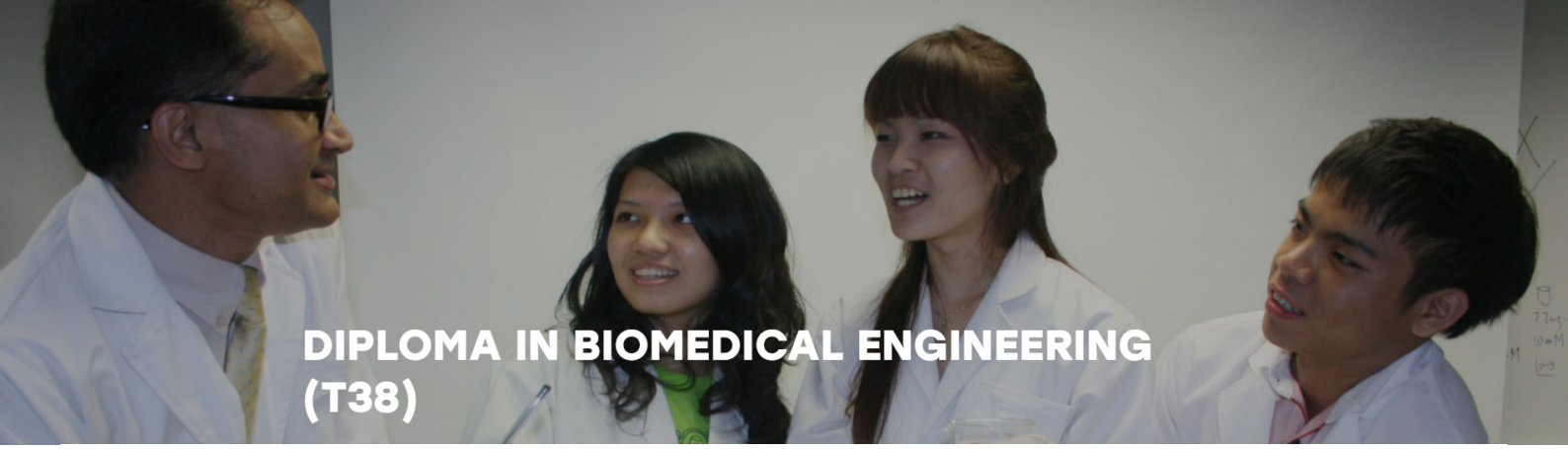

DIPLOMA IN BIOMEDICAL ENGINEERING (T38)

Course Overview

Ever wondered how medical devices that are used by doctors and nurses are designed? From developing Personal Protective Equipment (PPE) for COVID-19 to inventing X-ray machines, biomedical engineers are just as essential to the healthcare industry as doctors and nurses!

The Diploma in Biomedical Engineering provides you with training in biological techniques and biomedical instrumentation, including BioMEMS (Biomedical Micro-Electro-Mechanical Systems), intelligent wearable healthcare sensors and smart healthcare devices using artificial intelligence. Alongside the principles of engineering and digital electronics, you will learn the fundamentals of developing medical devices that are used in hospitals, human anatomy and physiology.

You can also join the University Pathway Programme, which allows you to take university modules in your final year of this course, and get a one-year exemption for selected degree courses at local universities. The holistic training you receive will enable you to meet the demands of the fast-growing Medical Technology (MedTech) and healthcare industries and embark on rewarding careers especially in the fields of manufacturing, regulatory sciences and clinical services.

Join us and help develop the next generation of smart medical devices!

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

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

- Certificate in Industrial Audiometry
- AI4I® – Literacy in AI Certification

VERSATILE SKILL SETS
Training in multiple areas of bio-science and engineering gives you greater flexibility and more options.

DIVERSE CURRICULUM
Broad-based curriculum allows you to pursue further studies in diverse areas including life sciences, medical research, IT and engineering.

MANY CAREER OPPORTUNITIES
A broad range of employment opportunities awaits you in the healthcare industry.

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	**95**
Net ELR2B2 aggregate range (2023 JAE)	**8 - 14**

Note: *Applicants should not be suffering from partial or 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.

What You'll Learn

YEAR 1 | YEAR 2 | 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	**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
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,	5

	functional blocks, latches and flip-flops.		
EEE1004	**Digital Fundamentals 2** 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.	**5**	^
EMA1002	**Engineering Mathematics 2** 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.	**4**	^
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**	^
ESC1004	**Engineering Physics** 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,	**3**	^

	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** 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**

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	**4**

	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.		
EMC3006	**Microcontroller Applications** 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.	**5**	^
EMD2001	**Medical Electronics** 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.	**4**	^
EMD2002	**Medical Devices** 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.	**4**	^
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** 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.	**4**	^
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**	^

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** 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.	8

Cluster Elective Subjects

Students to choose one of these elective clusters:

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

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** This subject covers biochemical and molecular exchanges that occur within the human body in the context of medicine, usually in terms of drug	4

	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** 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.	**4**

Healthcare Informatics 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 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.	**4**
EMD2005	**Patient Monitoring Technology** This subject provides an understanding of the fundamental principles and applications of the biomedical instrumentation systems	**4**

	commonly used in the healthcare sector. Patient monitoring tools will be used to reinforce the learning of physiological signal analysis techniques.	

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** 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.	4
ESC3002	**Physical World** This subject provide students with the ability to understand and explain the inner mechanism of the physical world	4

	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** 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 history – ranging from those in ancient China and Greece to those in contemporary Singapore.	**4**

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** 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 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.	**4**	^

YEAR 1 YEAR 2 YEAR 3 **TPFUN**

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 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.	**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 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**	**1**

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.

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*** 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**	^

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**	^
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.	**2**	^
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.	**1**	^

	There will be opportunities to build and to apply the concepts of being a values-centred leader.		
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 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.	**3**	^

** 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 Elective Subjects	min 8 credit units
Total Credit Units Completed	min 127 credit units