3.4.5 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 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 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:

- **Engineering knowledge**: Apply knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
- **Problem Analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components 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 including prediction and modelling to complex engineering activities 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 the 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 (Mechanical Engineering):

- 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)
- Comply with the requirement that the limit on the number of Level-1000 modules to be counted towards fulfilment of graduation requirements being 60 MCs (including the 20 MCs of APCs); 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 SCALE and the Department of Mechanical Engineering, a student may select a full-time equivalent module in place of any TMExxxx 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 (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 elective 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 from SCALE and the Department of Mechanical Engineering, 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
• TME4256 Functional Materials and Devices
• 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.

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<tr>
<th>1st Year of studies</th>
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<td>Sem 1:</td>
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<tr>
<td>TME2121 Engineering Thermodynamics (4)</td>
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<tr>
<td>TME2151 Principles of Mechanical Engineering Materials (4)</td>
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<tr>
<td>TTG1401 Engineering Mathematics I (4)</td>
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<td>Sem 2:</td>
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<td>TME2101 Fundamentals of Mechanical Design (4)</td>
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<td>TME2114 Mechanics of Materials II (3)</td>
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<td>TME2401 Engineering Mathematics II (4)</td>
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<td>SpTerm:</td>
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<td>General Education Module 1 (4)</td>
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<td>General Education Module 2 (4)</td>
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<th>2nd Year of studies</th>
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<td>Sem 1:</td>
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<td>TME2134 Fluid Mechanics I (4)</td>
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<td>TME3112 Mechanics of Machines (4)</td>
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<td>TME3162 Manufacturing Processes (4)</td>
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<td>Sem 2:</td>
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<td>TME2135 Fluid Mechanics II (4)</td>
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<td>TME2143 Sensors and Actuators (4)</td>
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<td>General Education Module 3 (4)</td>
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<td>TTG2415 Ethics in Engineering (4)</td>
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<td>1st Year of studies</td>
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<td><strong>Sem 2:</strong></td>
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<td>TME2101 Fundamentals of Mechanical Design (4)</td>
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<td>TME2114 Mechanics of Materials II (3)</td>
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<td><strong>SpTerm:</strong></td>
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<td>General Education Module 1 (4)</td>
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<td>General Education Module 2 (4)</td>
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| **Sem 1:** |
| TME2121 Engineering Thermodynamics (4) |
| TME2134 Fluid Mechanics I (4) |
| TME2401 Engineering Mathematics II (4) |

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<th>4th Year of studies</th>
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<tr>
<td><strong>Sem 1:</strong></td>
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<tr>
<td>*TME4102 BTech Dissertation</td>
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<tr>
<td>Elective Module 4 (4)</td>
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<td>Elective Module 5 (4)</td>
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<td><strong>Sem 2:</strong></td>
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<td>*TME4102 BTech Dissertation (8)</td>
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<td>Elective Module 6 (4)</td>
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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.
### 2nd Year of studies

**Sem 2:**
- TME2135 Fluid Mechanics II (4)
- TME2143 Sensors and Actuators (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*

### 3rd Year of studies

**Sem 2:**
- General Education Module 4 (4)
- TME3122 Heat Transfer (4)
- *TTG3002 Industrial Practice* (8)
- Elective Module 1 (4)

**SpTerm:** General Education Module 5 (4)

**Sem 1:**
- TME2142 Feedback Control Systems (4)
- Elective Module 2 (4)
- Elective Module 3 (4)

### 4th Year of studies

**Sem 2:**
- *TME4102 BTech Dissertation*
- Elective Module 4 (4)
- Elective Module 5 (4)

**SpTerm:**
- *TME4102 BTech Dissertation*
- TTG2415 Ethics in Engineering (4)

**Sem 1:**
- *TME4102 BTech Dissertation* (8)
- Elective Module 6 (4)