

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
- 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 BEng 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 BEng programme, students may also apply to read a minor in conjunction with the main degree. This will require the students to read additional modules as stipulated by the requirements of the minor programme. The available minor programmes are listed at <https://www.eng.nus.edu.sg/undergradtestudies/special-programmes/minors/>.

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 BEng (Mechanical Engineering) degree is accredited by the Engineering Accreditation Board (EAB) in Singapore. The BEng (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 BEng.(Mechanical Engineering) programme are required to satisfy the following requirements to graduate from the course:

- Complete a minimum of 160 MCs with a CAP \geq 2.0.
- Pass the modules in accordance with Table 3.2.10a.
- Pass at least 8 MCs equivalent of technical elective modules as listed in Table 3.2.10b. Students may, subject to approval of the Head of Department, take 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
 - 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 to <http://me.nus.edu.sg/current-students/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 AY2016/17 onwards)

Students are advised to refer to Department of Mechanical Engineering website at me.nus.edu.sg for latest updated information on BEng (ME) Curriculum.

MODULAR REQUIREMENTS	MCs
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University Requirements

General Education Modules (GE) (5 Modules, each of 4MCs)

- Human Cultures (GEH) **20**
- Quantitative Reasoning (GER)
- Thinking and Expression (GET)
- Singapore Studies (GES)
- Asking Questions (GEQ)

Unrestricted Electives 32

Programme Requirements

Faculty Requirements 6

(ES1531 or equivalent) Critical Thinking & Writing¹ 4

EG2401 Engineering Professionalism 2

ES1xxx English² –

Foundation Requirements 28

MODULAR REQUIREMENTS		MCs
MA1505	Mathematics I	4
MA1506	Mathematics II	4
PC1431	Physics IE	4
CS1010E	Programming Methodology	4
EG1111	Engineering Principles & Practice I	6
EG1112	Engineering Principles & Practice II	6
Mechanical Engineering Major Requirements		
<i>ME Core Subjects</i>		36
ME2112	Strength of Materials	4
ME2121	Engineering Thermodynamics	4
ME2134	Fluid Mechanics I	4
ME2142	Feedback Control Systems	4
ME2151	Principles of Mechanical Engineering Materials	4
ME3112	Mechanics of Machines	4
ME3162	Manufacturing Processes	4
Professional Development (Students in iRP pathway will read 2 Level-5000 modules)		8
<i>ME Design and Project Modules</i>		20
ME2102	Engineering Innovation and Modelling	4
ME3103	Mechanical Systems Design	8
ME4101A	BEng Dissertation (Over 2 semesters)	8
EG3611 Industrial Attachment³		10
ME Technical Electives (from Table 3.2.10b)		8
Total		160

¹ BEng students are required to read ES1531 Critical Thinking & Writing. Alternatively, students can read ES1501X Academic Expository Writing. USP/UTRP/RVRC students should refer to their respective programmes for USP/UTRP/RVRC modules to be read in place of ES1531.

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 ES1103. 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, industrial attachment is optional and the modular credits for the industrial attachment will become 'Free Electives' i.e., Unrestricted Electives (UE).

Table 3.2.10b: ME Technical Electives Modules

Applied Mechanics

ME2114 Mechanics of Materials
ME3211 Mechanics of Solids
ME4212 Aircraft Structures
ME4213 Vibration Theory and Applications
ESP3206 Continuum Mechanics

Control and Mechatronics

ME2143 Sensors and Actuators
ME3241 Microprocessor Applications
ME3242 Automation
ME4241 Aircraft Performance and Stability
ME4245 Robot Mechanics and Control
ME4246 Modern Control System
ME5405[◇] Machine Vision

Fluid Mechanics

ME2135 Fluid Mechanics II
ME2143 Sensor and Actuators
ME3232 Compressible Flow
ME3233 Unsteady Flow in Fluid Systems
ME4231 Aerodynamics and Propulsion
ME4233 Computational Methods in Fluid Mechanics
ME5304[◇] Experimental Fluid Mechanics
ME5305[◇] Fundamentals of 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

Materials Science

ME3251 Materials for Engineers
ME4253 Biomaterials Engineering
ME4255 Materials Failure
ME4256 Functional Materials and Devices

Micro Systems Technology

ME3281 Microsystems Design and Applications

Thermodynamics

ME3122 Heat Transfer
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/specialisations-for-2015/> for latest updated information related to specialisations.

Aeronautical Engineering

Students taking the Aeronautical Engineering Specialisation must read ME2135 Fluid Mechanics II, select TWO modules from Group A and TWO modules from Group B and present their FYP in a poster session.

Compulsory

ME2135 Fluid Mechanics II

Group A

ME3232 Compressible Flow
ME4231 Aerodynamics and Propulsion
ME4241 Aircraft Performance and Stability
ME5305[◇] Fundamentals of Aeroelasticity

Group B

ME4212 Aircraft Structures
ME4233 Computational Methods in Fluids Mechanics
ME4291 Finite Element Analysis
ME5304[◇] Experimental Fluid Mechanics

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 take Group A modules and at least another TWO modules from Group B.

Group A

GE3244 Fundamentals in Petroleum Geoscience (Fulfil UEM requirements)

ME2135 Fluid Mechanics II
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.

3.2.10.3 Sample Semester Schedule

Students may refer to Department of Mechanical Engineering website at me.nus.edu.sg/current-students/program-overview/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 subject to changes without prior notice.