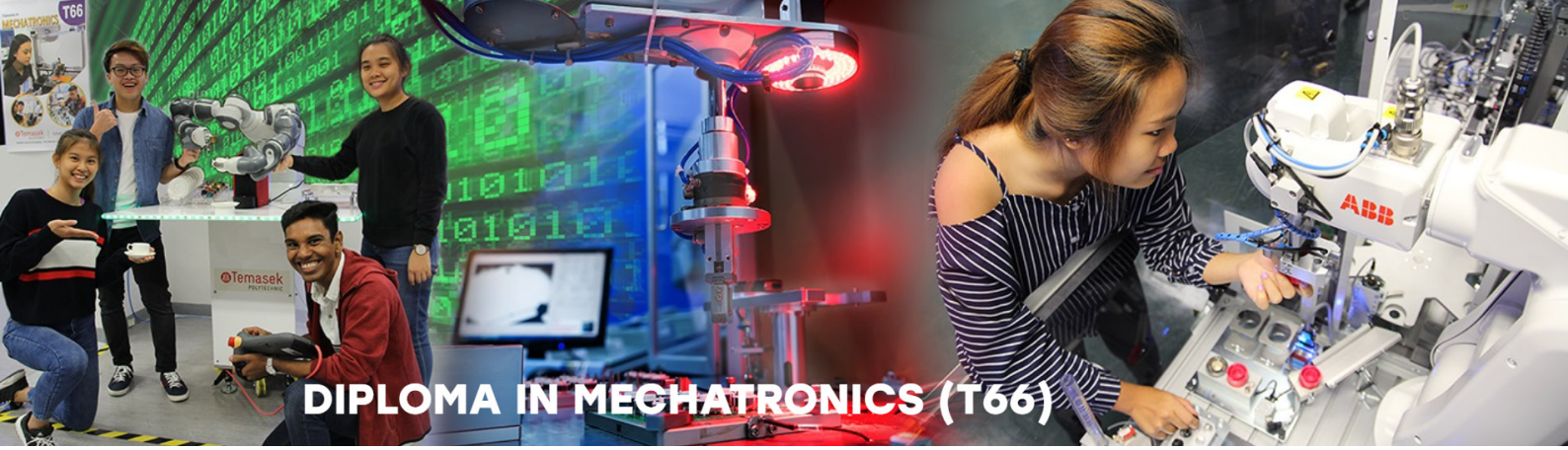

Course Overview

Welcome to the era of advanced manufacturing where humans, machines and systems, communicate and collaborate as one. The Diploma in Mechatronics equips you from basic engineering skills to cutting-edge technologies that have revolutionised the digital world today.

Through this course, you will be trained in the application of robotics, automation, 3D printing and data analytics in technological areas such as cyber-physical systems, machine vision and pattern recognition. In your final year, choose one of these exciting elective clusters for further specialisation: 3D Printing, Advanced Engineering Skills, Advanced Manufacturing, Intralogistics & Cybersecurity, Semiconductor Technology, or the University Pathway Programme.

Get hands-on training working on real-world industry projects at our TP Advanced Manufacturing Centre (TP-AMC) and the Digital Fabrication & Additive Manufacturing Centre (DFAMC). Our rigorous curriculum will also shape your critical thinking and problem-solving skills and develop you into a versatile professional ready for the workforce.

With increasing consumer demand for customised products and smart digital services, you are well-positioned for a rewarding career in growth areas such as advanced manufacturing, aerospace, robotics, artificial intelligence, precision engineering and pharmaceutical manufacturing.

Get the opportunity to attain the below certification(s) throughout the course of your study:

- **OMRON E-CERTIFICATES** in the following e-learning courses:
  - A009 - Introduction to Factory Automation
  - A064 - Introductory Course to IEC61131-3
  - A069 - Introduction to FA Open Networks
  - B010 - PLC Basics
  - B016 - Vision Basics
  - B046 - IEC 61131-3 Compliant ST Language Basics
  - B073 - Introduction to Ladder Programming

To download a copy of our 4-page course brochure, click here.

STRONG INDUSTRY PARTNERSHIPS

Through collaborations with industry partners and our Centres of Excellence, you will have the opportunity to work on real-time projects. You will also experience multi-disciplinary training in advanced automation technologies and solutions from industry leaders such as Omron, Siemens, Festo and PTC.

ROBUST STUDENT INTERNSHIP

You will have the opportunity to be attached to a leading organisation locally or overseas for student internship to be exposed to leading industry practices and latest technological trends. Selected students can embark on a year-long student internship (compared to 4 months normally), so as to get more in-depth industry experience and a head-start in their future jobs.

UNIVERSITY PATHWAY PROGRAMME

The TP-SUTD University Pathway Programme allows you to take university modules during your final year of study, and gain conditional admission into SUTD. You will get a taste of university life during your diploma studies at TP and shorten the time needed to get your degree!

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.

Subject	Grade
English Language (EL1)*	1-7
Mathematics (E or A)	1-6
Any one of the listed subjects^	1-6
Any two other subjects, excluding CCA	
2023 Planned Intake	**50**
Net ELR2B2 aggregate range (2023 JAE)	**9 - 16**

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.

YEAR 1 | YEAR 2 | YEAR 3 | TPFUN

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 gain an awareness of Industry 4.0 via guided visits to our TP Advanced Manufacturing Centre.

Core Subjects

Subject Code	Subject	Credit Units
EEE1001	**Circuit Analysis** 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.	6
ESE1006	**Computer Programming for Problem Solving** 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.	4
EEE1003	**Digital Fundamentals 1** 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.	5
EEE1004	**Digital Fundamentals 2**	5

	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.		
EEE1002	**Electronic Devices & Circuits** 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.	**6**	^
EED1001	**Electronic Prototyping** 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.	**3**	^
EMA1003	**Engineering Mathematics 1** 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.	**4**	^
EMA1002	**Engineering Mathematics 2** This subject introduces the basic concepts of calculus and statistical method to test a hypothesis. Basic	**4**	^

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.

ESC1004	**Engineering Physics**	**3**	^

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.

YEAR 1 | **YEAR 2** | YEAR 3 | TPFUN

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 and analytics, as well as additive printing, and will be exposed to key job roles by taking up operational roles in Advanced Manufacturing as relevant core diploma subjects.

Core Subjects

Subject Code	Subject	Credit Units
ESE1008	**Data Visualisation & Analytics** 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.	3
EDR1003	**Engineering Drawing** Engineering drawing is essential for communicating engineering design. This subject will introduce you to the understanding and preparation of two-dimensional mechanical engineering drawings with the use of both manual and Computer Aided Design/ Drafting (CAD) software. CAD modelling is also taught. You will also learn general methods of dimensioning according to international and local standards.	4
EMA2003	**Engineering Mathematics 3** 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.	4
EED2011	**Integrated Project** This subject covers the basic principles in the development of product design through hands-on	3

	experience. The project will involve the use of mechanical hardware, electronics, software and data visualisation to demonstrate solutions to real world problems in advanced manufacturing.		
EME2004	**Introduction to Smart Automation** 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.	**4**	^
EME2007	**Machining Technology** 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 (CAD/CAM) system. Safety aspects are emphasised throughout the workshop sessions. You will acquire the fundamental knowledge and skills in designing for the manufacturing sectors such as the tool and die industry.	**4**	^
EME2008	**Principles of Dynamics** 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 learn the fundamental principles of dynamics and apply them to the analyses of bodies in motion. The objective is to	**5**	^

	present the foundation and applications of dynamics. 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.		
EMF3005	**Robotics & Automation** This subject covers factory automation systems which are the foundation for advanced manufacturing systems. It provides the essential concepts and background on 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. Both hardware and software links between the main factory automation components are introduced.	**4**	^
EME1002	**Statics & Strength of Materials** 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.	**4**	^

YEAR 1 YEAR 2 **YEAR 3** TPFUN

Choose an elective in emerging fields in advanced manufacturing, or a "through-train" work-study degree programme! Deepen your specialisation via cross-school elective subjects and on-the-job training in the TP Advanced Manufacturing Centre as part of your Major Project. With this practice-based approach, you will get a head-start when working in relevant companies in the Advanced Manufacturing sector.

Core Subjects —

Subject Code	Subject	Credit Units	
EMP3002	**Major Project**	**8**	^

	In this subject, you will work in teams to integrate and apply your skills and knowledge to implement your projects in a practical work-and-learn environment. Besides research, design, analytics, project management, communication and problem solving skills, the emphasis will also be on innovation, teamwork and self-learning.	

#*Students to choose one of these elective clusters*

Cluster Elective Subjects

3D Printing Elective Cluster —

Subject Code	Subject	Credit Units
EDR3001	**Advanced CAD & Simulation** This subject involves the use of advanced computer-aided design (CAD) to design, create and simulate engineering production in a virtual environment. It aims to equip you with in-depth knowledge of the software and its advanced modelling tools. CAD applications include Mechanism, Animation, Simulate and Illustrate.	**4**
EME2012	**CAD & Additive Manufacturing** 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 principles and development of Additive Manufacturing, design guidelines for Additive Manufacturing (ISO/ASTM 52911-2), design of support structures, generalised process chain, process selection guidelines, pre-processing software, post-processing methods and laser-based powder bed.	**4**

Advanced Engineering Skills Elective Cluster

Subject Code	Subject	Credit Units
EED3014	**Advanced Skills Practices** 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.	8

Advanced Manufacturing Elective Cluster

Subject Code	Subject	Credit Units
EMF3006	**Machine Vision & Pattern Recognition** 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 skills and knowledge will be applied to machine vision systems in a smart manufacturing facility.	4

Subject Code	Subject	Credit Units
EMF2002	**Smart Manufacturing System** This subject introduces the core elements of a smart manufacturing system where real-time manufacturing data enables flexibility and increases 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.	4

Intralogistics & Cybersecurity Elective Cluster

Subject Code	Subject	Credit Units
BLO2010	**Distribution Centre Management** This subject provides an overview of the role of a Distribution Centre (DC) in the supply chain. It also covers the various activities performed within a DC and the significance of these activities on customer service and total logistics costs. It focuses on the major resources to be applied in a DC and explains how they interact with one another in contributing to the DC's effectiveness and efficiency. It will also cover the significance of providing DC services to the Third-Party Logistics industry.	4
CCF2C02	**IOT Security** This subject covers the knowledge and skills required to analyse and troubleshoot IoT vulnerabilities and threats. You will use latest technologies to perform risk assessments and recommend mitigation strategies for common security issues in IoT systems.	4

Semiconductor Technology Elective Cluster

Subject Code	Subject	Credit Units
EMI3005	**Cleanroom Equipment & Technology** 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.	4
EMI2008	**IC Process Integration** This subject covers the basic concepts of IC, IC fabrication and IC wafer fabrication, as well as producing process flow, conceptual mask layouts and test structures for CMOS process. It also covers the basic concepts of process in-line monitoring and characterisation of basic solid state devices.	4

University Pathway Programme (SUTD)

Subject Code	Subject	Credit Units
ESE3015	**Computational Thinking for Design** This subject covers programming both in the architectural design and computing contexts targeted at novice programmers. It will introduce students to programming and design computing skills that are essential for their studies. Students will learn visual programming and python programming together with design concepts, and will apply these skills in related projects.	4
EMA3002	**Modelling & Analysis**	4

	The main objective of this subject is to provide students firm foundations of single variable calculus so that they can apply calculus to model, solve and analyse applied math problems. It aims to motivate students on the importance of calculus through a plethora of applications in engineering, physical and biological sciences, computer science, finance, economics, probability and statistics and other topics. On top of the basic concepts, techniques and applications of two branches of calculus - differentiation and integration, students will also learn to use simple software to implement numerical methods in calculus.		
ESC3002	**Physical World** This subject provide students with the ability to understand and explain the inner mechanism of the physical world based on the principles of mechanics and thermodynamics. It aims to help students appreciate the beauty of physics and enable them to apply key concepts learnt to evaluate and address physics-based problems to make a positive impact on the world. By using concepts established through simplified mathematical models, reverse engineering case studies and experiential learning through hands-on demonstrations, connections between physics concepts and theoretical models are reinforced with practice.	**4**	
ECS3003	**Global Humanities: Literature, Philosophy & Ethics** This subject examines stories as a way to understand ourselves and our world. Some of these stories have endured for centuries and spread far beyond their locus of origin. They raise questions that resonate with our lives even today. This subject will equip you with critical reading, thinking, and writing skills by exploring different ways of reading and	**4**	

	interpreting classic texts. You will learn to identify the connections between various texts and between thinkers in history – ranging from those in ancient China and Greece to those in contemporary Singapore.	

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.

Special Electives —

Subject Code	Subject	Credit Units
EED3009	**Special Project 1** 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.	**2**
EED3010	**Special Project 2** 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.	**2**
EED3011	**Higher Engineering Skills 1** 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.	**2**
EED3012	**Higher Engineering Skills 2** Higher Engineering Skills 1 and 2 aim to impart some special design and hands-on skills that allow you to	**2**

	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.	
EMA3001	**Higher Engineering Mathematics** 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.	**4**

You will also take this set of subjects that equips you with the crucial 21st-Century life skills you need to navigate the modern world as an agile, forward-thinking individual and team player.

TP Fundamentals (TPFun) Subjects

Subject Code	Subject	Credit Units
ESI3001	**Student Internship Programme** This structured programme is designed to link your learning with the real work environment. You will be placed in organisation(s) with opportunities to apply the concepts and skills acquired in the course of your study. Besides reinforcing technical concepts and mastering of skills in areas that you have been trained, the practical training will enable you to build important skills such as problem-solving, communication, teamwork, and to cultivate good attitude and a strong work ethic.	**12**
ETX1001	**Effective Communication** This subject introduces the fundamentals of effective communication. It also covers how to	**3**

communicate with and convince an audience through writing and speaking tasks. The skills in this subject will include the application of strategies for communication, appropriate vocabulary, language features, visual aids, tone and style. The **M**essage, **A**udience, **P**urpose and **S**trategy (MAPS) framework will also be applied when planning and engaging in written and verbal communication. There will be opportunities to communicate and collaborate through active learning activities, apply digital and information literacy skills and build competence through self-directed learning.

ETX1002 **Professional Communication** **3**

This subject covers professional communication skills for the workplace and employability skills in the areas of career preparation. It covers communication and interpersonal skills, including effective virtual communication etiquette, and conducting oneself professionally in the workplace. In addition, essential career preparation skills such as resume writing and interview skills, needed to seek and secure work would be included. The **M**essage, **A**udience, **P**urpose and **S**trategy (MAPS) framework would also be applied when engaging in written and verbal communication. There will be opportunities to communicate and collaborate through active learning activities, apply digital and information literacy skills and build competence through self-directed learning.

GTP1301 **Current Issues & Critical Thinking** **3**

This subject covers current issues, including diverse local and global concerns, that will impact lives and may have critical implications for Singapore. There will be opportunities to build competence through self-directed learning, communicate and collaborate in active discussions and objectively analyse issues using digital

	and information literacy skills and critical thinking scaffolds.		
GTP1201	**Career Readiness** This subject focuses on personal management skills. It develops an understanding of one's career interests, values, personality and skills for career success. It covers the necessary knowledge, skills and attitudes needed to succeed in the workplace and achieve professional goals. There will be exposure to apply digital and information literacy skills, build competence through self-directed learning methods, and acquire the skills of being a lifelong learner.	**1**	^
GTP1202	**Career Management** This subject focuses on career management skills. It covers the importance of workplace readiness skills to adapt and respond to the changing job market environment. Career ownership and continuous learning for lifelong employability will be emphasised. There will be exposure to apply digital and information literacy skills, build competence through self-directed learning, and acquire the skills of being a lifelong learner.	**1**	^
EGS1002	**Global Studies** This subject provides essential skills and knowledge to prepare students for an overseas experience. They will examine the elements of culture and learn the key principles of cross-cultural communication. In addition, they will gain an appreciation and awareness of the political, economic, technological and social landscape to function effectively in a global environment. The subject prepares students to be responsible global citizens and leaders who can contribute to the global community through effective communication and collaboration.	**3**	^

GTP1302	**Guided Learning***	**3**	^
	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. Students will enhance their problem solving and digital literacy skills through this subject.		
EIN1001	**Innovation & Entrepreneurship**	**2**	^
	The subject is designed for learners from all disciplines to embrace innovation in either their specialised field or beyond. Learners will be taught to apply the Design Thinking framework to develop problem statements, ideate and identify feasible solutions. Learners will be exposed to several tools for prototyping. In addition, commercial awareness will be imbued in learners through various innovation and entrepreneurship concepts or tools. This subject also prepares students to be self-directed lifelong learners who are digital and information literate. It nurtures communicative and collaborative citizens who can use objective analysis in problem-solving.		
GTP1101	**Leadership Fundamentals**	**2**	^
	This subject focuses on self-leadership based on the values of integrity, respect, and responsibility. Increasing awareness of self and others will lay the foundations for personal and relationship effectiveness. Consequential thinking, clear articulation of personal values		

	and visions, emphatic listening, and collaboration in serving others are some of the essential skills covered in this leadership journey. There will be opportunities to build and to apply the concepts of being a values-centred leader.		
GTP1102	**Leadership in Action** This subject focuses on Service Learning as an experiential platform to apply the tenets of Self and Team Leadership. Service Learning will be the capstone project for this subject, which will require an analysis of the diverse needs of the community, collaboration with community partners and demonstration of learning, including key elements of empathy. There will be opportunities to build and to apply the concepts of being a values-centred leader.	**1**	^
LSW1002	**Sports & Wellness** The subject enables students to build a good foundation for healthy living. Students will have the opportunity to participate in hands-on practical sessions where they will experience and develop both physical and technical skills in their chosen sports or fitness activities. Through a structured curriculum that facilitates group participation, practice sessions and mini competitions, students will be able to build lifelong skills such as resilience, leadership, communication and teamwork. Physical activity sessions will also be supplemented by health-related topics that span the dimensions of health, such as diet, nutrition, stress and weight management, to provide students with a holistic approach to healthy living. This subject also prepares students to be self-directed and accountable for lifelong learning for good health.	**2**	^
TGS1001	**Sustainability & Climate Action*** This subject prepares students to be responsible global citizens and future	**3**	^

	leaders who can contribute to the global community. It introduces the topics of sustainability and explores how human societies can act to build a sustainable future. This subject focuses on the impact of climate change, potential solutions to climate change, and the future of the green economy from global and local perspectives.

** Students must choose to take either **Sustainability & Climate Action** or **Guided Learning**.*

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 8 credit units
Total Credit Units Completed	min 127 credit units