

Mechatronics

OVERVIEW



Aerospace, robotics, artificial intelligence, smart manufacturing, food processing, medicals and pharmaceuticals are just some of the engineering sectors that make use of Mechatronics.

In this versatile course, you will be equipped with skills in both mechanical engineering and electronics, and to integrate them with intelligent control systems. With rising consumer demand for smart products and automated systems, your know-how in these areas will give you an advantage in virtually any engineering sector!

In your final year, you can choose one of these elective clusters:

- 3D Printing
- Advanced Manufacturing
- Aerospace Systems
- Semiconductor Technology

You can also join a “through-train” programme in your 3rd year at TP, to secure a university place and a full-time job upon graduation.

Your Journey

Year 1

A strong foundation is needed to excel in Engineering, and this is exactly what you will get from the comprehensive first year programme. Learn basic engineering concepts through lab work, applied hands-on learning and educational visits, and discover your career aspiration!

Year 2

Apply your knowledge and skills in electronics, mechanics and computer technologies from Year 1, to develop smart devices and automated systems. You will also acquire new in-demand skills in data visualisation & analytics, additive printing, and advanced manufacturing to drive Singapore's industrial transformation.

Year 3

Choose an elective in emerging fields in advanced manufacturing, or a through-train work-study degree programme! Hone your knowledge and practical skills working on a Major Project, and experience working on real projects involving the latest technologies in a reputable company during your internship.

ENTRY REQUIREMENTS

Minimum Entry Requirements

To be eligible for consideration for admission, applicants must obtain 26 points or better for the net ELR2B2 aggregate score (i.e. English Language, 2 relevant subjects and best 2 other subjects, including CCA Bonus Points) and meet the minimum entry requirements of this course. CCA cannot be used to meet the minimum entry requirements.

English Language (EL1)*	Grades 1-7
Mathematics (E or A)	Grades 1-6
Any one of the listed subjects^	Grades 1-6
Any two other subjects, excluding CCA	

Note: Applicants should not be suffering from complete colour vision deficiency, uncontrolled epilepsy, profound hearing loss or severe vision impairment.

* SPM / UEC holders must have a minimum of grade 6 for the Bahasa Inggeris (English Language) subject.

^ List of acceptable subjects: Biology, Biotechnology, Chemistry, Combined Science, Computing/Computer Studies, Design & Technology, Electronics/Fundamentals of Electronics, Physics/Engineering Science, Science (Chemistry, Biology), Science (Physics, Biology), Science (Physics, Chemistry)/Physical Science.

See also the minimum entry requirements for:

- ITE Certificate Holders
- International Students

Mechatronics

COURSE STRUCTURE

TP Fundamentals Subjects

Subject code	Subject	Level	Credit Units
ECS1005	<p>Communication & Information Literacy</p> <p>In this subject, you will learn how to conduct research for relevant information and validate information sources. You will also learn to recognise and avoid plagiarism, and follow standard citation and referencing guidelines when presenting information. In the course of learning, you will be required to plan, prepare and present information appropriately in written and oral form. You will also be taught to consider the Message, Audience, Purpose and Strategy (MAPS) when writing and delivering oral presentations.</p>	1	2
ECS1006	<p>Workplace Communication</p> <p>In this subject, you will be taught how to conduct effective meetings while applying team communication strategies and the skills for documenting meeting notes. You will be required to write clear emails, using the appropriate format, language, tone and style for an audience. You will also be taught to communicate appropriately in and for an organisation when using various platforms. In all aspects, the principles of applying Message, Audience, Purpose and Strategy (MAPS) will be covered.</p>	1	2
ECS1007	<p>Persuasive Communication</p> <p>In this subject, you will be taught how to use persuasive language in written documents. You will be required to use information to your advantage to verbally communicate and convince an audience about your idea, product or service. Skills such as persuasive vocabulary, language features, graphical illustrations, tone and style would also be covered. The Message, Audience, Purpose and Strategy (MAPS) will also be applied when engaging in verbal and written communication.</p>	1	2
GCC1001	<p>Current Issues & Critical Thinking</p> <p>This subject presents you with a panoramic view of current local and global issues, which may have long term implications for Singapore. You will learn to apply critical thinking tools to examine current issues, support your views with relevant research and up-to-date data, articulate an informed opinion and mature as civic-minded individuals.</p>	1	2

EIN1001	<p>Innovation & Entrepreneurship</p> <p>The Innovation & Entrepreneurship subject is designed for learners from all disciplines to embrace innovation in either their specialised fields or beyond. You will first learn the Design Thinking framework, where you will develop problem statements and ideate solutions. Next, you will discover the tools for prototyping and innovation, such as 3D printing and laser cutting, at TP's Makerspace+ facility. Finally, you will acquire commercial awareness through the LEAN Startup framework of idea crystallisation, prototype building, customer testing and validation, refinement of business model canvas, and crowdfunding or crowdsourcing avenues.</p>	1	2
LEA1011	<p>Leadership: Essential Attributes & Practice 1</p> <p>LEAP 1, 2 and 3 are three fundamental subjects that seek to cultivate in you, the attitude, skills and knowledge for the development of your leadership competencies. This character-based leadership programme enables you to develop your life-skills through establishing personal core values, which will become the foundation for your leadership credibility and influence.</p>	1	1
LEA1012	<p>Leadership: Essential Attributes & Practice 2</p> <p>LEAP 1, 2 and 3 are three fundamental subjects that seek to cultivate in you, the attitude, skills and knowledge for the development of your leadership competencies. This character-based leadership programme enables you to develop your life-skills through establishing personal core values, which will become the foundation for your leadership credibility and influence.</p>	1	1
LEA1013	<p>Leadership: Essential Attributes & Practice 3</p> <p>LEAP 1, 2 and 3 are three fundamental subjects that seek to cultivate in you, the attitude, skills and knowledge for the development of your leadership competencies. This character-based leadership programme enables you to develop your life-skills through establishing personal core values, which will become the foundation for your leadership credibility and influence.</p>	1	1
LSW1002	<p>Sports & Wellness</p> <p>This subject will help you develop both the physical and technical skills in your chosen sports or fitness activities. Through a structured curriculum that facilitates group participation, practice sessions and mini competitions, you will learn to build lifelong skills such as resilience, leadership, communication and teamwork. Physical activity sessions will be supplemented by health-related topics to provide you with a holistic approach to healthy living.</p>	1	2
MCR1001	<p>Career Readiness 1</p> <p>This Career Readiness programme comprises three core subjects – Personal Management, Career Preparation and Career Management. It seeks to help you understand your career interests, values, personality and skills for career success. It also equips you with the necessary skills for seeking and securing jobs, and to develop professional work ethics.</p>	1	1

MCR1002	<p>Career Readiness 2</p> <p>This Career Readiness programme comprises three core subjects – Personal Management, Career Preparation and Career Management. It seeks to help you understand your career interests, values, personality and skills for career success. It also equips you with the necessary skills for seeking and securing jobs, and to develop professional work ethics.</p>	1	1
MCR1003	<p>Career Readiness 3</p> <p>This Career Readiness programme comprises three core subjects – Personal Management, Career Preparation and Career Management. It seeks to help you understand your career interests, values, personality and skills for career success. It also equips you with the necessary skills for seeking and securing jobs, and to develop professional work ethics.</p>	1	1
EGS1002	<p>Global Studies</p> <p>This subject provides essential skills and knowledge to prepare you for an overseas experience. You will examine the elements of culture and learn the key principles of cross-cultural communication. In addition, you will gain an appreciation and awareness of the political, economic, technological and social landscape to function effectively in a global environment.</p>	1	3
EGS1003	<p>Managing Diversity at Work*</p> <p>This subject explores the concepts of identity, diversity and inclusion at the workplace. It examines the relationship between identity and diversity, the benefits and challenges of diversity and the strategies that promote inclusion and inspire collaboration in a diverse workplace. Examples of the elements of diversity covered in this subject include nationality, generation, ethnicity and gender.</p>	1	3
EGS1004	<p>Global Citizenship & Community Development*</p> <p>Students will examine the meaning and responsibilities of being a Global Citizen, in order to contribute towards a more equitable and sustainable world.? In addition, students will learn how sustainable solutions can support community development, and, execute and critique a community action plan that addresses the needs of a specific community/cause.</p>	1	3
EGS1005	<p>Expressions of Culture*</p> <p>This subject provides a platform for an understanding of culture and heritage through modes of expression. Students will be introduced to global and local cultures via everyday objects, places and human behaviour seen through time and space. Students will explore issues and challenges in culture and heritage sustainability in community, national and global contexts.</p>	1	3
TGL1001	<p>Guided Learning</p> <p>The subject introduces students to the concepts and process of self-directed learning in a chosen area of inquiry. The process focusses on four stages: planning, performing, monitoring and reflecting. Students get to plan their individual learning project, refine and execute the learning plan, as well as monitor and reflect on their learning progress and project. The learning will be captured and showcased through a curated portfolio. The self-directed learning project will broaden and/or deepen a student’s knowledge and skills.</p>	1	3

ESI3001	<p>Student Internship Programme</p> <p>The on-the-job training nature of the programme allows you to gain some industrial experience. Through this programme, you will be exposed to the work environment so that you can better appreciate and understand the problems and issues at the work place. The content and scope of learning varies from organisation to organisation. However, it is envisaged that after the programme, you would have, in general, developed your communication and interpersonal skills as well as the right work ethics, and also become more mature, confident and independent, and have a more realistic expectation of what a working environment is like.</p>	3	12
---------	---	---	----

* Students must choose to take either one of these three subjects or TGL1001 Guided Learning.

Core Subjects

Subject code	Subject	Level	Credit Units
EDR1003	<p>Engineering Drawing</p> <p>Engineering drawing is essential for communicating engineering design. This subject will introduce you to two-dimensional mechanical engineering drawings as well as three-dimensional modelling with the use of both manual and computer-aided design (CAD) software. You will also learn general methods of dimensioning according to international and local standards.</p>	1	4
EED1001	<p>Electronic Prototyping</p> <p>This subject introduces you to the use of hand tools and standard laboratory equipment for the construction and testing of electronic prototypes. You will also learn to identify basic electronic components for project work and how to use them to build electronic devices.</p>	1	3
EEE1001	<p>Circuit Analysis</p> <p>This subject provides a good foundation in DC and AC network analysis. You will learn the basic principles of electric circuitry and how to apply circuit theorems to analyse DC and AC networks.</p>	1	6
EEE1002	<p>Electronic Devices & Circuits</p> <p>This subject covers the theory and practical knowledge of electronic devices such as diodes, bipolar junction transistors, field effect transistors and their applications. It also focuses on the fundamentals of operational amplifiers and their applications, and the rudiments of circuit troubleshooting and testing.</p>	1	6
EEE1003	<p>Digital Fundamentals 1</p> <p>This subject provides basic knowledge of digital electronics and circuits. Topics include number systems, operations and codes, logic gates, Boolean algebra and logic simplification, combinational logic, functional blocks, latches and flip-flops.</p>	1	5

EEE1004	<p>Digital Fundamentals 2</p> <p>This subject builds upon the fundamentals of digital electronics acquired in Digital Fundamentals 1. It introduces the digital concepts of the various building blocks in a computer's digital system. You will acquire the theoretical and practical knowledge of registers, counters, memory devices, and conversions between digital and analogue signals and integrated circuit technologies. Digital troubleshooting techniques are also explored in the laboratory work.</p>	1	5
EMA1002	<p>Engineering Mathematics 2</p> <p>This subject introduces the basic concepts of calculus and statistical method to test a hypothesis. Basic concepts in calculus include limits, derivatives and integrals. Applications of the derivative and integrals in engineering will be discussed. Basic statistical method in hypothesis testing includes normal distribution, confidence interval of population mean and procedure to test hypothesis for a claim made about a population mean.</p>	1	4
EMA1003	<p>Engineering Mathematics 1</p> <p>This subject teaches pre-calculus techniques required for an engineering course. It trains you in engineering problem-solving approaches using the appropriate mathematical tools. Topics such as simultaneous equations, matrices, trigonometric, exponential and logarithmic functions, complex numbers and vectors will be covered.</p>	1	4
EME1002	<p>Statics & Strength of Materials</p> <p>This subject consists of two principal areas: Fundamentals statics and strength of materials. Fundamental statics provides an introduction to the basic concepts in simple statics, while strength of materials introduces the methodology for designing members subjected to various loading conditions.</p>	1	4
ESC1004	<p>Engineering Physics</p> <p>This subject covers a spectrum of fundamental physics laws and concepts applicable to the scope of engineering physics. It covers a few core areas including Mechanics, Energy, Thermal Physics, Electromagnetism, Waves & Optics and Materials. This subject provides a foundation for a further in depth study of the various engineering disciplines.</p>	1	3
ESE1006	<p>Computer Programming for Problem Solving</p> <p>This subject covers the process of decomposing a problem into a sequence of smaller abstractions. The abstractions are implemented in software in a structured top-down approach. Software implementation includes the process of designing, writing, testing, and debugging program code.</p>	1	4
ESE1008	<p>Data Visualisation & Analytics</p> <p>This subject covers the data analytics lifecycle, including gathering, cleaning, processing and visualising of data. Exploratory data analysis methods, descriptive and predictive analytics, and the presentation of insights, will also be covered.</p>	1	3

EED2011	<p>Integrated Project</p> <p>This subject will introduce the basic principles of product design and development through hands-on experience. You will learn to use mechanical hardware, electronics, software and data visualisation to demonstrate solutions to real world problems in advanced manufacturing.</p>	2	3
EMA2003	<p>Engineering Mathematics 3</p> <p>This subject introduces Ordinary Differential Equations (ODE). In particular, it focuses on the formulation of engineering problems into first and second order differential equations. Some techniques in solving ODE and the applications of ODE will be discussed, including the use of Laplace Transforms and the calculation of Fourier series.</p>	2	4
EME2007	<p>Machining Technology</p> <p>The subject introduces the various manufacturing processes including computer-controlled processes and you get hands-on practice with conventional and computer numerical control (CNC) machines. You will also learn about computer-aided design and manufacturing systems (CAD/CAM) and advanced manufacturing processes. Safety aspects are emphasised throughout the workshop sessions. You will acquire the fundamental knowledge and skills in designing for the manufacturing sector, including the electronics, prototyping and precision parts production industries.</p>	2	4
EME2008	<p>Principles of Dynamics</p> <p>The application of dynamic systems theory can be seen everywhere in our daily lives, from vehicles moving on the road to planes flying in the air. In this subject, you will learn the fundamental principles of dynamics and apply them to the analyses of bodies in motion. The main topics covered include Newton's laws of motion, the principle of work and energy, the principle of impulse and momentum, and the motion of projectiles, gyroscopic principles and periodic motion.</p>	2	5
EME2004	<p>Introduction to Smart Automation</p> <p>This subject provides the fundamentals of automation in a manufacturing environment. Four main topics are covered, namely pneumatics, electro-pneumatics, programmable logic controllers and an introduction to advanced manufacturing. Essential knowledge of the working principles and applications of automation equipment are covered, followed by an overview of how to automate production processes to achieve quality and high productivity. You will also be introduced to the concept of smart automation and the key concepts of advanced manufacturing.</p>	2	4
EMF3005	<p>Robotics & Automation</p> <p>This subject covers factory automation systems that are the foundation for advanced manufacturing systems. It provides the essential concepts and background of industrial automation, robotics and their applications, as well as their integration into a complete manufacturing system. You will also learn the working principles and applications of automation equipment and how to automate production processes to achieve quality and high productivity. The links among the main factory automation components, in terms of both hardware and software, are also introduced.</p>	3	4

EMP3002	<p>Major Project</p> <p>The Major Project gives you an opportunity to integrate and apply your knowledge in a practical learning situation. Besides research, design and project management skills, the emphasis will also be on innovation, creativity, teamwork and enterprise.</p>	3	8
---------	---	---	---

Cluster Elective Subjects

- 3D Printing elective cluster

Subject code	Subject	Level	Credit Units
EME2012	<p>CAD & Additive Manufacturing</p> <p>Additive Manufacturing, also commonly known as 3D Printing, is becoming an important manufacturing technique in advanced manufacturing that complements existing manufacturing processes. In this subject, the main topics covered include the principles and development of additive manufacturing, as well as the design guidelines (ISO/ASTM 52911-2) of additive manufacturing for the designing of support structures, generalised process chain, process selection guidelines, pre-processing software, post-processing methods and laser-based powder bed.</p>	2	4
EDR3001	<p>Advanced CAD & Simulation</p> <p>In this subject, advanced Computer-aided Design (CAD) techniques are used to model complex objects. Design rules and guidelines for manufacturing processes, Computer-aided Manufacturing (CAM) / CAD file preparation for digitalisation, simulation techniques, as well as their respective applications, are introduced.</p>	3	4

- Advanced Engineering Skills elective cluster

Subject code	Subject	Level	Credit Units
EED3014	<p>Advanced Skills Practices</p> <p>This subject provides opportunities for you to integrate and apply your knowledge for high level competitions or projects in practical learning situations. The project or skills training can involve substantial work related to either a high level industrial program or an end-user product, as well as advanced training to develop technical abilities to execute specific tasks competitively. It could also involve the development, evaluation of workable designs and implementation of ideas related to an innovative product suitable for manufacturing, or an improvement to existing products or processes. You may be required to work on software, hardware, or a combination of both hardware and software.</p>	3	8

- Advanced Manufacturing elective cluster

Subject code	Subject	Level	Credit Units
--------------	---------	-------	--------------

EMF2002	<p>Smart Manufacturing System</p> <p>This subject introduces the core elements of a smart manufacturing system, and how real time manufacturing data enables flexibility and increased productivity. An introduction to advanced manufacturing and key enabling technologies such as Radio Frequency Identification (RFID) systems, Manufacturing Executions Systems (MES) and Augmented Reality (AR) are used to lay the foundation for understanding the application and benefits of smart manufacturing. A hands-on approach and industrial visits will bring concepts and ideas of smart manufacturing to life, while e-learning will enable participants to learn at their own pace.</p>	2	4
EMF3006	<p>Machine Vision & Pattern Recognition</p> <p>This subject covers the fundamentals of machine vision and pattern recognition technologies in advanced manufacturing. It provides the essential knowledge of the key components and technologies used in machine vision systems. An overview of the techniques in data analysis and the derivation of useful hidden patterns in the data are introduced, including the selection, development and application of suitable pattern recognition techniques to solve a given problem. These skill-sets and knowledge will be applied to machine vision systems in a smart manufacturing facility.</p>	3	4

- Aerospace Systems elective cluster

Subject code	Subject	Level	Credit Units
EME2009	<p>Thermodynamics</p> <p>This subject equips you with the basic knowledge in thermodynamics, concepts of the temperature scales and measurements, the First Law of Thermodynamics, Ideal Gas Laws, Second Law of Thermodynamics and heat energy calculations using a P-V diagram. The syllabus is based on the guide for relevant topics on thermodynamics listed in the Singapore Airworthiness Requirements (SAR-6) Module 2 "Physics". Knowledge of this subject allows you to understand the mechanisms of heat transfer and how gas turbine engines work.</p>	2	3
EAE3008	<p>Gas Turbine Engine</p> <p>This subject equips you with knowledge of aircraft propulsion methods, thermodynamic cycles, combustion and thermochemical analysis, reciprocating engines, gas turbine and jet engines, effects of atmospheric variations (temperature, density, pressure altitude) on engine and on engine/aircraft combination, auxiliary systems (such as fuel system, lubrication system, ignition, starting, fire protection, auxiliary power unit), and current developments in propulsion systems. The syllabus is equivalent to the Singapore Airworthiness Requirements (SAR-66) Module M15 on Gas Turbine Engine".</p>	3	4

- Semiconductor Technology elective cluster

Subject code	Subject	Level	Credit Units
--------------	---------	-------	--------------

EMI2008	<p>IC Process Integration</p> <p>This subject covers the design of photo-masks, sequencing of processes to form a process flow, technologies in processing of solid state devices, isolation and interconnection structures, application of test structures for process monitoring as well as the characterisation and functionality testing of basic solid state devices.</p>	2	4
EMI3005	<p>Cleanroom Equipment & Technology</p> <p>This subject introduces contamination control in a cleanroom and the factors to control the environment. It includes wafer plant facilities, process equipment and vacuum technology. Practical training includes appreciating the environment in the cleanroom, identifying the various components of a deionised water purification plant and operating vacuum pumps and systems.</p>	3	4

- Work-Study Degree Programme elective cluster

Subject code	Subject	Level	Credit Units
EME3006	<p>Engineering Statics</p> <p>This course aims to provide you with the important fundamentals in engineering mechanics. The statics component in engineering mechanics focuses on finding and analysing the governing mechanical characteristics of structural elements and bodies in equilibrium. As this subject is offered together with Singapore Institute of Technology (SIT), please refer to the SIT Work-Study Degree Programme page for more information.</p>	3	5
EMF3007	<p>Computer-Aided Design & Manufacturing</p> <p>You will learn how to employ solid modelling software to generate 3D models and 2D technical drawings, and be acquainted with forming processes, machine methods, production planning and costing. You will also gain an understanding of fundamental orthographic principles, engineering fits & limit dimensions, geometric dimensions & tolerances, as well as surface texture. As this subject is offered together with Singapore Institute of Technology (SIT), please refer to the SIT Work-Study Degree Programme page for more information.</p>	3	5
ESE3011	<p>Programming</p> <p>This module introduces you to computer programming using the “C” programming language. You will learn how to analyse programming problems, and also have hands-on exposure in designing, implementing, testing and debugging programs that use different data types. As this subject is offered together with Singapore Institute of Technology (SIT), please refer to the SIT Work-Study Degree Programme page for more information.</p>	3	5

Special Electives

Students can opt to take Special Electives when offered. These optional subjects aim to stretch the students' potential to enable them to meet their aspirations. They are taken in addition to the diploma cluster elective subjects.

Subject code	Subject	Level	Credit Units
EED3009	<p>Special Project 1</p> <p>The focus of this subject is on the application of students' existing domain knowledge to develop a deliverable. The subject will introduce new skills and knowledge specific to the project, as and when required.</p>	3	2
EED3010	<p>Special Project 2</p> <p>This subject provides opportunities for students to apply the acquired knowledge and skills, along with their fundamental and in-depth knowledge from different subjects to designing, developing, and implementing a well-engineered project solution.</p>	3	2
EED3011	<p>Higher Engineering Skills 1</p> <p>Higher Engineering Skills 1 and 2 aim to impart some special design and hands-on skills that allow you to acquire knowledge and skills that are not normally incorporated into a diploma programme. These Special Elective subjects will equip you with the skills and knowledge to participate in competitions and enable you to tackle real challenges.</p>	3	2
EED3012	<p>Higher Engineering Skills 2</p> <p>Higher Engineering Skills 1 and 2 aim to impart some special design and hands-on skills that allow you to acquire knowledge and skills that are not normally incorporated into a diploma programme. These Special Elective subjects will equip you with the skills and knowledge to participate in competitions and enable you to tackle real challenges.</p>	3	2
EMA3001	<p>Higher Engineering Mathematics</p> <p>The subject introduces mathematical concepts and techniques used in advanced engineering courses. You will learn topics in calculus such as limits and continuity, infinite series, improper integrals, multiple integrals, higher order differential equations, 2D and 3D analytic geometry, and partial differentiation.</p>	3	4

Graduation Requirements

Cumulative Grade Point Average	min 1.0
TP Fundamentals Subjects	36 credit units
Diploma Core Subjects	83 credit units
Diploma Cluster Elective Subjects	min 7 credit units
Total Credit Units Completed	min 126 credit units