

3.2.9.2 Degree Requirements

The following are the requirements for the degree of B.Eng. (Materials Science and Engineering):

- Required to complete a minimum of 160 MCs with a CAP ≥ 2.0 to graduate from the programme, depending on the pathway taken by the student.
- The minimum MCs will have to be earned by taking modules in accordance with Tables 1 and 2 for the research-focused pathway and the professional practice pathway, respectively.
- Students should not read more than 60 MCs of level 1000 modules towards their degree requirements.
- A student may obtain a specialisation certificate in Polymeric and Biomedical Materials or Nanostructured Materials/Nanotechnology by reading modules of 24 MCs that satisfy the respective requirements. The certificate will be issued by the Department.
- Satisfy all other requirements as prescribed by the Faculty of Engineering or the University.
- A student must also satisfy other additional requirements that may be prescribed by the Faculty of Engineering or the University.

Table 3.2.9a: Summary of MSE Module Requirements and Credits for Research-focused Pathway

Modular Requirements	MCs		
UNIVERSITY LEVEL REQUIREMENTS	20		
General Education Modules (5 Modules, each of 4 MCs)		UNRESTRICTED ELECTIVES	30
Quantitative Reasoning (GER1000)		Faculty Requirements:	26
Thinking and Expression (GET)	20	EG2401 Engineering Professionalism	2
Human Cultures (GEH)		ES2531 Critical Thinking & Writing [1]	4
Singapore Studies (GES)		EG1311 Design and Make	4
Asking Questions (GEQ1000)			
IE2211 Systems Thinking and Dynamics	4		
EE2211 Introduction to Machine Learning	4		
MLE1010 Materials Engineering Principles and Practice	4		
CS1010E Programming Methodology	4		
English [2]	-		
Foundational Requirements	20		

MA1512 Differential Equations for Engineering	2
MA1513 Linear Algebra with Differential Equations	2
PC1432 Physics IIE [3]	4
CM1501 Organic Chemistry for Engineers or CM1121 Organic Chemistry 1 [4]	4
MLE1001A Materials Science & Engineering Principles & Practise I	4
MLE2001 Materials Science & Engineering Principles & Practise II	4
MSE Discipline Requirements:	
MSE Core Modules	26
MLE2101 Introduction to Structure of Materials	4
MLE2102 Thermodynamics and Phase Diagrams	4
MLE2103 Phase Transformation and Kinetics	3
MLE2104 Mechanical Properties of Materials	4
MLE2105 Electronic Properties of Materials	4
MLE3101 Materials Characterization Laboratory	3
MLE3111 Materials Properties and Processing Laboratory	4
MSE Design and Final-Year Project Modules	16
MLE4102 Design Project	4
MLE4101 B.Eng. Dissertation [5]	12
MSE Technical Elective	4
MLE Level 3000 Electives	4

Pathway Requirements	8
MLE Level 5000 Electives	8
Internships Requirement	10
EG3611A Industrial Attachment [6, 7]	10
TOTAL	160

[1] Students in USP, UTRP, and RVRC may read an equivalent module (e.g. ES1501X Academic Expository Writing) in lieu of EG1531.

[2] Students who have not passed or been exempted from the Qualifying English Test at the time of admissions to the Faculty will have to read ES1000 and/or ES1103. This will be decided by CELC. ES1103 carries 4 MCs which may be counted as UEM.

[3] Bridging Module: Students without A-Level pass in Physics must read PC1221 Fundamentals of Physics I and PC1222 Fundamentals of Physics II as a prerequisite for PC1432.

[4] Bridging Module: Students without A-level pass in Chemistry must read CM1417 Fundamentals of Chemistry as a prerequisite for CM1501.

[5] Over two semesters.

[6] For BEng students in the following special programmes: DDPs, CDPs, GEP & CSP, internship/ industrial-attachment is optional and the modular credits for the internship/industrial-attachment will be become Unrestricted Electives (UE).

[7] RfP students will have to carry out internship in Research Institutions or R&D Labs.

Requirements for Research-Focused Pathway

- RfP students will have to carry out internship in Research Institutions or R & D Labs.
- RfP students will have to work on research based FYP over two semesters.
- RfP student will have to work on a team Design project over one semester.
- RfP students will have to complete two Level-5000 modules as their pathway requirements (8MCs). Any MLE coded module at 5000

Table 3.2.9b: Summary of MSE Module Requirements and Credits for Professional Practice Pathway

Modular Requirements	MCs		
UNIVERSITY LEVEL REQUIREMENTS	20		
General Education Modules (5 Modules, each of 4 MCs)		UNRESTRICTED ELECTIVES	32
Quantitative Reasoning (GER1000)		Faculty Requirements:	26
Thinking and Expression (GET)	20	EG2401 Engineering Professionalism	2
Human Cultures (GEH)		ES2531 Critical Thinking & Writing [1]	4
Singapore Studies (GES)		EG1311 Design and Make	4
Asking Questions (GEQ1000)			
IE2211 Systems Thinking and Dynamics	4		

EE2211 Introduction to Machine Learning	4
MLE1010 Materials Engineering Principles and Practice	4
CS1010E Programming Methodology	4
English [2]	-
Foundational Requirements	20
MA1512 Differential Equations for Engineering	2
MA1513 Linear Algebra with Differential Equations	2
PC1432 Physics IIE [3]	4
CM1501 Organic Chemistry for Engineers or CM1121 Organic Chemistry 1 [4]	4
MLE1001A Materials Science & Engineering Principles & Practise I	4
MLE2001 Materials Science & Engineering Principles & Practise II	4
MSE Discipline Requirements:	
MSE Core Modules	26
MLE2101 Introduction to Structure of Materials	4
MLE2102 Thermodynamics and Phase Diagrams	4
MLE2103 Phase Transformation and Kinetics	3
MLE2104 Mechanical Properties of Materials	4
MLE2105 Electronic Properties of Materials	4
MLE3101 Materials Characterization Laboratory	3

MLE3111 Materials Properties and Processing Laboratory	4
MSE Design and Final-Year Project Modules	14
MLE4102A Design Project [5]	8
MLE4101A B.Eng. Dissertation	6
MSE Technical Elective	4
MLE Level 3000 Electives	4
Pathway Requirement	8
Professional Electives	8
Internships Requirement	10
EG3611A Industrial Attachment [6, 7]	10
TOTAL	160

[1] Students in USP, UTRP, and RVRC may read an equivalent module (e.g. ES1501X Academic Expository Writing) in lieu of EG1531.

[2] Students who have not passed or been exempted from the Qualifying English Test at the time of admissions to the Faculty will have to read ES1000 and/or ES1103. This will be decided by CELC. ES1103 carries 4 MCs which may be counted as UEM.

[3] Bridging Module: Students without A-Level pass in Physics must read PC1221 Fundamentals of Physics I and PC1222 Fundamentals of Physics II as a prerequisite for PC1432.

[4] Bridging Module: Students without A-level pass in Chemistry must read CM1417 Fundamentals of Chemistry as a prerequisite for CM1501.

[5] Over two semesters.

[6] For BEng students in the following special programmes: DDPs, CDPs, GEP & CSP, internship/ industrial-attachment is optional and the modular credits for the internship/industrial-attachment will be become Unrestricted Electives (UE).

[7] PPP students will have to carry out internship in industrial companies.

Requirements for Professional Practice Pathway

- PPP students will have to carry out internship in industrial companies.
- RPP students will have to work on research based FYP over one semester.
- PPP student will have to work on a team Design project over two semesters.
- PPP students will have to take 8 MCs of professional development modules as their pathway requirements, one of which needs to be related to project management.

Requirements for Specialisation in Polymeric and Biomedical Materials

- FYP in the related area.
- MLE3104 Polymeric and Composite Materials.
- MLE3202 Materials for Biointerfaces.
- Level 4000 electives from the related area (Table 3).
- Minimum 24 MCs of modules from the above requirements.

Requirements for Specialisation in Nanostructured Materials and Nanotechnology

- FYP in the related area.
- Level 4000 electives from the related area (Table 3).
- Minimum 24 MCs of modules from the above requirements.

Table 3.2.9c: MSE Elective Modules

MLE LEVEL 3000 ELECTIVES

MLE3102 Degradation and Failure of Materials

MLE3104 Polymeric and Composite Materials

MLE3105 Dielectric and Magnetic Materials

MLE3202 Materials for Biointerfaces

MLE3203 Engineering Materials

MLE LEVEL 4000 ELECTIVES

POLYMERIC AND BIOMEDICAL MATERIALS

MLE4201 Advanced Materials Characterisation

MLE4202 Selected advanced Topics on Polymers or MLE5214 Advanced in Polymeric Materials.

MLE4203 Polymeric Biomedical Materials

ME4253 Biomaterials Engineering

BN4109 Special topics in Bioengineering

BN4301 Principles of Tissue Engineering

PC4268 Biophysical Instrumentation and Biomolecular Electronics

NANOSTRUCTURED MATERIALS & NANOTECHNOLOGY

MLE4201	Advanced Materials Characterisation
MLE4204	Synthesis and Growth of Nanostructures
MLE4205	Theory & Modelling of Material Properties or MLE5210 Modelling and Simulation of Materials
MLE4206	Current topics on Nanomaterials or MLE5211 Nanomaterials
MLE4211	Nanoelectronics and information technology
PC4253	Thin film Technology
CN4223R	Microelectronic Thin Films

OTHER ELECTIVE MODULES

MLE4207	Growth Aspects of Semiconductor <u>OR</u> EE4436 Semiconductor Process Technology
MLE4208	Photovoltaic Materials
MLE4209	Magnetism and Magnetic Materials
MLE4211	Nanoelectronics and information technology
MLE4212	Advanced Structural Materials
EE4437	Photonics - Principles and Applications
CN4217R	Processing of Microelectronic Materials
CN4203R	Polymer Engineering
CN5251	Membrane Science and Technology
ME4283	Micro-fabrication Process

ME4293 Microelectronics Packing

MLE LEVEL 5000 ELECTIVES

MLE5210 Modelling and simulation of Materials

MLE5211 Nanomaterials

MLE5212 Energy Conversion & Storage

MLE5213 Magnetic Materials

MLE5214 Advances in Polymeric Materials