3.4.3 Bachelor of Technology (Electronics Engineering)

The BTech (Electronics Engineering) is offered in partnership with the Department of Electrical & Computer Engineering. The programme aims to graduate professional electronics 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 electronics 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 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 structure of the BTech (Electronics Engineering) programme is designed to achieve the following ***educational objectives*** to prepare engineers who will have the following attributes:

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

The above objectives are achieved by a curriculum designed to graduate students who have attained the following ***learning outcomes***:

a. **Engineering knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
b. **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. **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.
d. **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.
e. **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.
f. **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.
g. **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.
h. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
j. **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.
k. **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.
l. **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.
m. **EE Specific Programme Criteria:** Have the knowledge to analyse and design complex electronic devices, software, and systems containing hardware and software components; and understand the principles and applications of the basic sciences, engineering science and 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 **160 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 **120 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 (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 SCALE and the Department of Electrical and Computer Engineering, a student may select a full-time equivalent module in place of any TEExxxx 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 (84MCs), comprising**

1. Faculty Requirements (4MCs)
   - TTG2415 Ethics in Engineering

2. Major Requirements – Essential Modules (60MCs)
   - TTG1401 Engineering Mathematics I
   - TEE2002 Engineering Mathematics II
   - TEE2003 Advanced Mathematics for Engineers
   - TEE2011 Engineering Electromagnetics
   - TEE2023 Signals & Systems
   - TEE2026 Digital Design
   - TEE2027 Electronic Circuits
   - TEE2028 Microcontroller Programming and Interfacing
   - TEE2033 Integrated System Lab
   - TEE2101 Programming Methodology
   - TEE3031 Innovation & Enterprise I
   - TEE3506 Electrical Energy Systems
   - TEE4001 BTech Dissertation (12MCs)

3. Major Requirements – Elective Modules (20MCs, 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. Unless approval for exemption is obtained from SCALE and the Department of Electrical and Computer Engineering, a student must read at least two Level-4000 electives and three other electives selected from the list below.

   Communications

- TEE3131 Communication Systems
- TEE4101 RF Communications

Computer Engineering

- TEE3201 Software Engineering
- TEE4204 Computer Networks
- TEE4210 Network Protocols and Applications

Microelectronics

- TEE4407 Analog Electronics
- TEE4436 Fabrication Process Technology

General

- TIE2130 Quality Engineering I
- TEE3331 Feedback Control Systems
- TEE3501 Power Electronics
- TEE4305 Introduction to Fuzzy/Neural Systems
- TEE4211 Data Science for the Internet of Things
- TME4245 Robot Mechanics and Control

C. **Unrestricted Elective Modules (16MCs)**

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.

1st Year of studies	
Sem 1:	General Education Module 1 (4) TTG1401 Engineering Mathematics I (4) TEE2027 Electronic Circuits (4)
Sem 2:	TEE2002 Engineering Mathematics II (4) TEE2026 Digital Design (4) TEE2101 Programming Methodology (4)

SpTerm:	General Education Module 2 (4) General Education Module 3 (4)
2nd Year of studies	
Sem 1:	TEE2003 Advanced Mathematics for Engineers (4) TEE2028 Microcontroller Programming and Interfacing (4) TEE3506 Electrical Energy Systems (4)
Sem 2:	TEE2011 Engineering Electromagnetics (4) TEE2023 Signals & Systems (4) Unrestricted Elective Module (4)
SpTerm:	General Education Module 4 (4)
3rd Year of studies	
Sem 1:	*TTG3002 Industrial Practice Elective Module 1 (4) Elective Module 2 (4) General Education Module 5 (4)
Sem 2:	*TTG3002 Industrial Practice (8) TEE2033 Integrated System Lab (4) TEE3031 Innovation & Enterprise I (4) Elective Module 3 (4)
SpTerm:	TTG2415 Ethics in Engineering (4)
4th Year of studies	
Sem 1:	*TEE4001 BTech Dissertation Elective Module 4 (4) Elective Module 5 (4)
Sem 2:	*TEE4001 BTech Dissertation (12) Unrestricted Elective Module (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.

1st Year of studies	
Sem 2:	TEE2026 Digital Design (4) TEE2101 Programming Methodology (4) TTG1401 Engineering Mathematics I (4)
SpTerm:	General Education Module 1 (4) General Education Module 2 (4)
Sem 1:	General Education Module 3 (4) TEE2002 Engineering Mathematics II (4) TEE2027 Electronic Circuits (4)
2nd 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:	General Education Module 5 (4) TEE2028 Microcontroller Programming and Interfacing (4) *TTG3002 Industrial Practice TEE3506 Electrical Energy Systems (4)
3rd Year of studies	
Sem 2:	TEE2033 Integrated System Lab (4) TEE3031 Innovation & Enterprise I (4) *TTG3002 Industrial Practice (8) Elective Module 1 (4)
SpTerm:	TTG2415 Ethics in Engineering (4)
Sem 1:	Elective Module 2 (4) Elective Module 3 (4) Unrestricted Elective Module (4)
4th Year of studies	

Sem 2:	*TEE4001 BTech Dissertation Elective Module 4 (4) Elective Module 5 (4)
SpTerm:	*TEE4001 BTech Dissertation
Sem 1:	*TEE4001 BTech Dissertation (12) Unrestricted Elective Module (4)