

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

The BTech (Industrial & Management Engineering) is offered in partnership with the Department of Industrial Systems Engineering and Management. 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 recognise 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 (Industrial & Management Engineering) curriculum strive to equip graduates with the abilities to:

- Apply fundamental knowledge and skill sets required in the Industrial and Management Engineering profession.
- Adopt a systems approach to design, develop, implement, manage and innovate integrated systems that include people, technology, information, energy and resources taking into account global, societal, environmental and economic contexts.
- Work and communicate effectively with multi-disciplinary team members and different types of stakeholders.
- Recognise the need and continue to develop skills and knowledge to embrace changes in society and the profession.

The **student learning outcomes** of the BTech (Industrial & Management Engineering) curriculum strive to equip graduates with the following attributes:

- **Engineering Knowledge:** Apply the knowledge of mathematics, science and engineering to the solution of complex engineering and management problems.
- **Problem Analysis:** Identify, formulate, research through relevant literature review, and analyse complex engineering and management problems to reach substantiated conclusions using mathematics and sciences.
- **Design/Development of Solutions:** Design and develop solutions for complex engineering and management problems including systems, components and/or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **Modern Tool Usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, to complex engineering and management activities including modelling and prediction with an understanding of the limitations.
- **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for, sustainable development.
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
- **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## ***Degree Requirements***

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

1. Complete a minimum of **161 MCs** with a minimum CAP of 2.00;  
(Note: 20 MCs of programme requirements and 20 MCs of unrestricted elective requirements will normally be given as Advanced Placement Credits (APCs) to holders of relevant diploma or higher qualifications. Students will be required to complete a minimum of **121 MCs** of 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 the 20 MCs of APCs); 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 SCALE and the Department of Industrial Systems Engineering and Management, a student may select a full-time equivalent module in place of any TIExxxx module.

A. University Level Requirements (20MCs)

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

B. Programme Requirements (89MCs), comprising

1. Faculty Requirements (4MCs)

- TTG2415 Ethics in Engineering

2. Major Requirements - Essential Modules (65MCs)

- TTG1401 Engineering Mathematics I
- TIE2010 Introduction to Industrial System
- TIE2020 Probability and Statistics
- TIE2030 Programming Methodology with Python
- TIE2100 Probability Models with Applications
- TIE2110 Operations Research I
- TIE2130 Quality Engineering I
- TIE2140 Engineering Economy
- TIE3100 Systems Design Project (8MCs)
- TIE3101 Statistics for Engineering Applications
- TIE3110 Simulation (5MCs)
- TIE4240 Project Management
- TIE4101 BTech Dissertation (8MCs)

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.

- TIE2150 Human Factors Engineering
- TIE4203 Decision Analysis in Industrial & Operations Management
- TIE4212 Advanced Modelling in Operations Management
- TIE4220 Supply Chain Modelling
- TIE4230 Quality Engineering I
- TIE4239 Selected Topics in Quality Engineering
- TIE4242 Cost Analysis and Management
- TIE4246 New Product Management and Innovation
- TIE4249 Selected Topics in Engineering Management
- TIE4252 Introduction to Systems Engineering
- TIE4259 Selected Topics in Systems Engineering
- TIE4299 Selected Topics in Industrial Engineering

- IE5108 Facility Layout and Location
- IE5121 Quality Planning and Management

In the rare event that a student is unable to secure sufficient number of electives from the above list to complete their requirements, permission may be granted by SCALE and the Department of Industrial Systems Engineering and Management for the student to select one Level-3000 or higher module from other programmes within the Faculty of Engineering.

### 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:	TEE2010 Introduction to Industrial System (4) TIE2030 Programming Methodology with Python (4) TTG1401 Engineering Mathematics I (4)
Sem 2:	TIE2020 Probability and Statistics (4) TIE2130 Quality Engineering (4) TIE2140 Engineering Economy (4)
SpTerm:	General Education Module 1 (4) General Education Module 2 (4)
<b>2<sup>nd</sup> Year of studies</b>	
Sem 1:	TIE2110 Operations Research I (4) TIE3101 Statistics for Engineering Applications (4) TIE3110 Simulation (5)

Sem 2:	TIE2100 Probability Models with Applications (4) TIE3010 Systems Thinking and Design (4) General Education Module 3 (4)
SpTerm:	TTG2415 Ethnics in Engineering (4) General Education Module 4 (4)
<b>3<sup>rd</sup> Year of studies</b>	
Sem 1:	*TIE3100 Systems Design Project TIE4240 Project Management (4) *TTG3001 Industrial Practice
Sem 2:	*TIE3100 Systems Design Project (8) Elective Module 1 (4) *TTG3001 Industrial Practice (12)
SpTerm:	Elective Module 2 (4) General Education Module 5 (4)
<b>4<sup>th</sup> Year of studies</b>	
Sem 1:	*TIE4101 BTech Dissertation Elective Module 3 (4) Elective Module 4 (4)
Sem 2:	*TIE4101 BTech Dissertation (8) Elective Module 5 (4)

**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:	TIE2020 Probability and Statistics (4) TIE2130 Quality Engineering I (4) TIE2140 Engineering Economy (4)

SpTerm:	General Education Module 1 (4) General Education Module 2 (4)
Sem 1:	TIE2010 Introduction to Industrial System (4) TIE2030 Programming Methodology with Python(4) TTG1401 Engineering Mathematics I (4)
<b>2<sup>nd</sup> Year of studies</b>	
Sem 2:	TIE2100 Probability Models with Applications (4) TIE3010 Systems Thinking and Design (4) General Education Module 3 (4)
SpTerm:	TTG2415 Ethics in Engineering (4) General Education Module 4 (4)
Sem 1:	TIE2110 Operations Research 1 (4) TIE3101 Statistics for Engineering Applications (4) TIE3110 Simulation (5) *TTG3001 Industrial Practice
<b>3<sup>rd</sup> Year of studies</b>	
Sem 2:	*TIE3100 Systems Design Project Elective Module 1 (4) Elective Module 2 (4) *TTG3001 Industrial Practice (12)
SpTerm:	*TIE3100 Systems Design Project General Education Module 5 (4)
Sem 1:	*TIE3100 Systems Design Project (8) TIE4240 Project Management (4) Elective Module 3 (4)
<b>4<sup>th</sup> Year of studies</b>	
Sem 2:	*TIE4101 BTech Dissertation Elective Module 4 (4)

SpTerm:	*TIE4101 BTech Dissertation Elective Module 5 (4)
Sem 1:	*TIE4101 BTech Dissertation (8)