

A photograph of two students, a woman and a man, wearing white lab coats and safety goggles. They are in a laboratory setting, looking at something in the woman's hands. The background shows various pieces of laboratory equipment.

## DIPLOMA IN CHEMICAL ENGINEERING (T33)

### Course Overview

Chemical engineers play a key role in ensuring environmental sustainability and addressing global issues like poverty and disease.

This multidisciplinary field brings together mathematics, chemistry, physics, biology and engineering to understand how raw materials are processed to bring us products we use in our daily lives, including fuels, paints, biodegradable plastics, medicines, cosmetics, personal care products, food, water, and many others.

Our students' learning go well beyond classrooms and labs, as they undergo work-based learning in our state-of-the-art facilities to acquire a range of scientific and engineering skills, as well as six-month internships to apply their knowledge and skills.

In Year 3, choose your specialisation in Applied Chemistry, Chemical Processing, Pharmaceutical & Biologics Technology or Semiconductor Technology.

The holistic training you receive will enable you to clinch a rewarding career in many growing sectors, including petrochemical, speciality chemical, pharmaceutical, energy, semiconductor, environment and water industries.

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

- bizSAFE Level 2 certification (for CHE)



#### FIRST OF ITS KIND

The first polytechnic in Singapore with an upcoming state-of-art chemical pilot plant to integrate biofuel manufacturing with industry 4.0 features, water/wastewater treatment and safety training.



#### PICK YOUR NICHE

Choose from four exciting specialisation options - Applied Chemistry, Chemical Processing, Pharmaceutical & Biologics Technology and Semiconductor Technology.



#### FAST-TRACK PROGRAMME

Join a direct pathway programme leading to a university degree from the Singapore University of Technology and Design (SUTD).

# 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 (ELT)*	1-7
Mathematics (E or A)	1-6
One of the following Science subjects: <ul style="list-style-type: none"><li>• Biology</li><li>• Biotechnology</li><li>• Chemistry</li><li>• Combined Science</li><li>• Food &amp; Nutrition</li><li>• Physics/Engineering Science</li><li>• Science (Chemistry, Biology)</li><li>• Science (Physics, Biology)</li><li>• Science (Physics, Chemistry)/Physical Science</li></ul>	1-6
Any two other subjects, excluding CCA	
<b>2023 Planned Intake</b>	<b>100</b>
<b>Net ELR2B2 aggregate range (2023 JAE)</b>	<b>5 - 14</b>

\* Sijil Pelajaran Malaysia (SPM)/ Unified Examination Chinese (UEC) holders must have a minimum of grade 6 for the relevant English Language subject (e.g. Bahasa Inggeris).

# What You'll Learn

YEAR 1

YEAR 2

YEAR 3

TPFUN

You will begin your journey by building a strong broad-based foundation through core subjects ranging from microbiology, cell biology, mathematics to conservation, nutrition and workplace safety.

## Core Subjects

Subject Code	Subject	Credit Units	
AMB1005	<b>Basic Microbiology</b> <p>This subject investigates the important fundamentals of microbiology and its relevance to the food, biomedical and biotechnology industries. It covers the types of microorganisms, their cultivation and growth as well as their control.</p>	4	^
AMT1004	<b>Cell Biology &amp; Biochemistry</b> <p>This subject introduces the biology of cells and the structure-function relationship of cells, cellular membranes and organelles. It covers basic concepts of organic chemistry and the structure-property relationship of essential biomolecules. Basic laboratory skills involving the study of cell structures with the use of cell staining and microscopy techniques, as well as basic biochemical analysis will also be introduced.</p>	5	^
AMA1008	<b>Digitalisation in Applied Science</b> <p>This subject covers the basic concept of data analytics as well as the processes of data cleaning, processing and visualisation of data in the contexts of applied science. Basic coding and fundamental computational thinking constructs such as variables, data type and logic will also be addressed.</p>	2	^
APH1004	<b>Laboratory &amp; Workplace Safety</b>	3	^

This subject covers an introduction to Good Laboratory Practice, and the identification and classification of biological, chemical, physical and ergonomic hazards at the workplace and laboratories. It also involves the conduct of risk assessment, risk controls and monitoring as well as communication of these risks to all persons involved in compliance with the Workplace Safety and Health (Risk Management) Regulations.

**AMA1003**

**Mathematics for Applied Science**

**3**



This subject covers algebra, differentiation, integration and their applications in applied science contexts.

**ANT1005**

**Nutrition & Health**

**3**



This subject examines the relationship between food, nutrition and health. It provides an introduction to macro- and micro- nutrients in relation to the well-being of the human body. It covers food sources of these nutrients and their interrelationships as well as the use of basic nutritional tools like My Healthy Plate, food composition tables and online nutritional databases for basic nutritional analysis.

**ACH1009**

**Principles of Inorganic & Physical Chemistry 1**

**4**



This subject covers the basic theory and practical knowledge of inorganic and physical chemistry. Topics include fundamentals of chemistry, atomic structure and chemical bonding, stoichiometry and equilibria concepts of a chemical reaction.

**AMA1004**

**Statistics for Applied Science**

**3**



This subject provides you with the basic statistical techniques that are essential for your course of study. Topics covered include basic probability and distributions, basic

statistics, sampling distribution, hypothesis testing, analysis of variance and chi-square testing.

YEAR 1

**YEAR 2**

YEAR 3

TPFUN

Your journey into the exciting field of chemical engineering begins with learning the principles of chemical processing to understand how chemicals are processed into everyday products such as petroleum, plastics and toiletries.

### Core Subjects

Subject Code	Subject	Credit Units	
ACE2013	<b>Chemical Reaction Engineering</b> This subject examines the scientific principles behind the kinetics of chemical reactions and techniques which are the basic principles of chemical engineering. This subject examines the scientific principles behind the kinetics of chemical reactions and techniques which are the basic principles of chemical engineering.	4	^
ACE1005	<b>Chemical Thermodynamics</b> This subject covers the basic laws of thermodynamics in chemical industry context with applications on closed and steady flow systems, phase equilibria, thermodynamic cycles and the use of empirical tables such as Steam tables. An introduction to the thermodynamic diagrams of pure substance and partial properties of mixtures will also be included.	5	^
AMA2003	<b>Engineering Mathematics</b> This subject covers the mathematical concepts and techniques which are essential for solving chemical engineering problems. The topics covered include matrices, trigonometry, first order differential equations and second order differential equations.	4	^
ACE1004	<b>Mass &amp; Energy Balance</b>	5	^

This subject covers scientific principles and techniques involved in mass and energy balances which form the fundamentals of Chemical Engineering. The topics covered include the understanding of dimensions in measurements of concentrations of liquids, gases and vapour systems, the development of process flow diagrams and the application of mass and energy balances to various chemical process systems.

**ACH1011**

**Organic Chemistry**

**3**



This subject covers basic concepts in organic chemistry which correlate the structure of organic molecules with their properties of the functional groups. Topics covered are classification of organic compounds, structure and properties of alkanes, alkenes, alcohols, aldehydes and ketones, carboxylic acids, amines and stereochemistry. Emphasis will be placed on the applications of organic compounds and their derivatives, and their impact on the chemical-related industries.

**ACE2017**

**Plant Operations & Process Optimisation**

**5**



This subject covers fundamental concepts and practical skills required for operations of a chemical plant. Students will acquire skills in practising safety, operations, sampling, analysis, chemical waste treatment and process improvement.

**ACE2015**

**Process Control & Instrumentation**

**4**



This subject covers the basic concepts and principles of process control and instrumentation in chemical process industries. Topics include process measuring instruments, basic concept of process control and open and closed-loop control systems.

**ACE2016****Unit Operations****5**

This subject covers the basic principles of selected unit operations in chemical engineering. The topics include fluid transportation, fluidisation, filtration, heat transfer and evaporation. It also covers the quantitative analysis of these operations in problem scenarios which involve extensive use of empirical charts. An introduction to the applications of the selected unit operations is also included.

YEAR 1

YEAR 2

**YEAR 3**

TPFUN

This year, you will get to apply what you have learned so far, in your internship! You will get to choose your specialisation in Applied Chemistry, Chemical Processing, Pharmaceutical & Biologics Technology or Semiconductor Technology, as well as an option to further your education and develop more skills.

**Core Subjects****Subject Code****Subject****Credit Units****AMP3018****Major Project****6**

This subject provides a framework for you to solve practical problems, conduct research work and/ or develop studies, through a self-managed project. The scope of the subject includes project proposal, investigative studies, analysis, interpretation of results, written report and presentation.

**Diploma Elective Cluster Subjects****Applied Chemistry****Subject Code****Subject****Credit Units****ACE3012****Chemical & Material Testing****4**

This subject provides key concepts of materials technology and their relevance to the chemical process

industry. Topics include basic concepts of materials property, types of materials, materials corrosion and prevention, and nanotechnology.

**ACH3005**

**Laboratory Analysis & Management**

**5**



This subject covers the basic principles and applications of some specialized instruments used in analytical laboratories as well as applications of data analysis, method validation, and test method development. It also provides an introduction to laboratory management guidelines and systems, as well as the technical requirements of an accredited laboratory.

### Chemical Processing



**Subject Code**

**Subject**

**Credit Units**

**ACE3004**

**Plant Safety and Loss Prevention**

**4**



This subject examines plant and process safety. Emphasis will be on risk assessment, hazard analysis and the concept of loss prevention in the chemical plant.

**ACE3013**

**Petrochemical Plant Processes**

**5**



This subject covers the production of petrochemicals from various sources, the basic chemistry of petrochemicals, their usefulness and applications. You will also learn about raw materials and their building blocks and the various processes involved in the production of petrochemicals.

### Pharmaceutical & Biologics Technology



**Subject Code**

**Subject**

**Credit Units**

**APH3014**

**GMP in Pharmaceuticals/ Biologics**

**4**



This subject provides the fundamental



knowledge and applications of cGMP in the pharmaceutical and biologics manufacturing industries. An overview of cGMP, quality systems, documentation and record keeping, laboratory controls, validation and self inspection are among the topics that will be covered.

**APH3015**

**Biopharmaceutical Processing**

**5**



This subject provides an overview of biopharmaceutical processing. It also covers the fundamental knowledge, applications and legislative requirement of biosafety, biosecurity and risk assessment relating to management of biological and other hazards.

### Semiconductor Technology (Jointly Offered By ASC And ENG)



**Subject Code**

**Subject**

**Credit Units**

**EMI2008**

**IC Process Integration**

**4**



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.

**EMI3005**

**Cleanroom Equipment & Technology**

**4**



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.

ACE3014

**Good Manufacturing Practices  
Implementation**

2



This subject covers the fundamental knowledge of Good Manufacturing Practices Implementation (GMPI) for the semiconductor industry. Topics include introduction to principles of Good Manufacturing Practices (GMP), application of GMP in a cleanroom environment, and process monitoring and control.

**SUTD Pathway Programme University Modules**



**Subject Code**

**Subject**

**Credit Units**

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.

**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.

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

Take SUTD modules in Year 3 at TP, alongside first-year SUTD students to complete your SUTD degree one year ahead of your peers

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
ASI3028	<p><b>Student Internship Programme</b></p> <p>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.</p>	16
ATX1001	<p><b>Effective Communication</b></p> <p>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 <b>Message, Audience, Purpose and Strategy</b> (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.</p>	3

ATX1002

**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 **Message, Audience, Purpose and Strategy (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**

**1**



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.

**AGS1002**

**Global Studies**

**3**



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.

**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.

**AIN1001**

**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**

**1**



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.

**LSW1002**

**Sports & Wellness**

**2**



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.

**TGS1001**

**Sustainability & Climate Action\***

**3**



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.



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

## GRADUATION REQUIREMENTS

Cumulative Grade Point Average	min 1.0
TP Fundamentals Subjects	40 credit units
Diploma Subjects - Core Subjects	71 credit units
Diploma Subjects - Elective Subjects	min 9 credit units
<b>Total Credit Units Completed</b>	min 120 credit units