

### **Course Overview**

The healthcare industry needs Biomedical Engineers as much as doctors and nurses. You can make your mark in this growing sector by working with your peers to develop the next generation of medical devices for clinical engineering.

You will go through a multi-disciplinary experiential learning journey and have opportunities to acquire specialised skills at the Healthcare Engineering Centre (HEC), which focuses on the development of BioMEMS (Biomedical Micro-Electro-Mechanical Systems), microfluidics, flexible hybrid electronics for healthcare wearables, smart Al healthcare devices and intelligent wearable healthcare sensors. You will work on research and development as well as prototyping projects under the supervision of a team of skilled research scientists and engineers at the HEC.

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

- Advanced Engineering Skills
- Biomedical Design & Devices
- Clinical Equipment & Process
- · Healthcare Informatics

Join this course and be part of the future-ready MedTech and healthcare workforce!

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



### FIRST OF ITS KIND

With more than 30 years in the business as the first product design course in a polytechnic, we are recognised for producing some of Singapore's top award-winners and entrepreneurs in the product design scene.



### ADVANCED TECHNOLOGY

Students work with industrygrade equipment and the latest 3D printers to prototype their ideas in one of Singapore's largest fully-equipped fabrication workshops.



### INNOVATIVE TOOLS

With equipment such as MS HoloLens 2 and Magic Leap, students can use virtual reality, mixed reality and augmented reality to collaborate and accelerate their design iteration process through interactive real-world digital visualisation.

# **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	-
2022 Planned Intake	100
Net ELR2B2 aggregate range (2021 JAE)	10 - 13

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

## **What You'll Learn**

YEAR 1 YEAR 2 YEAR

YEAR 3 TPFUN

You will receive a firm foundation in fundamental engineering concepts, through lab work, study trips to companies, and hands-on learning opportunities, preparing you for specialisation in the medical and life sciences fields.

Core Subjects			_
Subject Code	Subject	Credit Units	
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	^
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	^
EEE1002	<b>Electronic Devices &amp; Circuits</b> 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	^
EEE1003	Digital Fundamentals 1  This subject provides basic knowledge of digital electronics and circuits. Topics include number	5	^

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

<sup>^</sup> 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, Biology), Science (Physics, Chemistry)/Physical Science.

	systems, operations and codes, logic gates, Boolean algebra and logic simplification, combinational logic, functional blocks, latches and flip-flops.		
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.		
EMA1002	Engineering Mathematics 2	4	^
	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.		
EMA1003	Engineering Mathematics 1	4	^
	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.		
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.		
ESE1006	Computer Programming for Problem Solving	4	^
	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.		
YEAR 1	YEAR 2 YEAR 3 TPFUN		

Here, you will deepen your engineering skills, pick up fundamental knowledge of the life sciences, and learn how engineering is used to further the development of technology in the medical and life sciences fields.

Core Subjects			_
Subject Code	Subject	Credit Units	
EBI3008	Medical Imaging & Informatics  This subject will cover Medical Imaging techniques and Health Information Systems with the implementation of IT in the healthcare setting. This covers decision-making in patient care, clinical workflow, network infrastructures, standards and interoperability issues, and patient data privacy and security.	4	^
EBS1004	Human Anatomy & Physiology  This subject provides you with a basic understanding of human anatomy and physiology. Topics covered include the anatomy of the organs and organ systems and their functions.	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	^

EMC3006	Microcontroller Applications	5	^
	This subject provides you with working knowledge on microcontroller architecture, the features and characteristics of the internal peripherals in the microcontroller, such as interrupts, Timer and PWM, in order to design and implement an embedded system that involves hardware and software interfacing. The subject also covers the features of evolving microcontrollers that support Internet of Things (IoT) applications.		
EMD2001	Medical Electronics	4	^
	This subject introduces fundamental instrumentation theories for biomedical applications and design requirements for the measurement of bio-signals. Topics include electrodes and transducers, bio-potential measurements, amplifier basics, as well as differential and instrumentation amplifiers. Filter designs, noise and electromagnetic interference issues are also discussed.		
EMD2002	Medical Devices	4	^
	This subject discusses the fundamentals of medical devices generally used in hospitals, such as the electrocardiograph, electroencephalograph, electromyograph, therapeutic devices, as well as life-saving and support devices. The essential principles of safety and reliability of medical devices are also covered.		
EMF2003	Medical Device Manufacturing Practices	3	^
	This subject provides the fundamental knowledge of, and introduces good manufacturing practices in, the design and manufacturing of medical devices and pharmaceuticals. It covers design control, equipment maintenance, contamination prevention, qualification and validation, non-conformance handling as well as technical documentation.		
ESC1003	Chemistry	4	^
	This subject provides the students with an understanding of the fundamentals of chemistry concepts and applications useful in the bioengineering field. Topics covered include the principles, theories and applications of physical, inorganic and organic chemistry, ranging from atomic structure and electron configuration, stoichiometry, the periodic table, chemical bonding, equilibria, electrochemistry, and thermochemistry to topics of organic chemistry covering the hydrocarbons, haloalkanes, the hydroxy, carbonyl and carboxylic acids compounds. Essential practical sessions on chemical experimentation are also covered.		
ESE1008	Data Visualisation & Analytics	3	^
	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.		
YEAR 1	YEAR 2 YEAR 3 TPFUN		

You can specialise by choosing an elective in Audiometry & Hearing Devices, Clinical Laboratory Equipment, or Medical Biochemistry. Together with the Major Project and internship, you will be ready for an exciting and lucrative career upon graduation.

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.		

### **Cluster Elective Subjects**

Students to choose one of these elective clusters:

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

Biomedical Design	& Devices Elective Cluster		_
Subject Code	Subject	Credit Units	
EBI3004	Audiometry & Hearing Devices  This subject focuses on the hearing health sector in biomedicine. It exposes you to the science of hearing assessment and technologies available to remediate hearing loss. You will study the properties of sound, the physiology of hearing and the causes of hearing impairment; and you will be equipped with the skills to screen for hearing impairment. You will also learn about the underlying technologies behind digital hearing aids.	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	^

Clinical Equipment	& Process Elective Cluster		_
Subject Code	Subject	Credit Units	
EBS2004	Medical Biochemistry	4	^
	This subject covers biochemical and molecular exchanges that occur within the human body in the context of medicine, usually in terms of drug interactions or cellular responses to diseases. It includes Biochemistry, which investigates the constituents of biological systems, their properties and their significance to biological science, as well as Molecular Genetics, which studies DNA structure, DNA replication, DNA transcription & translation and DNA mutations. Connections will also be made between the two areas of study.		
EBS3004	Clinical Laboratory Equipment	4	^
	This subject focuses on important aspects of clinical laboratory and instruments widely used in clinical laboratories. Topics include centrifuges, automated analysers, separation techniques, bioreactors, mass spectrometry and clinical trials. Essential insights to clinical laboratory practices are also given.		

Healthcare Informa	atics Elective Cluster		_
Subject Code	Subject	Credit Units	
EBI3009	Healthcare Analytics  This subject covers the statistical techniques for biomedical data analysis and the decision-making process using machine-learning algorithms. The topics covered include techniques for	4	^
	data analysis and machine learning for decision-making. You will gain hands-on Python		

	programming experience by applying the statistical techniques on biomedical datasets to facilitate effective data-driven decisions through machine learning algorithms.		
EMD2005	Patient Monitoring Technology	4	^
	This subject provides an understanding of the fundamental principles and applications of the biomedical instrumentation systems commonly used in the healthcare sector. Patient monitoring tools will be used to reinforce the learning of physiological signal analysis techniques.		

Subject Code	Subject	Credit Units	
ESE3015	Computational Thinking for Design	4	^
	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.		
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	4	^
	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.		
ECS3003	Global Humanities: Literature, Philosophy & Ethics	4	^
	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 interpreting classic texts. You will learn to identify the connections between various texts and between thinkers in		

## **Special Electives**

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

Special Electives			_
Subject Code	Subject	Credit Units	
EED3009	Special Project 1	2	^
	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.		
EED3010	Special Project 2	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.		
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 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	^
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.		
YEAR 1	YEAR 2 YEAR 3 <b>TPFUN</b>		

You will also undergo TP Fundamentals (TPFun) – a set of subjects that equips you with the crucial life skills you need to navigate the modern world as an agile and forward-thinking individual, and team player.

TP Fundamentals (TPFun) Subjects —			_
Subject Code	Subject	Credit Units	
GTP1301	Current Issues & Critical Thinking  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.  This subject aims to provide students with the knowledge and skills to:  apply critical thinking tools to examine current issues.  effectively search for relevant information from a variety of sources.  evaluate research information.  cite sources to support their views.  articulate an informed opinion about current issues.	3	^
ETX1001	Effective Communication  This subject introduces the fundamentals of effective communication. It also covers how to 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 Message, Audience, Purpose and Strategy (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.  This subject aims to equip students with the knowledge and skills to:  apply the factors that influence effective communication.  structure a compelling point of view through a writing task.  express their ideas convincingly to an audience in an oral presentation.	3	^
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 preparationskills 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.

The subject aims to equip students with the knowledge and skills to:

- communicate effectively in the workplace using principles of effective written communication and interpersonal skills.
- apply effective job search and interview skills in their career preparation.

### GTP1101 Leadership Fundamentals

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.

The aim of this subject is to guide students to:

- design a personal growth plan based on strengths, values and purpose.
- apply the attributes of logical and emotional intelligence to improve team effectiveness.
- identify the key messages of respect in relationships.
- apply the principles of effective personal financial management.

### 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.

This subject aims to equip students with the knowledge and skills to:

- plan and carry out a project to demonstrate empathy towards people in a diverse community.
- apply diploma core knowledge and skills through the Service Learning platform to address community needs.
- reflect on the Service Learning experience when working in teams and with community partners.

### GTP1201 Career Readiness CARE1

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.

This subject aims to equip students with the knowledge and skills to:

- analyse personal characteristics that can contribute positively to achieving personal, educational and career goals.
- make career decisions that are aligned with their interests, skills and values.

### GTP1202 Career Readiness CARE2

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.

This subject aims to equip students with the knowledge and skills to:

- identify their work profiles to help them in their career choices in a changing job market environment.
- take career ownership for continuous learning and lifelong employability.

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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	^
EIN1001	Innovation & Entrepreneurship  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.	2	^
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 citizens and leaders who can contribute to the global community through effective communication and collaboration.	3	^
EGS1003	Managing Diversity at Work*  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. The subject prepares students to be responsible citizens and leaders who can contribute to the global community through effective communication and collaboration.	3	^
EGS1004	Global Citizenship & Community Development*  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. The subject prepares students to be responsible citizens and leaders who can contribute to the global community through effective communication and collaboration.	3	^
EGS1005	Expressions of Culture*  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. The subject prepares students to be responsible citizens and leaders who can contribute to the global community through effective communication and collaboration.	3	^
GTP1302	Guided Learning  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.	3	^
ESI3001	Student Internship Programme	12	^

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.

\*Students must choose one of these three electives under the 'Global Studies 2' subject, or take 'Guided Learning'

### **GRADUATION REQUIREMENTS**

Cumulative Grade Point Average	min 1.0
TP Fundamentals Subjects	36 credit units
Diploma Core Subjects	83 credit units
Diploma Elective Subjects	min 8 credit units
Total Credit Units Completed	min 127 credit units