication skills. Through this work-based experiential program, they will be better prepared for entry into the workforce.

**EGF324****Full-Time Semestral Project [12 weeks]**

This module is designed to allow students to put the knowledge and skills they have acquired from the course into practice. Students are assigned projects with well-defined objectives that meet industrial standards. The focus is on how resourceful students can be to work independently to meet project objectives and deadlines. They may also be organised into various project teams to develop team spirit while meeting specific objectives.

**EGF325****Internship Programme [24 weeks]**

The industrial placement programme forms an integral part of the course work and allows students to gain practical working exposure in the real-life working environment through attachments to companies locally. Apart from providing a platform for students to apply their knowledge, it will also help to develop other important work skills such as positive working attitude, initiative, interpersonal relationship and communication skills in the students.

## **EGF326**

### **Overseas Internship Programme**

**[24 weeks]**

The industrial placement programme forms an integral part of the course work and allows students to gain practical working exposure in the real-life working environment through attachments to companies overseas. Apart from providing a platform for students to apply their knowledge, it will also help to broaden the students' view by exposing to different working culture and environment. It also aims to develop other important work skills such as positive working attitude, initiative, interpersonal relationship and communication skills in the students.