

Bachelor of Engineering (Mechanical Engineering)

Overview

The undergraduate mechanical engineering curriculum has evolved over the years to meet the challenges of technological development and industry. It emphasises the fundamentals of the engineering sciences as well as applications relevant to the prevailing industries. The students undergo a rigorous course of training in science and mathematics in their first year with the Faculty. In the four semesters following that, the students are given a strong foundation in all the principal areas of mechanical engineering sciences, namely: Applied Mechanics, Control, Electrical Engineering, Fluids Engineering, Manufacturing, Materials and Thermodynamics and Heat Transfer. Engineers exercise their creativity through the innovative products that they design. Design is hence an integral part of the mechanical engineering curriculum. In addition to the teaching of mechanical design principles, students are also taught computer-aided design and analysis (CAD/CAM) with the aid of state-of-the-art computer software and hardware. In the fifth and sixth semesters, students are given a design-and-build project on a group basis. The project provides learning opportunities for the students in integrative skills, and develops innovation, teamwork and communication skills. From the sixth semester onwards, the students are offered a wide-range of technical electives. They may choose a combination of elective modules to suit their individual interests or they may apply to the Department to enrol in one of the following specialisations:

- Aeronautical Engineering
- Automotive Engineering
- Energy and Sustainability
- Offshore Oil & Gas Technology

Enrolment in a specialisation is subjected to approval of the Head of Department. The students are also required to undertake a research-based project leading to a B.Eng. Dissertation in the last two semesters. The project enhances the capacity of the students for critical thinking and self-motivated learning, and trains them in research methodology. The independent study elective modules provide further opportunities for interested students to be engaged on project and research-based work.

In addition to the aforementioned specialisations, which may be read as part of the B.Eng. programme, students may also apply to read a minor in conjunction with the main degree. This will require the students to offer additional modules as stipulated by the requirements of the minor programme. The available minor programmes are listed at http://www.eng.nus.edu.sg/ugrad/SP_minors.html

The Mechanical Engineering programme at NUS prepares its graduates well for challenging and rewarding careers in all phases of productive industrial activity extending from research to design, development and manufacturing. Our graduates are much sought after in a broad spectrum of industry covering:

- General Manufacturing
- Advanced Materials
- Aerospace
- Automation and Control
- Defence
- Precision Engineering
- Semiconductor Manufacturing and Testing

- Thermal and Power Engineering
- Design, Testing and Consulting services

The B.Eng. (Mechanical Engineering) degree is accredited by the Engineering Accreditation Board (EAB) in Singapore and is recognised by the signatories of the Washington Accord (<http://www.washingtonaccord.org/>). The B.Eng. (Mechanical Engineering) degree is also internationally recognised for admission to graduate studies in all the major universities around the world.

Degree Requirements

Students in the Bachelor of Engineering (Mechanical Engineering) programme are required to satisfy the following requirements to graduate from the course:

- Complete a minimum of 160 MCs with a CAP ≥ 2.0 .
- Pass the modules in accordance with Table 3.2.10a.
- Pass at least 12MCs equivalent of technical elective modules as listed in Table 3.2.10b. Students may, subject to approval of the Head of Department, offer up to two ME5-Level technical modules in lieu of two of the technical electives
- Subject to approval of the Head of Department, students may enrol in one of the following specialisations when they have completed a minimum of 100 MCs of the programme requirements:
 - Aeronautical Engineering
 - Automotive Engineering
 - Energy and Sustainability
 - Offshore Oil & Gas Technology
- To qualify for a specialisation, a student must pass at least four modules from the chosen area of specialisation and any other requirements as given in Table 3.2.10c. Students in a specialisation programme are required to do their final-year dissertation (8MCs) in an area related to the specialisation. For updated information on Specialisation programmes, please refer <http://me.nus.edu.sg/current-students/b-eng-me-programme/specialisations/specialisations-for-2015/>

Students should not read more than 60 MCs of Level-1000 modules towards their degree requirements.

Table 3.2.10a: Summary of ME Modular Requirements and Credits (For student intakes from AY2015/16 onwards)

Students are advised to refer to Department of Mechanical Engineering website at <http://www.me.nus.edu.sg> for latest updated information on B.Eng.(ME) Curriculum.

MODULAR REQUIREMENTS	MCs
UNIVERSITY REQUIREMENTS	20
General Education Modules (GE) (5 Modules, each of 4MCs) – Human Cultures (HC), Quantitative Reasoning (QR), Thinking and Expression (T&E) ¹ , Singapore Studies (SS), Asking Questions (AQ)	20
UNRESTRICTED ELECTIVES	20
PROGRAMME REQUIREMENTS	
Faculty Requirements	10
(GET1021 or equivalent) Critical Thinking & Writing ¹	-
ES2331 Communicating Engineering	4
HR2002 Human Capital in Organizations	3
EG2401 Engineering Professionalism	3
ES1 xxx English ²	-
Foundation Requirements	23
MA1505 Mathematics I	4
MA1506 Mathematics II	4
EG1108 Electrical Engineering	3
EG1109 M Statics and Mechanics of Materials	4
PC1431 Physics IE	4
CS1010E Programming Methodology	4
Mechanical Engineering Major Requirements	
ME Core Subjects	42
ME2113 Mechanics of Materials I	3
ME2114 Mechanics of Materials II	3
ME2121 Engineering Thermodynamics	4
ME2134 Fluid Mechanics I	4
ME2135 Fluid Mechanics II	4
ME2142 Feedback Control Systems	4
ME2143 Sensors and Actuators	4
ME2151 Principles of Mechanical Engineering Materials	4
ME3112 Mechanics of Machines	4
ME3122 Heat Transfer	4
ME3162 Manufacturing Processes	4

MODULAR REQUIREMENTS		MCs
ME Design and Project Modules		33
ME2101	Fundamentals of Mechanical Design	4
ME2103	Engineering Visualisation and Modelling	3
ME3103	Mechanical Systems Design	6
ME4101 A	B.Eng. Dissertation (Over 2 semesters)	8
EG3601 Industrial Attachment Programme³		12
ME Electives		
Technical Electives (from Table 3.2.10b)		12
Total		160

¹ BEng students are required to read a Critical Thinking & Writing module and a Communications module. GET1021 Critical Thinking & Writing, which also satisfies the GE (T&E) requirement and ES2331 Communicating Engineering would meet these requirements. Alternatively, students can read ES1501X Academic Expository Writing in place of both GET1021 and ES2331. USP/UTRP/RVRC students should refer to their respective programmes for USP/UTRP/RVRC modules to be read in place of GET1021 and/or ES2331.

² Students who have not passed or been exempted from the Qualifying English Test at the time of admission to the Faculty will have to read ES1000 and/or ES1102. This will be decided by CELC.

³ For BEng students who are from direct poly intake and in the following special programmes: DDPs, CDPs, GEP & CSP, internship / industrial-attachment is optional and the modular credits for the internship/industrial-attachment will become 'Free Electives' i.e., Unrestricted Electives (UE).

Table 3.2.10b: ME Technical Electives Modules

Applied Mechanics

ME3211	Mechanics of Solids
ME4212	Aircraft Structures
ME4213	Vibration Theory and Applications
ME4214	Vehicle Dynamics
ESP3206	Continuum Mechanics

Control and Mechatronics

ME3241	Microprocessor Applications
ME3242	Automation
ME4241	Aircraft Performance and Stability
ME4245	Robot Mechanics and Control
ME4246	Modern Control System
ME5405 [◇]	Machine Vision
EE4305	Introduction to Fuzzy/Neural Systems

Fluid Mechanics

ME3232	Compressible Flow
ME3233	Unsteady Flow in Fluid Systems
ME4231	Aerodynamics and Propulsion
ME4233	Computational Methods in Fluid Mechanics
ME4234	Experimental Methods in Fluid Mechanics
ME4235	Introduction to Aeroelasticity

Manufacturing

ME3261	Computer aided Design and Manufacturing
ME3263	Design for Manufacturing and Assembly
ME4261	Tool Engineering
ME4262	Automation in Manufacturing
ME4263	Fundamentals of Product Development
ME4264	Automobile Design and Engineering
ME4265	Automotive Body and Chassis Engineering

Materials Science

ME3251	Materials for Engineers
ME4253	Biomaterials Engineering
ME4255	Materials Failure

Micro Systems Technology

ME3281	Microsystems Design and Applications
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Thermodynamics

ME3221	Sustainable Energy Conversion
ESP3401	Photovoltaic Devices & Systems
ME4223	Thermal Environmental Engineering
ME4225	Applied Heat Transfer
ME4226	Energy and Thermal Systems
ME4227	Internal Combustion Engine
ESP4401	Optimization of Energy Systems

Multidisciplinary

ME3291	Numerical Methods in Engineering
ME4291	Finite Elements Analysis

Table 3.2.10c: Technical Electives Modules for ME Specialisations

Students are advised to refer to Department of Mechanical Engineering website at <http://me.nus.edu.sg/current-students/b-eng-me-programme/specialisations/specialisations-for-2015/> for latest updated information related to specialisation.

Aeronautical Engineering

Students taking the Aeronautical Engineering Specialisation must select TWO modules from Group A and TWO modules from Group B and present their FYP in a poster session.

Group A

ME3232	Compressible Flow
ME4231	Aerodynamics and Propulsion
ME4235	Introduction to Aeroelasticity
ME4241	Aircraft Performance and Stability

Group B

ME4212	Aircraft Structures
ME4233	Computational Methods in Fluids Mechanics
ME4234	Experimental Methods in Fluid Mechanics
ME4291	Finite Element Analysis

Automotive Engineering

Students taking the Automotive Engineering Specialisation must select at least THREE modules from Group A and another ONE from either Group.

Group A

ME4214	Vehicle Dynamics
ME4227	Internal Combustion Engine
ME4264	Automobile Design and Engineering
ME4265	Automotive Body and Chassis Engineering

Group B

ME3251	Materials for Engineers
ME3261	Computer aided Design and Manufacturing
ME3263	Design for Manufacturing and Assembly
ME4213	Vibration Theory and Application
ME4255	Materials Failure
ME4262	Automation in Manufacturing

Energy and Sustainability

Students taking the Energy and Sustainability Specialisation must take at least FOUR modules from the list below and present their FYP in a poster session.

ME3221	Sustainable Energy Conversion
ME4223	Thermal Environmental Engineering
ME4225	Applied Heat Transfer
ME4226	Energy and Thermal Systems
ME4227	Internal Combustion Engines
ME5205 [◇]	Energy Engineering
ME5207 [◇]	Solar Energy Systems
ME5516 [◇]	Emerging Energy Conversion and Storage Technologies
ESP3401	Photovoltaic Devices & Systems
ESP4401	Optimization of Energy Systems
ESP4402	Transport Phenomena in Energy Systems

Offshore Oil and Gas Technology

Students taking the Offshore Oil and Gas Technology Specialisation must Group A modules and at least another TWO modules from Group B.

Group A

GE3244 Fundamentals in Petroleum Geoscience (Fulfil UEM requirements)
ME4105 Specialisation Study Module (Offshore Oil and Gas Technology)

Group B

ME3211 Mechanics of Solids
ME3233 Unsteady Flow in Fluid Systems
ME4213 Vibration Theory and Applications
ME4245 Robot Mechanics and Control
ME4261 Tool Engineering
ME5506[◇] Corrosion of Materials

[◇] Stage 4 status and a CAP of more than 3.5 are needed in order to read Level-5000 modules.

Sample Semester Schedule

Students may refer to Department of Mechanical Engineering website at <http://me.nus.edu.sg/current-students/sample-schedules/> for the updated copy of the sample semester schedule for their reference. The scheduling of the modules is a reference guide and may be subject to changes without prior notice.