

# School of Continuing and Lifelong Education

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# 1 Faculty's Commitment

The School of Continuing and Lifelong Education (SCALE) was established in January 2016 for NUS to expand its Continuing and Professional Education (CPE) presence and offerings in a concerted and strategic way that furthers NUS' mission to be a leading global university, as well as fulfil NUS' role as a public university in Singapore.

SCALE aims to:

- Provide opportunities for working adults to acquire new knowledge and skills from Asia's leading university, NUS;
- Help Singapore companies and industries stay competitive by providing lifelong learning experiences for their employees; and
- Effectively support national manpower needs.

The Bachelor of Technology (BTech) programme, offered on a part-time basis in the area of Engineering, is SCALE's first core offering. The BTech programme has a strong reputation among Polytechnic upgraders and working adults, and students of this programme have, by all accounts, benefitted greatly from the NUS experience.

SCALE will build on the success of the BTech programme, all of which are offered in partnership with the Faculty of Engineering at this present moment. The School plans to launch new degree programmes as well as executive development programmes in due course. These programmes will use blended learning methodology where students will experience online learning as well as face-to-face discussions. SCALE also hopes to introduce more bite-sized and stackable programmes to make lifelong learning more manageable for working adults.

## 2 Key Contact Information

SCALE's administrative office is located at:

University Town  
Education Resource Centre (ERC), #02-16  
8 College Avenue West  
Singapore 138608

For the time being, queries may be directed, via email, as follows:

For admissions: [scale.admissions@nus.edu.sg](mailto:scale.admissions@nus.edu.sg)

For current BTech students: [scale.students@nus.edu.sg](mailto:scale.students@nus.edu.sg)

For up to date information on the School, please visit: <http://scale.nus.edu.sg>

## **3 Undergraduate Education**

### 3.1 Degree Offered

### 3.2 Curriculum Structure and General Academic Matters

#### 3.2.1 Curriculum Structure

#### 3.2.2 General Academic Matters

### 3.3 Degree Requirements

#### 3.3.1 Bachelor of Technology (Chemical Engineering)

#### 3.3.2 Bachelor of Technology (Electronics Engineering)

#### 3.3.3 Bachelor of Technology (Industrial & Management Engineering)

#### 3.3.4 Bachelor of Technology (Mechanical Engineering)

### 3.4 Financial Assistance

### **3.1 Degree Offered**

For a start, SCALE's core offering comprises the following four Bachelor of Technology (BTech) programmes, offered on a part-time basis.

- Bachelor of Technology (Chemical Engineering)
- Bachelor of Technology (Electronics Engineering)
- Bachelor of Technology (Industrial & Management Engineering)
- Bachelor of Technology (Mechanical Engineering)

## **3.2 Curriculum Structure and General Academic Matters**

### **3.2.1 [Curriculum Structure](#)**

### **3.2.2 [General Academic Matters](#)**

### 3.2.1 Curriculum Structure

The structure and design of each of the BTech programmes are based on those of the corresponding four-year full-time Bachelor of Engineering (BEng) programmes offered by the Faculty of Engineering. However, unlike other engineering degree programmes which cater primarily to students admitted with GCE 'A' Level qualifications, BTech Programmes are specially tailored to suit the needs and background of polytechnic graduates holding relevant full-time jobs in industry. The BTech curriculum recognises that Polytechnic upgraders have all attained a certain level of training in addition to acquiring some actual work experience. As such, although almost all the upper-year modules are identical to those of the full time BEng programmes, the modules in the earlier years are somewhat different and are specially designed to cater to the different needs of BTech students.

The BTech curriculum structure follows that of the normal 160-MC four-year full-time programmes. As all students admitted into BTech programmes must have the minimum of a recognised polytechnic diploma, all students are granted, upon admission, advanced placement credits of 40 MCs which is equivalent to one year of the four-year full-time degree requirements. As such, all BTech students are admitted directly as Stage 2 (Year 2) students. Students with additional post-diploma academic qualifications may, on a case-by-case basis, apply and be considered for additional advanced placement credits. The granting of such additional credits will be entirely at the discretion of the University.

To qualify for a BTech degree, a student must take and pass a minimum of 120 MCs of modules, as tabulated below, and achieve a CAP of at least 2.0.

**Table: 120-MC BTech curriculum structure**

Minimum MCs required	
<b>University Level Requirements</b>	
General Education (GE) Modules <sup>1</sup>	20
<b>Sub-total</b>	<b>20</b>
<b>Programme Requirements <sup>2</sup></b>	
Ethics in Engineering	4
Foundation & Major Requirements	85 - 89
<b>Sub-total</b>	<b>89 - 93</b>
<b>Unrestricted Elective Modules <sup>3</sup></b>	<b>8 - 12</b>

Minimum MCs required	
<b>Grand-total</b>	<b>120 - 121</b>

Notes:

1. A limited selection of GE modules (from the wide range available in the University) which can best meet the interests and professional needs of BTech students, will be offered specially in the evenings. The list of modules will be available in the SCALE website in due course.
2. These are specific to the individual BTech programme and reference should be made to the relevant sections.
3. UEMs enable students to pursue their interests without any restrictions. Students may select any module at any level from among Technical or GE modules to meet this requirement.



### 3.2.2 General Academic Matters

**Admission Intakes:** Each of the BTech programmes has two intakes in each Academic Year, one for Semester 1 in August and the other for Semester 2 in January of the following year except for BTech (Chemical Engineering) which offers only one intake in Semester 2 in January.

**Periods of Study in each AY:** In addition to the two normal semesters of study in each Academic Year (Semesters 1 and 2), the BTech Programme also runs a 10-week Special Term during the period from May to July.

**Minimum and Maximum Candidature:** SCALE recognises the need to equip potential adult learners with the necessary skills within a reasonable amount of time so that they stay relevant in the industry upon graduation. As such, the minimum and maximum candidature periods are two-and-a-half and six years respectively, inclusive of approved periods of leave of absence. Nonetheless, records show that if work, family and other commitments permit, students typically attend classes three evenings a week and should typically be able to complete their degree requirements in four years. The curriculum structure is completely modular and flexible and students should study at their own comfortable pace. Unless their other commitments allow them sufficient time and peace of mind to focus on, and gain the most out of, their studies, students are strongly advised not to rush through their programmes. If taking an extra semester to complete their degree requirements results in greater benefit from their studies and perhaps a better class of honours for the degree, it might be worthwhile to do so as the benefits are lifelong.

**Workload:** In any normal semester, unless otherwise approved by the Dean of SCALE, a student may register for up to 14 MCs of modules during a normal semester and 2 modules in a Special Term, excluding TG3001 Industrial Practice.

**Stage Promotion:** Students will be deemed to have progressed to the next stage of study if they have obtained at least the number of MCs, including exemptions, as stated below:

To move to Stage 2 (Year 2): 36 MCs

To move to Stage 3 (Year 3): 76 MCs

To move to Stage 4 (Year 4): 112 MCs

**General:** Students are advised to read carefully other relevant information presented in this document as well as published by the Registrar's Office ([www.nus.edu.sg/registrar](http://www.nus.edu.sg/registrar)). Of particular importance are information relating to: the Modular System, Undergraduate Education Continuation and Graduation Requirements, Academic Calendar, Responsibility for Notices/Circulars, Update of Personal Particulars, Acceptance Record, Leave of Absence, Grading Policy and Exam Process, Graduation, Discipline, Module Enrolment, S/U Option Declaration, and Commencement amongst others. Academic and administrative

rules and regulations set out by the University will apply to every NUS student.

## **3.3 Degree Requirements**

3.3.1 [Bachelor of Technology \(Chemical Engineering\)](#)

3.3.2 [Bachelor of Technology \(Electronics Engineering\)](#)

3.3.3 [Bachelor of Technology \(Industrial & Management Engineering\)](#)

3.3.4 [Bachelor of Technology \(Mechanical Engineering\)](#)

### 3.3.1 Bachelor of Technology (Chemical Engineering)

The BTech (Chemical Engineering) programme is offered in partnership with the Department of Chemical and Biomolecular Engineering. The programme is accredited by the Engineering Accreditation Board (EAB) of the Institution of Engineers Singapore (IES). Via this accreditation, all signatories in the Washington Accord recognize the substantial equivalence of this programme in satisfying the academic requirements for the practice of engineering at the professional level in many countries including Canada, United States of America, United Kingdom, Hong Kong, New Zealand, Australia and others.

The **educational objectives** of the BTech (Chemical Engineering) programme are to:

- develop knowledge and skills required for immediate employment as a professional engineer in Chemical Engineering;
- develop an understanding of and an ability to apply basic mathematics, chemical, physical and information sciences to the practice of Chemical Engineering;
- prepare students for future career paths and life-long learning; and
- enable students to better contribute to national development in the context of globalisation.

The programme aims to achieve the following **learning outcomes**:

- *Core*: Understanding of and ability to apply the science, mathematics and engineering knowledge fundamental to the discipline.
- *Breadth*: Basic competence in a range of technical areas relevant to Chemical Engineering.
- *Depth*: Be able to understand and apply in-depth knowledge of one or more specialisations within Chemical Engineering.
- *Design*: An enhanced ability to perform engineering design by the process of creative thinking, synthesis and integration of interdisciplinary knowledge.

### **Degree Requirements**

Candidates must satisfy the following requirements to be conferred the degree of BTech (Chemical Engineering):

- Complete a minimum of **121 MCs** with a minimum CAP of 2.00 by taking modules as listed below;
- Comply with the requirement that the limit on the number of Level-1000 modules to be counted towards fulfillment of graduation requirements being 60 MCs (including exemption of 20 MCs for polytechnic diploma holders); and
- Satisfy any other additional requirements that may be prescribed by SCALE, the Faculty of Engineering, or the University.

#### **List of modules - BTech (Chemical Engineering), comprise:**

1. All modules are 4MCs, except when otherwise stated.
2. A module with module code TCNxxxx is equivalent to the module CNxxxx/CNxxxxR offered to full-

time students. Subject to the approval from the Dean of SCALE and the ChBE Department, a student may select a full-time equivalent module in place of any TCNxxxx module.

**A. University Level Requirements (20MCs)**

- Quantitative Reasoning (module with prefix GER)
- Thinking and Expression (module with prefix GET)
- Human Cultures (module with prefix GEH)
- Asking Questions (module with prefix GEQ)
- Singapore Studies (module with prefix GES)

**B. Programme Requirements (89MCs), comprising**

**1. Faculty Requirements (4MCs)**

- TTG2415 Ethics in Engineering

**2. Major Requirements – Essential Modules (65MCs)**

- TCN1111 Chemical Engineering Principles
- TCN1005 MatLab Programming for Chemical Engineers
- TCN1411 Mathematics for Chemical Engineers 1
- TCN2411 Mathematics for Chemical Engineers 2
- TCN1422 Materials for Chemical Engineers
- TCN2116 Chemical Kinetics and Reactor Design
- TCN2121 Chemical Engineering Thermodynamics
- TCN2122 Fluid Mechanics
- TCN2125 Heat and Mass Transfer
- TCN3121 Process Dynamics and Control
- TCN3124 Particle Technology
- TCN3132 Separation Processes (5MCs)
- TCN3421 Process Modelling & Numerical Simulation
- TCN3135 Process Safety, Health and Environment (3MCs)
- TCN4122 Process Synthesis and Simulation (3MCs)
- TCN4124 Design Project (6MCs)

**3. Major Requirements – Elective Modules (20MCs, selected from the list below)**

Not all electives modules may be offered in any semester/year. An elective module may not be offered if there is insufficient number of students opting for that module at any particular time. Subject to the approval of the Dean of SCALE, a student may select one Level-3000 or higher module from other programmes within the Faculty of Engineering.

- TCN4119 BTech Dissertation (8MCs)
- TCN4203 Polymer Engineering
- TCN4205 Pinch Analysis and Process Integration
- TCN4208 Biochemical Engineering
- TCN4210 Membrane Science and Engineering
- TCN4211 Petrochemicals & Processing Technology
- TCN4215 Food Technology and Engineering
- TCN4216 Electronic Materials Science
- TCN4217 Processing of Microelectronic Materials
- TCN4227 Advanced Process Control
- TCN4231 Downstream Processing of Biochemical and Pharmaceutical Products

- TCN4238 Chemical & Biochemical Process Modeling
- TCN4240 Unit Operations and Processes for Effluent Treatment
- TCN4242 Optimization of Chemical Processes
- TCN4246 Chemical and Bio-Catalysis
- TCN4229 Computer Aided Chemical Engineering
- TCN4233 Good Manufacturing Practices in Pharmaceutical Industry

### C. Unrestricted Elective Modules (12MCs)

## **Study Schedule**

There is only one intake per academic year in Semester 2 (i.e. January). One sample study schedule for a four-year candidature is shown below. This assumes the students' work and other commitments allow them sufficient time to properly cope with their studies. Students are strongly advised to slow down if necessary so that they progress at their own comfortable pace.

### **Sample Study Schedule (4-year candidature beginning in Semester 2 of an AY):**

1. The number of Modular Credits (MC) of a module is denoted by the number in the bracket.
2. Modules marked with an asterisk (\*) are modules stretching over more than one semester and the total number of MCs will only be given upon completion of the module.

<b>1<sup>st</sup> Year of studies</b>	
Sem 2:	TCN1411 Mathematics for Chemical Engineers 1 (4) TCN1422 Materials for Chemical Engineers (4) TCN1111 Chemical Engineering Principles (4)
SpTerm:	TCN2411 Mathematics for Chemical Engineers 2 (4) General Education Module 1 - Quantitative Reasoning (4)
Sem 1:	TCN1005 MatLab Programming for Chemical Engineers (4) TCN2121 Chemical Engineering Thermodynamics (4) TCN2122 Fluid Mechanics (4)
<b>2<sup>nd</sup> Year of studies</b>	
Sem 2:	TCN2116 Chemical Kinetics & Reactor Design (4) TCN2125 Heat and Mass Transfer (4) TCN3124 Particle Technology (4)

SpTerm:	TCN3135 Process Safety, Health and Environment (3) General Education Module 2 - Asking Questions (4)
Sem 1:	TCN3121 Process Dynamics & Control (4) TCN3132 Separation Processes (5) TCN3421 Process Modelling & Numerical Simulation (4)
<b>3<sup>rd</sup> Year of studies</b>	
Sem 2:	TCN4119* BTech Dissertation / Technical Elective Module (4) Technical Elective Module 1 (4) General Education Module 3 - Thinking & Expression (4)
SpTerm:	TTG2415 Ethics in Engineering (4) TCN4119* BTech Dissertation
Sem 1:	TCN4119* BTech Dissertation (8) / Technical Elective Module (4) TCN4122 Process Synthesis and Simulation (3) TTG3001* Industrial Practice / Unrestricted Elective Module (4)
<b>4<sup>th</sup> Year of studies</b>	
Sem 2:	TCN4124* Final Year Design Project TTG3001* Industrial Practice / Unrestricted Elective Module (4) General Education Module 4 - Human Cultures (4)
SpTerm:	TCN4124* Final Year Design Project (6) TTG3001* Industrial Practice (12) / Unrestricted Elective Module (4)
Sem 1:	Technical Elective Module 2 (4) Technical Elective Module 3 (4) General Education Module 5 - Singapore Studies (4)

### 3.3.2 Bachelor of Technology (Electronics Engineering)

The BTech (Electronics Engineering) is offered in partnership with the Electrical & Computer Engineering (ECE) Department. The programme aims to graduate professional electronic engineers who have a strong foundation in the relevant sciences and technology and who are able to contribute to society through innovation, enterprise and leadership. The programme provides students with an education that enhances and complements their knowledge and experiences, offers the requisite balance of breadth and depth for a professional electrical engineering education, and seeks to establish a solid foundation for lifelong learning throughout an electronic engineer's career.

The programme comprises of three components – a strong core in mathematics, computing and engineering; technical competence through a minimum of breadth and depth modules; and general education. The core – which includes group projects, a product design and innovations project, and individual research and design projects – provides knowledge and skills considered essential for electronics engineers. A minimum number of breadth modules ensures that each student is exposed to many aspects of the state-of-the-art areas; in addition, students can achieve depth in one or two areas of their choice. General education modules complement the technical education through a wide array of modules in humanities, social sciences and professionalism to make our graduates educated members of the global community.

The programme is accredited by the Engineering Accreditation Board (EAB) of the Institution of Engineers Singapore (IES). Via this accreditation, all signatories in the Washington Accord recognize the substantial equivalence of this programme in satisfying the academic requirements for the practice of engineering at the professional level in many countries including Canada, United States of America, United Kingdom, Hong Kong, New Zealand, Australia and others.

The structure of the BTech (Electronics Engineering) programme is designed to achieve the following **educational objectives** to prepare engineers who will be:

- technically competent to solve complex problems in electronics engineering and can adapt effectively in a fast changing environment;
- able to critically think, analyse and make decisions that give due consideration to global issues in business, ethics, society and the environment;
- able to communicate effectively, act with integrity, and have the inter-personal skills needed to engage in, lead, and nurture diverse teams; and
- committed to lifelong learning, resourceful and embrace global challenges and opportunities to make a positive impact in society.

The success of the programme is assessed through the attainment of **learning outcomes** as follows:



- apply knowledge of mathematics, science and engineering to the solution of complex engineering problems;
- design and conduct experiments such as to analyse, interpret data and synthesise valid conclusions;
- design a system, component, or process, and synthesise solutions to achieve desired needs;
- identify, formulate, research through relevant literature review, and solve engineering problems reaching substantiated conclusions;
- use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints;
- communicate effectively;
- recognize the need for, and have the ability to engage in lifelong learning;
- understand the impact of engineering solutions in a societal context and to be able to respond effectively to the needs for sustainable development;
- function effectively within multidisciplinary teams and understand the fundamental precepts of effective project management;
- understand professional, ethical and moral responsibility; and
- have a good understanding of the principles and applications of advanced mathematics, including probability and statistics, differential and integral calculus, linear algebra and complex variables.

## ***Degree Requirements***

Candidates must satisfy the following requirements to be conferred the degree of BTech (Electronics Engineering):

- Complete a minimum of **120 MCs** with a minimum CAP of 2.0 by taking modules as listed below;
- Comply with the requirement that the limit on the number of Level-1000 modules to be counted towards fulfillment of graduation requirements being 60 MCs (including exemption of 20 MCs for polytechnic diploma holders); and
- Satisfy any other additional requirements that may be prescribed by SCALE, the Faculty of Engineering, or the University.

### **List of modules - BTech (Electronics Engineering), comprise:**

1. All modules are 4MCs, except when otherwise stated.
2. A module with module code TEExxxx is equivalent to the module EExxxx offered to the full-time students. Subject to the approval from the Dean of SCALE and the ECE Department, a student may select a full-time equivalent module in place of any TEExxxx module.

#### **A. University Level Requirements (20MCs)**

- Quantitative Reasoning (module with prefix GER)
- Thinking and Expression (module with prefix GET)
- Human Cultures (module with prefix GEH)
- Asking Questions (module with prefix GEQ)
- Singapore Studies (module with prefix GES)

#### **B. Programme Requirements (92MCs), comprising**

1. Faculty Requirements (4MCs)

- TTG2415 Ethics in Engineering

2. Major Requirements – Essential Modules (64MCs)

- TTG1401 Engineering Mathematics I
- TEE2002 Engineering Mathematics II
- TEE2003 Advanced Mathematics for Engineers
- TEE2101 Programming Methodology
- TEE1001 Emerging Technologies in Electrical Engineering
- TEE2011 Engineering Electromagnetics
- TEE2020 Digital Fundamentals (5MCs)
- TEE2021 Devices & Circuits
- TEE2023 Signals & Systems
- TEE2024 Programming for Computer Interfaces (5MCs)
- TEE2031 Circuit and Systems Design Lab (3MCs)
- TEE2032 Signals and Communications Design Lab (3MCs)
- TEE3031 Innovation & Enterprise I
- TEE4001 BTech Dissertation (12MCs)

3. Major Requirements – Elective Modules (24MCs, selected from the list below)

Not all electives modules may be offered in any semester/year. An elective module may not be offered if there is insufficient number of students opting for that module at any particular time. Unless approval for exemption is obtained from the Dean of SCALE, a student must read at least three Level-4000 electives, two outer core electives (from: TEE3013, TEE3104, TEE3131, TEE3331, TEE3431, TEE3408, TEE3501, TEE3731 and TEE3201) and one design module (from: TEE3013, TEE3207, TEE3208, TEE3407, TEE3408, TEE3501, TEE4415 and TEE3801).

*Communications*

- TEE3104 Introduction to RF and Microwave Systems & Circuits
- TEE3131 Communication Systems
- TEE3731 Signal Processing Methods
- TEE4101 RF Communications
- TEE4112 HF Techniques
- TEE4113 Digital Communications and Coding

*Computer Engineering*

- TEE3201 Software Engineering
- TEE3204 Computer Communication Networks I
- TEE3206 Introduction to Computer Vision and Image Processing
- TEE3207 Computer Architecture
- TEE3208 Embedded Computer Systems Design
- TEE3731 Signal Processing Methods
- TEE4210 Computer Communication Networks II
- TEE4214 Real time Embedded Systems

*Microelectronics*

- TEE3408 Integrated Analog Design
- TEE3431 Microelectronics Materials and Devices
- TEE4408 Silicon Device Reliability
- TEE4411 Silicon Processing Technology
- TEE4412 Technology and Modelling of Silicon Transistors
- TEE4415 Integrated Digital Design

## General

- 
- TIE2130 Quality Engineering I
- TEE3013 Labview for Electrical Engineers
- TEE3302 Industrial Control Systems
- TEE3331 Feedback Control Systems
- TEE3407 Analog Electronics
- TEE3501 Power Electronics
- TEE4305 Introduction to Fuzzy/Neural Systems
- TEE3801 Robust Design of Electronic Circuits
- TME4245 Robot Kinematics, Dynamics and Control

### C. Unrestricted Elective Modules (8MCs)

## Study Schedules

There are two intakes per academic year, in Semester 1 (i.e. August) and in Semester 2 (i.e. January). The respective sample study schedules for a four-year candidature are presented below. These assume the students' work and other commitments allow them sufficient time to properly cope with their studies. Students are strongly advised to slow down if necessary so that they progress at their own comfortable pace.

### A. Sample Study Schedule (4-year candidature beginning in Semester 1 of an AY):

1. The number of Modular Credits (MC) of a module is denoted by the number in the bracket.
2. Modules marked with an asterisk (\*) are modules stretching over more than one semester and the total number of MCs will only be given upon completion of the module.

1 <sup>st</sup> Year of studies	
Sem 1:	General Education Module 1 - Quantitative Reasoning (4) TTG1401 Engineering Mathematics I (4) TEE1001 Emerging Technologies in EE (4)
Sem 2:	TEE2002 Engineering Mathematics II (4) TEE2020 Digital Fundamentals (5) TEE2101 Programming Methodology (4)
SpTerm:	General Education Module 2 - Asking Questions (4) General Education Module 3 (4)

**2<sup>nd</sup> Year of studies**

Sem 1:	TEE2003 Advanced Mathematics for Engineers (4) TEE2024 Programming for Computer Interfaces (5) TEE2021 Devices & Circuits (4)
Sem 2:	TEE2011 Engineering Electromagnetics (4) TEE2031 Circuits and Systems Design Lab (3) TEE2023 Signals & Systems (4)
SpTerm:	TTG2415 Ethics in Engineering (4) / General Education Module 4 (4)

**3<sup>rd</sup> Year of studies**

Sem 1:	Elective 1 (4) Elective 2 (4) / General Education Module 4/5 (4) TTG3002* Industrial Practice TEE2032 Signals and Communications Design Lab (3)
Sem 2:	TEE3031 Innovation & Enterprise I (4) Elective 2 (4) / General Education Module 4/5 (4) Elective 3 (4) TTG3002* Industrial Practice
SpTerm:	TTG2415 Ethics in Engineering (4)/ General Education Module 5 (4) TTG3002* Industrial Practice (8)

**4<sup>th</sup> Year of studies**

Sem 1:	Elective 4 (4) Elective 5 (4) TEE4001* BTech Dissertation
Sem 2:	Elective 6 (4) TEE4001* BTech Dissertation (12)

**B. Sample Study Schedule (4-year candidature beginning in Semester 2 of an AY):**

1. The number of Modular Credits (MC) of a module is denoted by the number in the bracket.
2. Modules marked with an asterisk (\*) are modules stretching over more than one semester and the total number of MCs will only be given upon completion of the module.

**1<sup>st</sup> Year of studies**

Sem 2:	TTG1401 Engineering Mathematics I (4) TEE2020 Digital Fundamentals (5) TEE2101 Programming Methodology (4)
SpTerm:	General Education Module 1 - Asking Questions (4) General Education Module 2 (4)
Sem 1:	TEE2002 Engineering Mathematics II (4) General Education Module 3 - Quantitative Reasoning (4) TEE1001 Emerging Technologies in EE (4)

**2<sup>nd</sup> Year of studies**

Sem 2:	TEE2003 Advanced Mathematics for Engineers (4) TEE2011 Engineering Electromagnetics (4) TEE2023 Signals and Systems (4)
SpTerm:	General Education Module 4 (4)
Sem 1:	TEE2021 Devices & Circuits (4) TEE2032 Signals and Communications Design Lab (3) TEE2024 Programming for Computer Interfaces (5)

**3<sup>rd</sup> Year of studies**

Sem 2:	TEE3031 Innovation & Enterprise I (4) TEE2031 Circuits and Systems Design Lab (3) Elective 1 (4) TTG3002* Industrial Practice
SpTerm:	TTG2415 Ethics in Engineering (4) / General Education Module 5 (4) TTG3002* Industrial Practice
Sem 1:	Elective 2 (4) Elective 3 (4) General Education Module 5 (4) TTG3002* Industrial Practice (8)

**4<sup>th</sup> Year of studies**

Sem 2:	Elective 4 (4) Elective 5 (4) TEE4001* BTech Dissertation
SpTerm:	TTG2415 Ethics in Engineering (4) TEE4001* BTech Dissertation
Sem 1:	TEE4001* BTech Dissertation (12) Elective 6 (4)

### 3.3.3 Bachelor of Technology (Industrial & Management Engineering)

The BTech (Industrial & Management Engineering) is offered in partnership with the Department of Industrial and Systems Engineering. The programme aims to graduate professional industrial and management engineers who have a strong foundation in the relevant modelling and methodological expertise together with a systems mindset, who can contribute to society through innovation, enterprise and leadership. The programme provides students with an education that enhances and complements their knowledge and experiences.

In order to prepare graduates for the rapidly evolving landscape of Industrial and Management Engineering (IME) and to upgrade polytechnic graduates into learning engineers, the programme is specially designed to comprise essential modules, elective modules (both technical and non technical), enrichment modules, and projects. The essential modules seek to equip students with a strong foundation in mathematics, probability and statistics in engineering fundamentals. The technical electives provide the breadth and depth in different areas of IME.

Design, which is the heart of engineering, is integrated through various project activities. Non-technical modules introduce students to methodologies of business and management. By providing graduates with a combination of broad-based fundamentals and specialised knowledge, the programme strives to graduate versatile engineers who would be best positioned to lead in a rapidly changing and increasingly knowledge-based economy.

The programme is accredited by the Engineering Accreditation Board (EAB) of the Institution of Engineers Singapore (IES). Via this accreditation, all signatories in the Washington Accord recognize the substantial equivalence of this programme in satisfying the academic requirements for the practice of engineering at the professional level in many countries including Canada, United States of America, United Kingdom, Hong Kong, New Zealand, Australia and others.

The **educational objectives** of the programme are as follows:

- To impart fundamental knowledge and skill sets required in the Industrial and Management Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics, and the domain knowledge of Industrial and Management Engineering.
- To produce graduates with the ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.
- To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
- To cultivate the practices of independent learning on the part of the students that will prepare them to function effectively for diverse careers and life-long learning.
- To enable students to understand their role as engineers and their impact to society at the national and global context.

The **learning outcomes** of the programme are:

- **Core:** Apply knowledge of mathematics, science and engineering to the solution of complex engineering problems.
- **Experimental Design:** Design and conduct experiments, analyse, interpret data and synthesise valid conclusions.
- **System Design:** Design a system, component, or process, and synthesise solutions to achieve desired needs.
- **Breadth and Depth:** Identify, formulate, research through relevant literature review, and solve engineering problems reaching substantiated conclusions.
- **Knowledge Application and Transfer:** Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints.
- **Communications:** Communicate effectively.
- **Attitude:** Recognize the need for, and have the ability to engage in life-long learning.
- **Awareness:** Understand the impact of engineering solutions in a societal context and to be able to respond effectively to the needs for sustainable development.
- **Professional Relations:** Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management.
- **Professional Ethics:** Understand professional, ethical and moral responsibility.

## ***Degree Requirements***

Candidates must satisfy the following requirements to be conferred the degree of BTech (Industrial & Management Engineering):

1. Complete a minimum of **121 MCs** with a minimum CAP of 2.0 by taking modules as listed below;
2. Comply with the requirement that the limit on the number of Level-1000 modules to be counted towards fulfillment of graduation requirements being 60 MCs (including exemption of 20 MCs for polytechnic diploma holders); and
3. Satisfy any other additional requirements that may be prescribed by SCALE, the Faculty of Engineering, or the University.

### **List of modules - BTech (Industrial & Management Engineering), comprise:**

1. *All modules are 4MCs, except when otherwise stated.*
2. *A module with module code TIExxxx is equivalent to the module IExxxx offered to the full-time students. Subject to the approval from the Dean of SCALE and the ISE Department, a student may select a full-time equivalent module in place of any TIExxxx module.*

#### **A. University Level Requirements (20MCs)**

- Quantitative Reasoning (module with prefix GER)
- Thinking and Expression (module with prefix GET)
- Human Cultures (module with prefix GEH)
- Asking Questions (module with prefix GEQ)
- Singapore Studies (module with prefix GES)



**B. Programme Requirements (89MCs), comprising**

**1. Faculty Requirements (4MCs)**

- TTG2415 Ethics in Engineering

**2. Major Requirements – Essential Modules (69MCs)**

- TTG1401 Engineering Mathematics I
- TEE2101 Programming Methodology
- TIE2010 Introduction to Industrial Systems
- TIE2120 Probability and Statistics
- TIE2100 Probability Models with Applications
- TIE2110 Operations Research I
- TIE2130 Quality Engineering I
- TIE2140 Engineering Economy
- TIE2150 Human Factors Engineering
- TIE3100 Systems Design Project (8MCs)
- TIE3101 Statistics for Engineering Applications
- TIE3110 Simulation (5MCs)
- TIE4240 Project Management
- TIE4101 BTech Dissertation (8MCs)
- TIE3010 Systems Thinking and Design

**3. Major Requirements – Elective Modules (16MCs, selected from the list below)**

Not all electives modules may be offered in any semester/year. An elective module may not be offered if there is insufficient number of students opting for that module at any particular time. Subject to the approval of the Dean of SCALE, a student may select one Level-3000 or higher module from other programmes within the Faculty of Engineering.

- TIE4220 Supply Chain Modelling
- TIE4230 Quality Engineering II
- TIE4242 Cost Analysis and Management
- IE5108 Facility Layout and Location
- IE5121 Quality Planning and Management
- IE5203 Decision Analysis
- IE5301 Human Factors in Engineering and Design
- TIE4229 Selected Topics in Logistics
- TIE4239 Selected Topics in Quality Engineering
- TIE4249 Selected Topics in Engineering Management
- TIE4259 Selected Topics in Systems Engineering
- TIE4299 Selected Topics in Industrial Engineering
- TME4209 Management of New Product Development

**C. Unrestricted Elective Modules (12MCs)**

***Study Schedules***

There are two intakes per academic year, in Semester 1 (i.e. August) and in Semester 2 (i.e. January). The respective sample study schedules for a four-year candidature are presented below. These assume the

students' work and other commitments allow them sufficient time to properly cope with their studies. Students are strongly advised to slow down if necessary so that they progress at their own comfortable pace.

**A. Sample Study Schedule (4-year candidature beginning in Semester 1 of an AY):**

1. The number of Modular Credits (MC) of a module is denoted by the number in the bracket.
2. Modules marked with an asterisk (\*) are modules stretching over more than one semester and the total number of MCs will only be given upon completion of the module.

<b>1<sup>st</sup> Year of studies</b>	
Sem 1:	TTG1401 Engineering Mathematics I (4) TEE2101 Programming Methodology (4) TIE2010 Introduction to Industrial Systems (4)
Sem 2:	TIE2150 Human Factors Engineering (4) TIE2140 Engineering Economy (4) TIE2130 Quality Engineering I (4)
SpTerm:	General Education Module 1 - Quantitative Reasoning (4) General Education Module 2 - Asking Questions (4)
<b>2<sup>nd</sup> Year of studies</b>	
Sem 1:	TIE2120 Probability and Statistics (4) TIE2110 Operations Research I (4) TIE3110 Simulation (5)
Sem 2:	TIE2100 Probability Models with Applications (4) TIE3010 Systems Thinking and Design (4) TTG2415 Ethics in Engineering (4)
SpTerm:	General Education Module 3 (4) General Education Module 4 (4)
<b>3<sup>rd</sup> Year of studies</b>	
Sem 1:	TIE3101 Statistics for Engineering Applications (4) TIE3100* Systems Design Project TTG3001* Industrial Practice

Sem 2:	Elective 1 (4) TIE3100* Systems Design Project (8) TTG3001* Industrial Practice
SpTerm:	General Education Module 5 (4) Elective 2 (4) TTG3001* Industrial Practice (12)
<b>4<sup>th</sup> Year of studies</b>	
Sem 1:	TIE4240 Project Management (4) Elective 3 (4) TIE4101* BTech Dissertation
Sem 2:	Elective 4 (4) TIE4101* BTech Dissertation (8)

**B. Sample Study Schedule (4-year candidature beginning in Semester 2 of an AY):**

1. The number of Modular Credits (MC) of a module is denoted by the number in the bracket.
2. Modules marked with an asterisk (\*) are modules stretching over more than one semester and the total number of MCs will only be given upon completion of the module.

<b>1<sup>st</sup> Year of studies</b>	
Sem 2:	TTG1401 Engineering Mathematics I (4) TIE2140 Engineering Economy (4) TIE2130 Quality Engineering I (4)
SpTerm:	General Education Module 1 - Quantitative Reasoning (4) General Education Module 2 - Asking Questions (4)
Sem 1:	TEE2101 Programming Methodology (4) TIE2010 Introduction to Industrial Systems (4) TIE2120 Probability and Statistics (4)
<b>2<sup>nd</sup> Year of studies</b>	
Sem 2:	TIE2100 Probability Models with Applications (4) TIE2150 Human Factors Engineering (4) TIE3010 Systems Thinking and Design (4)

SpTerm:	General Education Module 3 (4) General Education Module 4 (4)
Sem 1:	TIE2110 Operations Research 1 (4) TIE3110 Simulation (5) TIE3101 Statistics for Engineering Applications (4)
<b>3<sup>rd</sup> Year of studies</b>	
Sem 2:	TIE3100* Systems Design Project Elective 1 (4) TTG2415 Ethics in Engineering (4) TTG3001* Industrial Practice
SpTerm:	TIE3100* Systems Design Project General Education Module 5 (4) TTG3001* Industrial Practice
Sem 1:	TIE4240 Project Management (4) TTG3001* Industrial Practice (12) TIE3100* Systems Design Project (8)
<b>4<sup>th</sup> Year of studies</b>	
Sem 2:	TIE4101* BTech Dissertation Elective 2 (4)
SpTerm:	TIE4101* BTech Dissertation Elective 3 (4)
Sem 1:	TIE4101* BTech Dissertation (8) Elective 4 (4)

### 3.3.4 Bachelor of Technology (Mechanical Engineering)

The BTech (Mechanical Engineering) programme is offered in partnership with the Department of Mechanical Engineering. The academic curriculum follows closely that of the equivalent BEng programme.

The programme is accredited by the Engineering Accreditation Board (EAB) of the Institution of Engineers Singapore (IES). Via this accreditation, all signatories in the Washington Accord recognize the substantial equivalence of this programme in satisfying the academic requirements for the practice of engineering at the professional level in many countries including Canada, United States of America, United Kingdom, Hong Kong, New Zealand, Australia and others.

The **educational objectives** of the programme are as follows:

- To prepare graduates with the knowledge and competency for careers in and related to Mechanical Engineering
- To prepare graduates to become leaders in fields related to Mechanical Engineering
- To enable graduates to understand their role as engineers and their impact on society in both national and global contexts.

The **learning outcomes** for the programme are the abilities to:

- Apply knowledge of mathematics, science and engineering to the solution of complex engineering problems.
- Design and conduct experiments, analyse, interpret data and synthesise valid conclusions.
- Design a system, component, or process, and synthesise solutions to achieve desired needs.
- Identify, formulate, research through relevant literature review, and solve engineering problems reaching substantiated conclusions.
- Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints.
- Communicate effectively.
- Recognize the need for, and have the ability to engage in life-long learning.
- Understand the impact of engineering solutions in a societal context and to be able to respond effectively to the needs for sustainable development
- Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management.
- Understand professional, ethical and moral responsibility.

### ***Degree Requirements***

Candidates must satisfy the following requirements to be conferred the degree of BTech (Mechanical Engineering):

- Complete a minimum of **121 MCs** with a minimum CAP of 2.0 by taking modules as listed below;
- Comply with the requirement that the limit on the number of Level-1000 modules to be counted towards fulfillment of graduation requirements being 60 MCs (including exemption of 20 MCs for polytechnic diploma holders); and
- Satisfy any other additional requirements that may be prescribed by SCALE, the Faculty of Engineering, or the University.

**List of modules - BTech (Mechanical Engineering), comprise:**

1. All modules are 4MCs, except when otherwise stated.
2. A module with module code TMExxxx is equivalent to the module MExxxx offered to the full-time students. Subject to the approval from the Dean of SCALE and the ME Department, a student may select a full-time equivalent module in place of any TMExxxx module.

**A. University Level Requirements (20MCs)**

- Quantitative Reasoning (module with prefix GER)
- Thinking and Expression (module with prefix GET)
- Human Cultures (module with prefix GEH)
- Asking Questions (module with prefix GEQ)
- Singapore Studies (module with prefix GES)

**B. Programme Requirements (93MCs), comprising**

1. Faculty Requirements (4MCs)

- TTG2415 Ethics in Engineering

2. Major Requirements - Essential Modules (65MCs)

- TTG1401 Engineering Mathematics I
- TME2401 Engineering Mathematics II
- TME2114 Mechanics of Materials II (3MCs)
- TME2121 Engineering Thermodynamics
- TME2134 Fluid Mechanics I
- TME2135 Fluid Mechanics II
- TME2142 Feedback Control Systems
- TME2143 Sensors and Actuators
- TME2151 Principles of Mechanical Engineering Materials
- TME3112 Mechanics of Machines
- TME3122 Heat Transfer
- TME3162 Manufacturing Processes
- TME2101 Fundamentals of Mechanical Design
- TME3101 Mechanical Systems Design (6MCs)
- TME4102 BTech Dissertation (8MCs)

3. Major Requirements - Elective Modules (24MCs, selected from the list below)

*Not all electives modules may be offered in any semester/year. An elective module may not be offered if there is insufficient number of students opting for that module at any particular time. Subject to the approval of the Dean of SCALE, a student may select one Level-3000 or higher module from other programmes within the Faculty of Engineering.*

- TME3211 Mechanics of Solids

- TME3233 Unsteady Flow in Fluid Systems
- TME3251 Materials for Engineers
- TME3241 Microprocessor Applications
- TME3242 Automation
- TME3261 Computer Aided Design and Manufacturing
- TME3263 Design for Manufacturing and Assembly
- TME3291 Numerical Methods in Engineering
- TME4213 Vibration Theory and Applications
- TME4223 Thermal Environmental Engineering
- TME4225 Applied Heat Transfer
- TME4234 Experimental Methods in Fluid Mechanics
- TME4245 Robot Mechanics and Control
- TME4254 Materials in Engineering Design
- TME4261 Tool Engineering
- TME4262 Automation in Manufacturing
- TME4283 Micro fabrication Processes
- TIE2010 Introduction to Industrial Systems
- TIE2130 Quality Engineering I
- TME4209 Management of New Product Development
- TME4263 Manufacturing Simulation & Data Communication
- TME4264 Fundamentals of Automotive Engineering

### C. Unrestricted Elective Modules (8MCs)

## Study Schedules

There are two intakes per academic year, in Semester 1 (i.e. August) and in Semester 2 (i.e. January). The respective sample study schedules for a four-year candidature are presented below. These assume the students' work and other commitments allow them sufficient time to properly cope with their studies. Students are strongly advised to slow down if necessary so that they progress at their own comfortable pace.

### A. Sample Study Schedule (4-year candidature beginning in Semester 1 of an AY):

1. The number of Modular Credits (MC) of a module is denoted by the number in the bracket.
2. Modules marked with an asterisk (\*) are modules stretching over more than one semester and the total number of MCs will only be given upon completion of the module.

1 <sup>st</sup> Year of studies	
Sem 1:	TTG1401 Engineering Mathematics I (4)
	TME2121 Engineering Thermodynamics (4)
	TME2151 Principles of Mechanical Engineering Materials (4)

Sem 2:	TME2401 Engineering Mathematics II (4) TME2114 Mechanics of Materials II (3) TME2101 Fundamentals of Mechanical Design (4)
SpTerm:	General Education Module 1 – Quantitative Reasoning (4) General Education Module 2 – Asking Questions (4)
<b>2<sup>nd</sup> Year of studies</b>	
Sem 1:	TME2134 Fluid Mechanics I (4) TME3112 Mechanics of Machines (4) TME3162 Manufacturing Processes (4)
Sem 2:	TME2143 Sensors and Actuators (4) TME2135 Fluid Mechanics II (4) TTG2415 Ethics in Engineering (4) TTG3002* Industrial Practice
SpTerm:	General Education Module 3 (4) TTG3002* Industrial Practice
<b>3<sup>rd</sup> Year of studies</b>	
Sem 1:	TME2142 Feedback Control Systems (4) Elective 1 (4) Elective 2 (4) TTG3002* Industrial Practice (8)
Sem 2:	TME3101 Mechanical Systems Design (6) TME3122 Heat Transfer (4) Elective 3 (4)
SpTerm:	General Education Module 4 (4) General Education Module 5 (4)
<b>4<sup>th</sup> Year of studies</b>	
Sem 1:	Elective 4 (4) Elective 5 (4) TME4102* BTech Dissertation



Sem 2:	Elective 6 (4) TME4102* BTech Dissertation (8)
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**B. Sample Study Schedule (4-year candidature beginning in Semester 2 of an AY):**

1. The number of Modular Credits (MC) of a module is denoted by the number in the bracket.
2. Modules marked with an asterisk (\*) are modules stretching over more than one semester and the total number of MCs will only be given upon completion of the module.

<b>1<sup>st</sup> Year of studies</b>	
Sem 2:	TTG1401 Engineering Mathematics I (4) TME2114 Mechanics of Materials II (3) TME2101 Fundamentals of Mechanical Design (4)
SpTerm:	General Education Module 1 - Quantitative Reasoning (4) General Education Module 2 - Asking Questions (4)
Sem 1:	TME2401 Engineering Mathematics II (4) TME2121 Engineering Thermodynamics (4) TME2134 Fluid Mechanics I (4)
<b>2<sup>nd</sup> Year of studies</b>	
Sem 2:	TME2143 Sensors and Actuators (4) TME2135 Fluid Mechanics II (4) TME3101 Mechanical Systems Design (6)
SpTerm:	General Education Module 3 (4)
Sem 1:	TME2151 Principles of Mechanical Engineering Materials (4) TME3112 Mechanics of Machines (4) TME3162 Manufacturing Processes (4) TTG3002* Industrial Practice
<b>3<sup>rd</sup> Year of studies</b>	
Sem 2:	Elective 1 (4) TME3122 Heat Transfer (4) TTG2415 Ethics in Engineering (4) TTG3002* Industrial Practice

SpTerm:	General Education Module 4 (4) TTG3002* Industrial Practice (8)
Sem 1:	TME2142 Feedback Control Systems (4) Elective 2 (4) Elective 3 (4)
<b>4<sup>th</sup> Year of studies</b>	
Sem 2:	TME4102* BTech Dissertation Elective 4 (4) Elective 5 (4)
SpTerm:	TME4102* BTech Dissertation General Education Module 5 (4)
Sem 1:	TME4102* BTech Dissertation (8) Elective 6 (4)

### 3.4 Financial Assistance

The Ministry of Education (MOE) provides **tuition fee subsidy** of 55% and 20% for eligible Singapore Citizens and Permanent Residents, respectively, taking **part-time undergraduate programmes** in local universities.

To be eligible for MOE's tuition fee subsidy, in addition to fulfilling the nationality criteria, students must also satisfy the following:

- Must not have previously received government subsidy/sponsorship for a completed first degree from a local university, including NUS/NTU/SMU/SUTD/UniSIM, or from an overseas university funded by government scholarship/bursary;
- Be at least 21 years old in the year of programme commencement; and
- Possess 2 years of full-time work experience, OR have fully discharged their National Service liability, OR are currently employed on a full-time basis.

It should be noted that part-time employment will not be considered as "full-time work experience". A part-time employee is one who works for less than 35 hours a week under a contract of service with an employer.

Finally, as part of Singapore's national initiative of encouraging continuing education and lifelong learning, MOE provides additional subsidy such that **Singaporeans aged 40 and above** will pay tuition fees that are 60% lower than the standard subsidised fees payable by other Singaporeans who are below 40 years old. This amounts to a total tuition fee subsidy of at least a little over 80%.