Innovation & Design Programme
NUS College of Design and Engineering

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

Cohorts AY2021/2022 and AY2022/2023

Modular Requirements	Modular Credits (MCs)
Common Curriculum	
GEA1000 Quantitative Reasoning with Data [1]	4
CS1010E Programming Methodology	4
ES2631 Critique and Communication of Thinking and Design [1]	4
GE: Cultures and Connections [1]	4
GE: Singapore Studies [1]	4
GE: Communities and Engagement [1]	4
CDE2000 Creating Narratives	4
DTK1234 Design Thinking	4
EE2211 Introduction to Machine Learning	4
EG1311 Design and Make	4
EG2501 Liveable Cities	4
IE2141 Systems Thinking and Dynamics	4
PF1101 Fundamentals of Project Management	4
EG4301 DCP Dissertation or EG4301A Ideas to Start-up (over 2 consecutive semesters) [2]	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 [3] 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 Principles of Renewable Energy	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 module for Second Major	4
Group B module for Second Major	4
Group C modules for Second Major (Innovation & Enterprise electives)	8
EG3301R DCP Project (over 2 consecutive semesters)	12
EG4301 DCP Dissertation or EG4301A Ideas to Start-up (over 2 consecutive semesters) [2]	4

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Other unrestricted electives	8
Sub-total for Unrestricted Electives	**40**
Total	**160**

Notes:

[1] Students may read equivalent modules in USP/NUSC, UTCP, and RVRC.

[2] The 12 MCs for EG4301/EG4301A are counted towards 8 MCs for the Integrated Project requirement in the Common Curriculum while 4 MCs are counted as unrestricted elective.

[3] May be replaced by EG2605 Undergraduate Research Opportunities Programme.

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

Semester 1	MCs	Semester 2	MCs
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 module for Second Major	4
Sub-total	**20**	**Sub-total**	**20**

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

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	MLE2105 Electronic Properties of Materials	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	4
EG2501 Liveable Cities	4	IE2141 Systems Thinking & Dynamics	4
EG2401A Engineering Professionalism	2	GE	4
GE	4	EG3301R DCP Project	6
Group B module for Second Major	4		
Sub-total	**22**	**Sub-total**	**22**

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

Semester 5	MCs	Semester 6 – can be used for SEP	MCs
EG3301R DCP Project	6	Innovation & Enterprise Elective 1	4
MLE2103A Materials Kinetics and Processing	2	Innovation & Enterprise Elective 2	4
MLE3101A Materials Characterization	3	Technical Elective 1	4
MLE3101 Materials Characterization Laboratory	3	Technical Elective 2	4
GE	4	UE	4
Sub-total	**18**	**Sub-total**	**20**

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Semester 7	MCs	Semester 8	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	UE	4
MLE3111A Materials Properties and Processing Laboratory	2		
MLE3112 Machine Learning Approaches in Materials Laboratory	2		
CDE2000 Creating Narratives	4		
Sub-total	**18**	**Sub-total**	**10**

(updated 26 May 2022)

Innovation & Design Programme
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Recommended semester schedule – JC-intake students or equivalent
(for students who opt for vacation internships plus a specialisation)

Semester 1	MCs	Semester 2	MCs
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 module for Second Major	4
Sub-total	**20**	**Sub-total**	**20**

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

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	MLE2105 Electronic Properties of Materials	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	4
EG2501 Liveable Cities	4	IE2141 Systems Thinking & Dynamics	4
EG2401A Engineering Professionalism	2	GE	4
GE	4	EG3301R DCP Project	6
Group B module for Second Major	4		
Sub-total	**22**	**Sub-total**	**22**

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

Semester 5	MCs	Semester 6 – can be used for SEP	MCs
EG3301R DCP Project	6	Innovation & Enterprise Elective 1	4
MLE2103A Materials Kinetics and Processing	2	Innovation & Enterprise Elective 2	4
MLE3101A Materials Characterization	3	Specialisation module 1	4
MLE3101 Materials Characterization Laboratory	3	Specialisation module 2	4
GE	4	Specialisation module 3	4
Sub-total	**18**	**Sub-total**	**20**

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Semester 7	MCs	Semester 8	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	Specialisation module 4	4
MLE3111A Materials Properties and Processing Laboratory	2	Specialisation module 5	4
MLE3112 Machine Learning Approaches in Materials Laboratory	2		
CDE2000 Creating Narratives	4		
Sub-total	**18**	**Sub-total**	**14**

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

Semester 1	MCs	Semester 2	MCs
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 module for Second Major	4
Sub-total	**20**	**Sub-total**	**20**

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	MLE2105 Electronic Properties of Materials	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	4
EG2501 Liveable Cities	4	IE2141 Systems Thinking & Dynamics	4
EG2401A Engineering Professionalism	2	GE	4
GE	4	EG3301R DCP Project	6
Group B module for Second Major	4		
Sub-total	**22**	**Sub-total**	**22**

Semester 5	MCs	Semester 6	MCs
EG3301R DCP Project	6	EG3611A Industrial Attachment	10
MLE2103A Materials Kinetics and Processing	2		
MLE3101A Materials Characterization	3		
MLE3101 Materials Characterization Laboratory	3		
GE	4		
UE	4		
Sub-total	**22**	**Sub-total**	**10**

Semester 7	MCs	Semester 8	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
Innovation & Enterprise Elective 1	4	Innovation & Enterprise Elective 2	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	Technical Elective 1	4
MLE3111A Materials Properties and Processing Laboratory	2	Technical Elective 2	4
MLE3112 Machine Learning Approaches in Materials Laboratory	2	UE	4
CDE2000 Creating Narratives	4		
Sub-total	**22**	**Sub-total**	**22**

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

Semester 1	MCs	Semester 2	MCs
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 module for Second Major	4
Sub-total	**20**	**Sub-total**	**20**

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	MLE2105 Electronic Properties of Materials	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	4
EG2501 Liveable Cities	4	IE2141 Systems Thinking & Dynamics	4
EG2401A Engineering Professionalism	2	GE	4
GE	4	EG3301R DCP Project	6
Group B module for Second Major	4		
Sub-total	**22**	**Sub-total**	**22**

Semester 5	MCs	Semester 6	MCs
EG3301R DCP Project	6	EG3611A Industrial Attachment	10
MLE2103A Materials Kinetics and Processing	2	Specialisation module 2	4
MLE3101A Materials Characterization	3		
MLE3101 Materials Characterization Laboratory	3		
GE	4		
Specialisation module 1	4		
Sub-total	**22**	**Sub-total**	**14**

Semester 7	MCs	Semester 8	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
Innovation & Enterprise Elective 1	4	Innovation & Enterprise Elective 2	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	Specialisation module 3	4
MLE3111A Materials Properties and Processing Laboratory	2	Specialisation module 4	4
MLE3112 Machine Learning Approaches in Materials Laboratory	2	Specialisation module 5	4
CDE2000 Creating Narratives	4		
Sub-total	**22**	**Sub-total**	**22**

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Innovation & Design Programme
NUS College of Design and Engineering

Recommended semester schedule – JC-intake students or equivalent
(for students in year-long NOC programmes)

Semester 1	MCs	Semester 2	MCs
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 module for Second Major	4
Sub-total	**20**	**Sub-total**	**20**

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	MLE2105 Electronic Properties of Materials	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	4
EG2501 Liveable Cities	4	IE2141 Systems Thinking & Dynamics	4
GE	4	GE	4
Group B module for Second Major	4	EG3301R DCP Project	6
Sub-total	**20**	**Sub-total**	**22**

Semester 5	MCs	Semester 6 – NOC	MCs
EG3301R DCP Project	6	NOC	
MLE2103A Materials Kinetics and Processing	2		
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		
Sub-total	**22**	**Sub-total**	**20**

Semester 7 – NOC	MCs	Semester 8	MCs
NOC		Technical Elective 1	4
		Technical Elective 2	4
		CDE2000 Creating Narratives	4
		GE	4
Sub-total	**20**	**Sub-total**	**16**

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A year-long NOC programme comprises the following modules:

- TR3201N Entrepreneurship Practicum (8 MCs) – replaces EG4301A (4 MCs out of 12 MCs) and UE (4 MCs)
- TR3202N Start-up Internship Programme (12 MCs) – replaces EG3611A (10 MCs) and EG2401A (2 MCs)
- TR3203N Start-up Case Study and Analysis (8 MCs) – replaces EG4301A (8 MCs out of 12 MCs)
- Entrepreneurship courses (up to 12 MCs) – replaces Innovation & Enterprise electives (up to 8 MCs) while the rest are counted as UE

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Innovation & Design Programme
NUS College of Design and Engineering

Recommended semester schedule – JC-intake students or equivalent
(for students in one-semester NOC programmes)

Semester 1	MCs	Semester 2	MCs
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 module for Second Major	4
Sub-total	**20**	**Sub-total**	**20**

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	MLE2105 Electronic Properties of Materials	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	4
EG2501 Liveable Cities	4	IE2141 Systems Thinking & Dynamics	4
GE	4	GE	4
Group B module for Second Major	4	EG3301R DCP Project	6
Sub-total	**20**	**Sub-total**	**22**

Semester 5	MCs	Semester 6 – NOC	MCs
EG3301R DCP Project	6	NOC	
MLE2103A Materials Kinetics and Processing	2		
MLE3101A Materials Characterization	3		
MLE3101 Materials Characterization Laboratory	3		
GE	4		
UE	4		
Sub-total	**22**	**Sub-total**	**20**

Semester 7	MCs	Semester 8	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	Technical Elective 1	4
MLE3111A Materials Properties and Processing Laboratory	2	Technical Elective 2	4
MLE3112 Machine Learning Approaches in Materials Laboratory	2	UE	4
CDE2000 Creating Narratives	4		
Sub-total	**18**	**Sub-total**	**18**

A one-semester NOC programme comprises the following modules:

- TR3202S Start-up Internship Programme (12 MCs) – replaces EG3611A (10 MCs) and EG2401A (2 MCs)
- TR3204 Entrepreneurship Practicum (4 MCs) – replaces Innovation & Enterprise Elective 1
- Entrepreneurship course (4 MCs) – replaces Innovation & Enterprise Elective 2

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

Semester 1	MCs	Semester 2	MCs
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	RC4 module 2 (replaces GE)	4
CE2407A Uncertainty Analysis for Engineers	2	EG3301R DCP Project	6
PF1101 Fundamentals of Project Management	4	Group A module for Second Major	4
RC4 module 1 (replaces GE)	4	UE (or IE2141 Systems Thinking & Dynamics if not in RC4)	4
Sub-total	**24**	**Sub-total**	**28**

Semester 3	MCs	Semester 4 – NOC	MCs
MLE2102 Principles of Renewable Energy	4	NOC	
EE2211 Introduction to Machine Learning	4		
EG2501 Liveable Cities	4		
RC4 module 3 (replaces GE)	4		
EG3301R DCP Project	6		
Group B module for Second Major	4		
Sub-total	**26**	**Sub-total**	**20**

Semester 5	MCs	Semester 6	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
RC4 module 4 (replaces ES2631 Critique and Communication of Thinking and Design)	4	Technical Elective 1	4
MLE2103A Materials Kinetics and Processing	2	Technical Elective 2	4
MLE3101A Materials Characterization	3	CDE2000 Creating Narratives	4
MLE3101 Materials Characterization Laboratory	3	UE	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	UE	2
MLE3111A Materials Properties and Processing Laboratory	2		
MLE3112 Machine Learning Approaches in Materials Laboratory	2		
Sub-total	**26**	**Sub-total**	**24**

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

- CS1010E Programming Methodology (4 MCs)
- MA1511 Engineering Calculus (2 MCs) – using MA1505 Mathematics I (remaining 2 MCs counted as UE)
- EG1311 Design & Make (4 MCs)

A one-semester NOC programme comprises the following modules:

- TR3202S Start-up Internship Programme (12 MCs) – replaces EG3611A (10 MCs) and EG2401A (2 MCs)
- TR3204 Entrepreneurship Practicum (4 MCs) – replaces Innovation & Enterprise Elective 1
- Entrepreneurship course (4 MCs) – replaces Innovation & Enterprise Elective 2

Students who are not going on NOC must read EG2101 Pathways to Engineering Leadership in lieu of EG2401A.

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Recommended semester schedule – poly-intake students
(for students who are not required to take MA1301 and PC1201)

Semester 1	MCs	Semester 2	MCs
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
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	EG3301R DCP Project	6
Group A module for Second Major	4	Group B module for Second Major	4
Sub-total	**20**	**Sub-total**	**22**

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	Innovation & Enterprise Elective 1	4
MLE2103A Materials Kinetics and Processing	2	MLE2105 Electronic Properties of Materials	4
MLE3101A Materials Characterization	3	ES2631 Critique and Communication of Thinking and Design	4
MLE3101 Materials Characterization Laboratory	3	IE2141 Systems Thinking & Dynamics	4
EE2211 Introduction to Machine Learning	4	GE	4
EG2401A Engineering Professionalism	2	GE	4
EG3301R DCP Project	6		
Sub-total	**24**	**Sub-total**	**24**

Semester 5	MCs	Semester 6	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
EG2501 Liveable Cities	4	Innovation & Enterprise Elective 2	4
MLE3103 Materials Design: Aerospace to Biomedical Applications	4	Technical Elective 1	4
MLE3111A Materials Properties and Processing Laboratory	2	Technical Elective 2	4
MLE3112 Machine Learning Approaches in Materials Laboratory	2	GE	4
CDE2000 Creating Narratives	4		
Sub-total	**22**	**Sub-total**	**22**

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

- EG1311 Design & Make (4 MCs)
- DTK1234 Design Thinking (4 MCs)
- EG3611A Industrial Attachment (10 MCs)
- Unrestricted elective modules (20 MCs)

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Innovation & Design Programme
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Recommended semester schedule – poly-intake students
(for students who are required to take MA1301 and PC1201)

Semester 1	MCs	Semester 2	MCs
MLE1001B Materials Science & Engineering Principles & Practice I	4	MLE2001A Materials Science & Engineering Principles & Practice I	4
MA1301 Introductory Mathematics (UEM)	4	GEA1000 Quantitative Reasoning with Data	4
PC1201 Fundamentals of Physics (UEM)	4	CS1010E Programming Methodology	4
PF1101 Fundamentals of Project Management	4	MA1511 Engineering Calculus	2
Group A module for Second Major	4	MA1512 Differential Equations for Engineering	2
		EG3301R DCP Project	6
		Group B module for Second Major	4
Sub-total	**20**	**Sub-total**	**26**

Semester 3	MCs	Semester 4	MCs
MLE2102 Principles of Renewable Energy	4	Innovation & Enterprise Elective 1	4
MLE2103A Materials Kinetics and Processing	2	MLE2105 Electronic Properties of Materials	4
MLE3101A Materials Characterization	3	ES2631 Critique and Communication of Thinking and Design	4
MLE3101 Materials Characterization Laboratory	3	IE2141 Systems Thinking & Dynamics	4
MA1513 Linear Algebra with Differential Equations	2	GE	4
CE2407A Uncertainty Analysis for Engineers	2	GE	4
EG2401A Engineering Professionalism	2		
EG3301R DCP Project	6		
Sub-total	**24**	**Sub-total**	**24**

Semester 5	MCs	Semester 6	MCs
EG4301 DCP Dissertation	6	EG4301 DCP Dissertation	6
EE2211 Introduction to Machine Learning	4	Innovation & Enterprise Elective 2	4
EG2501 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
MLE3112 Machine Learning Approaches in Materials Laboratory	2		
CDE2000 Creating Narratives	4		
Sub-total	**26**	**Sub-total**	**22**

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

- EG1311 Design & Make (4 MCs)
- DTK1234 Design Thinking (4 MCs)
- EG3611A Industrial Attachment (10 MCs)
- Unrestricted elective modules (20 MCs)

(updated 26 May 2022)