

**Bachelor of Engineering (Materials Science & Engineering)  
with Minor in Innovation & Design**

**Cohort AY2023/2024**

Course Requirements	Units
<b>Common Curriculum</b>	
GEA1000 Quantitative Reasoning with Data	4
CS1010E Programming Methodology	4
ES2631 Critique and Communication of Thinking and Design <sup>1</sup>	4
GE: Cultures and Connections <sup>1</sup>	4
GE: Singapore Studies <sup>1</sup>	4
GE: Communities and Engagement <sup>1</sup>	4
CDE2000 Creating Narratives	4
CDE2501 Liveable Cities	4
DTK1234 Design Thinking	4
EE2211 Introduction to Machine Learning	4
EG1311 Design and Make	4
IE2141 Systems Thinking and Dynamics	4
PF1101 Fundamentals of Project Management	4
MLE4101B B.Eng. Dissertation <u>or</u> MLE4102A Design Project (over 2 consecutive semesters) <sup>2</sup>	8
<b>Sub-total for Common Curriculum</b>	<b>60</b>
<b>Engineering Core</b>	
MA1511 Engineering Calculus	2
MA1512 Differential Equations for Engineering	2
MA1513 Linear Algebra with Differential Equations	2
CE2407A Uncertainty Analysis for Engineers	2
EG2401A Engineering Professionalism	2
EG3611A Industrial Attachment <u>or</u> CFG2101 NUS Vacation Internship Programme <sup>3</sup> <u>and</u> EG3612 Vacation Industrial Attachment	10
<b>Sub-total for Engineering Core</b>	<b>20</b>
<b>Engineering Programme Requirements</b>	
MLE1001B Materials Science & Engineering Principles & Practice I	4
MLE2001A Materials Science & Engineering Principles & Practice II	4
MLE2102 Thermodynamics and Renewable Energy Technologies	4
MLE2103A Materials Kinetics and Processing	2
MLE2105 Electronic Materials of Materials	4
MLE3101A Materials Characterization	3
MLE3101 Materials Characterization Laboratory	3
MLE3103 Materials Design: Aerospace to Biomedical Applications	4
MLE3111A Materials Properties and Processing Laboratory	2
MLE3112 Machine Learning Approaches in Materials Laboratory	2
Technical electives	8
<b>Sub-total for Engineering Programme Requirements</b>	<b>40</b>
<b>Unrestricted Electives</b>	
Group A course for Minor	4
Group B course for Minor	4
CDE3301/EG3301R Ideas to Proof-of-Concept (over 2 consecutive semesters)	12
Other unrestricted electives <sup>2</sup>	20
<b>Sub-total for Unrestricted Electives</b>	<b>40</b>
<b>Total</b>	<b>160</b>

**Innovation & Design Programme**  
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Notes:

- <sup>1</sup> Students may read equivalent courses in NUS College (NUSC), University Town College Programme (UTCP), and Ridge View Residential Programme (RVRC).
- <sup>2</sup> Students may take CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up in lieu of MLE4101B/MLE4102A and 4 units of unrestricted electives
- <sup>3</sup> May be replaced by CDE2605 Undergraduate Research Opportunities Programme or CDE2605R Undergraduate Research Experience (UREx).

**Recommended semester schedule – JC-intake students or equivalent**  
(for students who opt for vacation internships)

Semester 1	Units	Semester 2	Units
MLE1001B Materials Science & Engineering Principles & Practice I	4	MLE2001A Materials Science & Engineering Principles & Practice I	4
GEA1000 Quantitative Reasoning with Data	4	CS1010E Programming Methodology	4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential Equations	2	MA1511 Engineering Calculus	2
CE2407A Uncertainty Analysis for Engineers	2	MA1512 Differential Equations for Engineering	2
PF1101 Fundamentals of Project Management	4	Group A/B course for Minor	4
<b>Sub-total</b>	<b>20</b>	<b>Sub-total</b>	<b>20</b>

Summer vacation between Semesters 2 and 3	Units
CFG2101 NUS Vacation Internship Programme	4
<b>Sub-total</b>	<b>4</b>

Semester 3	Units	Semester 4	Units
MLE2102 Thermodynamics and Renewable Energy Technologies	4	MLE2105 Electronic Properties of Materials	4
CDE2501 Liveable Cities	4	ES2631 Critique and Communication of Thinking and Design	4
EE2211 Introduction to Machine Learning	4	IE2141 Systems Thinking & Dynamics	4
EG2401A Engineering Professionalism	2	GE	4
GE	4	CDE3301/EG3301R Ideas to Proof-of-Concept	6
Group A/B course for Minor	4		
<b>Sub-total</b>	<b>22</b>	<b>Sub-total</b>	<b>22</b>

Summer vacation between Semesters 4 and 5	Units
EG3612 Vacation Internship Attachment	6
<b>Sub-total</b>	<b>6</b>

Semester 5	Units	Semester 6 – can be used for SEP	Units
CDE3301/EG3301R Ideas to Proof-of-Concept	6	Technical Elective 1	4
MLE2103A Materials Kinetics and Processing	2	Technical Elective 2	4
MLE3101A Materials Characterization	3	UE	4
MLE3101 Materials Characterization Laboratory	3	UE	4
GE	4	UE	4
<b>Sub-total</b>	<b>18</b>	<b>Sub-total</b>	<b>20</b>

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<b>Semester 7</b>	<b>Units</b>	<b>Semester 8</b>	<b>Units</b>
MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4	MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	MLE3112 Machine Learning Approaches in Materials Laboratory	2
MLE3111A Materials Properties and Processing Laboratory	2	UE	4
CDE2000 Creating Narratives	4	UE	4
<b>Sub-total</b>	<b>14</b>	<b>Sub-total</b>	<b>14</b>

**Recommended semester schedule – JC-intake students or equivalent**  
(for students who opt for industrial attachment)

Semester 1	Units	Semester 2	Units
MLE1001B Materials Science & Engineering Principles & Practice I	4	MLE2001A Materials Science & Engineering Principles & Practice I	4
GEA1000 Quantitative Reasoning with Data	4	CS1010E Programming Methodology	4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential Equations	2	MA1511 Engineering Calculus	2
CE2407A Uncertainty Analysis for Engineers	2	MA1512 Differential Equations for Engineering	2
PF1101 Fundamentals of Project Management	4	Group A/B course for Minor	4
<b>Sub-total</b>	<b>20</b>	<b>Sub-total</b>	<b>20</b>

Semester 3	Units	Semester 4	Units
MLE2102 Thermodynamics and Renewable Energy Technologies	4	MLE2105 Electronic Properties of Materials	4
CDE2501 Liveable Cities	4	ES2631 Critique and Communication of Thinking and Design	4
EE2211 Introduction to Machine Learning	4	IE2141 Systems Thinking & Dynamics	4
EG2401A Engineering Professionalism	2	GE	4
GE	4	CDE3301/EG3301R Ideas to Proof-of-Concept	6
Group A/B course for Minor	4		
<b>Sub-total</b>	<b>22</b>	<b>Sub-total</b>	<b>22</b>

Semester 5	Units	Semester 6	Units
CDE3301/EG3301R Ideas to Proof-of-Concept	6	EG3611A Industrial Attachment	10
MLE2103A Materials Kinetics and Processing	2		
MLE3101A Materials Characterization	3		
MLE3101 Materials Characterization Laboratory	3		
GE	4		
UE	4		
<b>Sub-total</b>	<b>22</b>	<b>Sub-total</b>	<b>10</b>

Semester 7	Units	Semester 8	Units
MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4	MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	MLE3112 Machine Learning Approaches in Materials Laboratory	2
MLE3111A Materials Properties and Processing Laboratory	2	Technical Elective 1	4
CDE2000 Creating Narratives	4	Technical Elective 2	4
UE	4	UE	4
UE	4	UE	4
<b>Sub-total</b>	<b>22</b>	<b>Sub-total</b>	<b>22</b>

**Recommended semester schedule – JC-intake students or equivalent**  
(for students in Engineering Scholars Programme)

Semester 1	Units	Semester 2	Units
MLE1001B Materials Science & Engineering Principles & Practice I	4	MLE2001A Materials Science & Engineering Principles & Practice I	4
GEA1000 Quantitative Reasoning with Data	4	MLE2105 Electronic Properties of Materials	4
DTK1234 Design Thinking	4	MA1512 Differential Equations for Engineering	2
MA1513 Linear Algebra with Differential Equations	2	UTCP course 2 (replaces GE)	4
CE2407A Uncertainty Analysis for Engineers	2	CDE3301/EG3301R Ideas to Proof-of-Concept	6
PF1101 Fundamentals of Project Management	4	Group A/B course for Minor	4
UTCP course 1 (replaces GE)	4	UE (or IE2141 Systems Thinking & Dynamics if not in RC4)	4
<b>Sub-total</b>	<b>24</b>	<b>Sub-total</b>	<b>28</b>

Semester 3	Units	Semester 4 – NOC	Units
MLE2102 Thermodynamics and Renewable Energy Technologies	4	NOC	
MLE2103A Materials Kinetics and Processing	2		
MLE3101A Materials Characterization	3		
MLE3101 Materials Characterization Laboratory	3		
CDE2501 Liveable Cities	4		
UTCP course 3 (replaces GE)	4		
CDE3301/EG3301R Ideas to Proof-of-Concept	6		
<b>Sub-total</b>	<b>26</b>	<b>Sub-total</b>	<b>22</b>

Semester 5	Units	Semester 6	Units
MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4	MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4
Group A/B course for Minor	4	MLE3112 Machine Learning Approaches in Materials Laboratory	2
UTCP course 4 (replaces ES2631 Critique and Communication of Thinking and Design)	4	Technical Elective 1	4
EE2211 Introduction to Machine Learning	4	Technical Elective 2	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	CDE2000 Creating Narratives	4
MLE3111A Materials Properties and Processing Laboratory	2	UE	4
<b>Sub-total</b>	<b>24</b>	<b>Sub-total</b>	<b>24</b>

Students must complete the following courses before Semester 1 through advanced placement credits:

- CS1010E Programming Methodology (4 units)
- EG1311 Design & Make (4 units)
- MA1505 Mathematics I (4 units) – replaces MA511 Engineering Calculus (2 units) and counted as UE (2 units)

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A one-semester NOC programme comprises the following courses:

- ETP3201L Innovation & Enterprise Internship (12 units) – replaces EG3611A (10 units) and EG2401A (2 units)
- ETP3204S Innovation & Enterprise Internship Practicum (4 units) – counted as UE (4 units)
- Entrepreneurship course (4 units) – counted as UE (4 units)
- ETP2271 Discovering Resilience and Purpose (2 units) – counted as UE (2 units)

**Recommended semester schedule – poly-intake students**  
(for students who may want to upgrade to a Second Major)

Semester 1	Units	Semester 2	Units
MLE1001B Materials Science & Engineering Principles & Practice I	4	MLE2001A Materials Science & Engineering Principles & Practice I	4
GEA1000 Quantitative Reasoning with Data	4	CS1010E Programming Methodology	4
MA1301 Introductory Mathematics * (UE)	4	MA1511 Engineering Calculus	2
PC1201 Fundamentals of Physics (UE)	4	MA1512 Differential Equations for Engineering	2
Group A/B course for Minor	4	PF1101 Fundamentals of Project Management	4
		CDE3301/EG3301R Ideas to Proof-of-Concept	6
		Group A/B course for Minor	4
<b>Sub-total</b>	<b>20</b>	<b>Sub-total</b>	<b>26</b>

Semester 3	Units	Semester 4	Units
MLE2102 Thermodynamics and Renewable Energy Technologies	4	MLE2105 Electronic Properties of Materials	4
MLE2103A Materials Kinetics and Processing	2	ES2631 Critique and Communication of Thinking and Design	4
MLE3101A Materials Characterization	3	IE2141 Systems Thinking & Dynamics	4
MLE3101 Materials Characterization Laboratory	3	GE	4
MA1513 Linear Algebra with Differential Equations	2	GE	4
CE2407A Uncertainty Analysis for Engineers	2		
EG2401A Engineering Professionalism	2		
CDE3301/EG3301R Ideas to Proof-of-Concept	6		
<b>Sub-total</b>	<b>24</b>	<b>Sub-total</b>	<b>20</b>

Semester 5	Units	Semester 6	Units
MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4	MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4
EE2211 Introduction to Machine Learning	4	MLE3112 Machine Learning Approaches in Materials Laboratory	2
CDE2501 Liveable Cities	4	Technical Elective 1	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	Technical Elective 2	4
MLE3111A Materials Properties and Processing Laboratory	2	GE	4
CDE2000 Creating Narratives	4		
<b>Sub-total</b>	<b>22</b>	<b>Sub-total</b>	<b>18</b>

\* Students who are exempted from MA1301 can take MA1513 and CE2407A in Semester 1.



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Poly-intake students with accredited diplomas will receive the following exemptions:

- DTK1234 Design Thinking (4 units)
- EG1311 Design & Make (4 units)
- EG3611A Industrial Attachment (10 units)
- Unrestricted electives (20 units)

**Recommended semester schedule – poly-intake students**

(for students who are not planning to upgrade to a Second Major)

Semester 1	Units	Semester 2	Units
MLE1001B Materials Science & Engineering Principles & Practice I	4	MLE2001A Materials Science & Engineering Principles & Practice I	4
GEA1000 Quantitative Reasoning with Data	4	CS1010E Programming Methodology	4
MA1301 Introductory Mathematics * (UE)	4	MA1511 Engineering Calculus	2
PC1201 Fundamentals of Physics (UE)	4	MA1512 Differential Equations for Engineering	2
GE	4	PF1101 Fundamentals of Project Management	4
		GE	4
		Group A/B course for Minor	4
<b>Sub-total</b>	<b>20</b>	<b>Sub-total</b>	<b>24</b>

Semester 3	Units	Semester 4	Units
MLE2102 Thermodynamics and Renewable Energy Technologies	4	MLE2105 Electronic Properties of Materials	4
MLE2103A Materials Kinetics and Processing	2	ES2631 Critique and Communication of Thinking and Design	4
MLE3101A Materials Characterization	3	IE2141 Systems Thinking & Dynamics	4
MLE3101 Materials Characterization Laboratory	3	GE	4
MA1513 Linear Algebra with Differential Equations	2	CDE3301/EG3301R Ideas to Proof-of-Concept	6
CE2407A Uncertainty Analysis for Engineers	2		
EG2401A Engineering Professionalism	2		
Group A/B course for Minor	4		
<b>Sub-total</b>	<b>22</b>	<b>Sub-total</b>	<b>22</b>

Semester 5	Units	Semester 6	Units
MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4	MLE4101B B.Eng. Dissertation or MLE4102A Design Project	4
EE2211 Introduction to Machine Learning	4	MLE3112 Machine Learning Approaches in Materials Laboratory	2
CDE2501 Liveable Cities	4	Technical Elective 1	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	Technical Elective 2	4
MLE3111A Materials Properties and Processing Laboratory	2	CDE2000 Creating Narratives	4
CDE3301/EG3301R Ideas to Proof-of-Concept	6		
<b>Sub-total</b>	<b>24</b>	<b>Sub-total</b>	<b>18</b>

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- Unrestricted electives (20 units)