NUS Innovation & Design Programme
College of Design and Engineering

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

Cohort AY2024/2025

Course Requirements	Units
Common Curriculum	
GEA1000 Quantitative Reasoning with Data	4
CS1010E Programming Methodology	4
ES2631 Critique and Communication of Thinking and Design [1]	4
GEC: Cultures and Connections [1]	4
GEN: Communities and Engagement [1]	4
CDE2501 Liveable Cities [1, 2]	4
DTK1234 Design Thinking	4
EE2211 Introduction to Machine Learning or EE2213 Introduction to Artificial Intelligence	4
EG1311 Design and Make	4
PF1101 Fundamentals of Project Management or PF1101A Project Management and Finance	4
Additional technical courses for Engineering major [3]	12
MLE4101B B.Eng. Dissertation or MLE4102A Design Project (over 2 consecutive semesters) [4]	8
Sub-total for Common Curriculum	**60**
Engineering Core	
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 or CFG2101 NUS Vacation Internship Programme [5] and EG3612 Vacation Industrial Attachment	10
Sub-total for Engineering Core	**20**
Engineering Programme Requirements	
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
Sub-total for Engineering Programme Requirements	**40**
Unrestricted Electives	
Group A course for Minor	4
Group B course for Minor	4
CDE3301 Ideas to Proof-of-Concept (over 2 consecutive semesters)	12
Other unrestricted electives [4]	20
Sub-total for Unrestricted Electives	**40**
Total	**160**

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Notes:

[1] Students may read equivalent courses in NUS College (NUSC), University Town College Programme (UTCP), and Ridge View Residential Programme (RVRC).

[2] Students who are not in NUSC, UTCP or RVRC but have read another GESS Singapore Studies course prior to CDE2501 must still complete CDE2501.

[3] Students who have already read CDE2000 Creating Narratives and/or IE2141 Systems Thinking and Dynamics must still complete the 12 units of additional technical courses from their Engineering major.

The latest list of additional technical course may be found on this website: https://cde.nus.edu.sg/undergraduate/curriculum-structure/

Poly-intake students and those in the Engineering Scholars Programme only need to complete 8 units of additional technical course. The remaining 4 units may be fulfilled by CDE2501 (if not in NUSC/UTCP/RVRC and using another course to fulfil Singapore Studies), CDE2000, IE2141, or a third additional technical course.

[4] Students may take CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up in lieu of MLE4101B/MLE4102A and 4 units of unrestricted electives

[5] May be replaced by CDE2605 Undergraduate Research Opportunities Programme or CDE2605R Undergraduate Research Experience (UREx).

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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 and 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
Sub-total	**20**	**Sub-total**	**20**

Summer vacation between Semesters 2 and 3	Units
CFG2101 NUS Vacation Internship Programme	4
Sub-total	**4**

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 or EE2213 Introduction to Artificial Intelligence	4	Additional technical course 1	4
EG2401A Engineering Professionalism	2	GEC/GEN	4
GEC/GEN	4	CDE3301 Ideas to Proof-of-Concept	6
Group A/B course for Minor	4		
Sub-total	**22**	**Sub-total**	**22**

Summer vacation between Semesters 4 and 5	Units
EG3612 Vacation Internship Attachment	6
Sub-total	**6**

Semester 5	Units	Semester 6 – can be used for SEP	Units
CDE3301 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
Additional technical course 2	4	UE	4
Sub-total	**18**	**Sub-total**	**20**

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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	UE	4
Additional technical course 3	4	UE	4
Sub-total	**14**	**Sub-total**	**14**

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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 and 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
Sub-total	**20**	**Sub-total**	**20**

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 or EE2213 Introduction to Artificial Intelligence	4	Additional technical course 1	4
EG2401A Engineering Professionalism	2	GEC/GEN	4
GEC/GEN	4	CDE3301 Ideas to Proof-of-Concept	6
Group A/B course for Minor	4		
Sub-total	**22**	**Sub-total**	**22**

Semester 5	Units	Semester 6	Units
CDE3301 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		
Additional technical course 2	4		
UE	4		
Sub-total	**22**	**Sub-total**	**10**

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
Additional technical course 3	4	Technical Elective 2	4
UE	4	UE	4
UE	4	UE	4
Sub-total	**22**	**Sub-total**	**22**

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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 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
Sub-total	**24**	**Sub-total**	**28**

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		
Additional technical course 1	4		
UTCP course 3 (replaces CDE2501)	4		
CDE3301 Ideas to Proof-of-Concept	6		
Sub-total	**26**	**Sub-total**	**20**

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	Additional technical course 2	4
MLE3111A Materials Properties and Processing Laboratory	2	UE	4
UE	2		
Sub-total	**26**	**Sub-total**	**24**

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

- CS1010E Programming Methodology (4 units)
- EG1311 Design and Make (4 units)
- MA1505 Mathematics I (4 units) – replaces MA1511 Engineering Calculus (2 units) and counted as UE (2 units)

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A one-semester NOC programme comprises the following courses (up to 20 units):

- ETP3201S 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)

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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 Ideas to Proof-of-Concept	6
		Group A/B course for Minor	4
Sub-total	**20**	**Sub-total**	**26**

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	Additional technical course 1	4
MLE3101 Materials Characterization Laboratory	3	GEC/GEN	4
MA1513 Linear Algebra with Differential Equations	2	GEC/GEN	4
CE2407A Uncertainty Analysis for Engineers	2		
EG2401A Engineering Professionalism	2		
CDE3301 Ideas to Proof-of-Concept	6		
Sub-total	**24**	**Sub-total**	**20**

Semester 5	Units	Semester 6	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
EE2211 Introduction to Machine Learning or EE2213 Introduction to Artificial Intelligence	4	Technical Elective 2	4
Additional technical course 2	4	CDE2501 Liveable Cities	4
Additional technical course 3	4		
Sub-total	**22**	**Sub-total**	**18**

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

(updated 16 July 2025)

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

- DTK1234 Design Thinking (4 units)
- EG1311 Design and Make (4 units)
- EG3611P Industrial Attachment (10 units)
- Unrestricted electives (20 units)

(updated 16 July 2025)

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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
GEC/GEN	4	PF1101 Fundamentals of Project Management	4
		GEC/GEN	4
		Group A/B course for Minor	4
Sub-total	**20**	**Sub-total**	**24**

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	Additional technical course 1	4
MLE3101 Materials Characterization Laboratory	3	CDE2501 Liveable Cities	4
MA1513 Linear Algebra with Differential Equations	2	CDE3301 Ideas to Proof-of-Concept	6
CE2407A Uncertainty Analysis for Engineers	2		
EG2401A Engineering Professionalism	2		
Group A/B course for Minor	4		
Sub-total	**22**	**Sub-total**	**22**

Semester 5	Units	Semester 6	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
Additional technical course 2	4	Technical Elective 2	4
Additional technical course 3	4	EE2211 Introduction to Machine Learning	4
CDE3301 Ideas to Proof-of-Concept	6		
Sub-total	**24**	**Sub-total**	**18**

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

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

- DTK1234 Design Thinking (4 units)
- EG1311 Design and Make (4 units)
- EG3611P Industrial Attachment (10 units)
- Unrestricted electives (20 units)

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