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

<table>
<thead>
<tr>
<th>Modular Requirements</th>
<th>MCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSITY LEVEL REQUIREMENTS</td>
<td>20</td>
</tr>
<tr>
<td>General Education Modules (5 Modules, each of 4 MCs)</td>
<td></td>
</tr>
<tr>
<td>Quantitative Reasoning (GER1000)</td>
<td></td>
</tr>
<tr>
<td>Thinking and Expression (GET)</td>
<td>20</td>
</tr>
<tr>
<td>Human Cultures (GEH)</td>
<td></td>
</tr>
<tr>
<td>Singapore Studies (GES)</td>
<td></td>
</tr>
<tr>
<td>Asking Questions (GEQ1000)</td>
<td></td>
</tr>
<tr>
<td>IE2211 Systems Thinking and Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>EE2211 Introduction to Machine Learning</td>
<td>4</td>
</tr>
<tr>
<td>MLE1010 Materials Engineering Principles and Practice</td>
<td>4</td>
</tr>
<tr>
<td>CS1010E Programming Methodology</td>
<td>4</td>
</tr>
<tr>
<td>English [2]</td>
<td>-</td>
</tr>
<tr>
<td>Foundational Requirements</td>
<td>20</td>
</tr>
</tbody>
</table>
MA1512 Differential Equations for Engineering 2
MA1513 Linear Algebra with Differential Equations 2
PC1432 Physics IIE [3] 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

**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 BVRC 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.
[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 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

<table>
<thead>
<tr>
<th>Modular Requirements</th>
<th>MCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSITY LEVEL REQUIREMENTS</td>
<td>20</td>
</tr>
<tr>
<td>General Education Modules (5 Modules, each of 4 MCs)</td>
<td></td>
</tr>
<tr>
<td>Quantitative Reasoning (GER1000)</td>
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</tr>
<tr>
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<tr>
<td>Singapore Studies (GES)</td>
<td></td>
</tr>
<tr>
<td>Asking Questions (GEQ1000)</td>
<td></td>
</tr>
<tr>
<td>IE2211 Systems Thinking and Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>UNRESTRICTED ELECTIVES</td>
<td>32</td>
</tr>
<tr>
<td>Faculty Requirements:</td>
<td>26</td>
</tr>
<tr>
<td>EG2401 Engineering Professionalism</td>
<td>2</td>
</tr>
<tr>
<td>ES2531 Critical Thinking &amp; Writing [1]</td>
<td>4</td>
</tr>
<tr>
<td>EG1311 Design and Make</td>
<td>4</td>
</tr>
</tbody>
</table>
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
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, UTBP, 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.


[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 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 OR 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