NUS Innovation & Design Programme
College of Design and Engineering

Bachelor of Engineering (Chemical Engineering) with Second Major 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
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up (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	
CN1101A Chemical Engineering Principles and Practice I	4
CN2102 Chemical Engineering Principles and Practice II	4
CN2103 Mass and Energy Balance	4
CN2104 Chemical Engineering Thermodynamics	4
CN2105 Reaction Engineering	4
CN2106 Fluid Mechanics and Heat Transfer	4
CN3103 Mass Transfer and Separation Processes	4
CN3104 Computer-Aided Chemical Process Simulation	4
CN4101 Process Control and Safety	4
CN4102 Chemical Engineering Lab	4
Sub-total for Engineering Programme Requirements	**40**
Unrestricted Electives	
Group A course for Second Major	4
Group B course for Second Major	4
Group C courses for Second Major (Innovation & Enterprise electives)	8
CDE3301 Ideas to Proof-of-Concept (over 2 consecutive semesters)	12
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up (over 2 consecutive semesters) [4]	4

(updated 15 July 2025)

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

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.

[2] The 12 units for CDE4301/CDE4301A are counted towards 8 units for the Integrated Project requirement in the Common Curriculum while 4 units are counted as unrestricted elective.

[3] 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
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	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 Second Major	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
CN2103 Mass & Energy Balance	4	CN2105 Reaction Engineering	4
CN2104 Chemical Engineering Thermodynamics	4	CN2106 Fluid Mechanics & Heat Transfer	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
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
Sub-total	**20**	**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	Innovation & Enterprise Elective 1	4
CN3103 Mass Transfer and Separation Processes	4	Additional technical course 3	4
CN3104 Computer-Aided Chemical Process Simulation	4	GEC/GEN	4
EG2401A Engineering Professionalism	2	GEC/GEN	4
Additional technical course 2	4	UE	4
Sub-total	**20**	**Sub-total**	**20**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6	CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6
CN4101 Process Control and Safety	4	Innovation & Enterprise Elective 2	4
UE	4	CN4102 Chemical Engineering Lab	4
Sub-total	**14**	**Sub-total**	**14**

(updated 15 July 2025)

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

Semester 1	Units	Semester 2	Units
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	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 Second Major	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
CN2103 Mass & Energy Balance	4	CN2105 Reaction Engineering	4
CN2104 Chemical Engineering Thermodynamics	4	CN2106 Fluid Mechanics & Heat Transfer	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
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
Sub-total	**20**	**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
EG3301R Ideas to Proof-of-Concept	6	Innovation & Enterprise Elective 1	4
CN3103 Mass Transfer and Separation Processes	4	Additional technical course 3	4
CN3104 Computer-Aided Chemical Process Simulation	4	GEC/GEN	4
EG2401A Engineering Professionalism	2	GEC/GEN	4
Additional technical course 2	4	Specialisation course 1	4
Sub-total	**20**	**Sub-total**	**20**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6	CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6
CN4101 Process Control and Safety	4	Innovation & Enterprise Elective 2	4
Specialisation course 2	4	CN4102 Chemical Engineering Lab	4
Specialisation course 3	4	CN4119 Final Year Design Project [#]	8
Sub-total	**18**	**Sub-total**	**22**

(updated 15 July 2025)

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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
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	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 Second Major	4
Sub-total	**20**	**Sub-total**	**20**

Semester 3	Units	Semester 4	Units
CN2103 Mass & Energy Balance	4	CN2105 Reaction Engineering	4
CN2104 Chemical Engineering Thermodynamics	4	CN2106 Fluid Mechanics & Heat Transfer	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
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
Sub-total	**20**	**Sub-total**	**22**

Semester 5	Units	Semester 6	Units
CDE3301 Ideas to Proof-of-Concept	6	EG3611A Industrial Attachment	10
CN3103 Mass Transfer and Separation Processes	4		
CN3104 Computer-Aided Chemical Process Simulation	4		
EG2401A Engineering Professionalism	2		
Additional technical course 2	4		
GEC/GEN	4		
Sub-total	**24**	**Sub-total**	**10**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6	CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6
Innovation & Enterprise Elective 1	4	Innovation & Enterprise Elective 2	4
CN4101 Process Control and Safety	4	CN4102 Chemical Engineering Lab	4
Additional technical course 3	4	UE	4
GEC/GEN	4	UE	4
Sub-total	**22**	**Sub-total**	**22**

(updated 15 July 2025)

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Recommended semester schedule – JC-intake students or equivalent

(for students who opt for industrial attachment plus a specialisation)

Semester 1	Units	Semester 2	Units
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	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 Second Major	4
		GEC/GEN	4
Sub-total	**20**	**Sub-total**	**24**

Semester 3	Units	Semester 4	Units
CN2103 Mass & Energy Balance	4	CN2105 Reaction Engineering	4
CN2104 Chemical Engineering Thermodynamics	4	CN2106 Fluid Mechanics & Heat Transfer	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
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
GEC/GEN	4		
Sub-total	**24**	**Sub-total**	**22**

Semester 5	Units	Semester 6	Units
CDE3301 Ideas to Proof-of-Concept	6	EG3611A Industrial Attachment	10
CN3103 Mass Transfer and Separation Processes	4	Specialisation course 1	4
CN3104 Computer-Aided Chemical Process Simulation	4		
EG2401A Engineering Professionalism	2		
Additional technical course 2	4		
Additional technical course 3	4		
Sub-total	**24**	**Sub-total**	**14**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6	CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6
Innovation & Enterprise Elective 1	4	Innovation & Enterprise Elective 2	4
CN4101 Process Control and Safety	4	CN4102 Chemical Engineering Lab	4
Specialisation course 2	4	CN4119 Final Year Design Project [#]	8
Specialisation course 3	4		
Sub-total	**22**	**Sub-total**	**22**

[#] May be replaced by Specialisation Elective 4 and Specialisation Elective 5 if CN4119 is not compulsory.

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NUS Innovation & Design Programme
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Recommended semester schedule – JC-intake students or equivalent

(for students in year-long NOC programmes)

Semester 1	Units	Semester 2	Units
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	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 Second Major	4
Sub-total	**20**	**Sub-total**	**20**

Semester 3	Units	Semester 4	Units
CN2103 Mass & Energy Balance	4	CN2105 Reaction Engineering	4
CN2104 Chemical Engineering Thermodynamics	4	CN2106 Fluid Mechanics & Heat Transfer	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
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
Sub-total	**20**	**Sub-total**	**22**

Semester 5	Units	Semester 6 – NOC	Units
CDE3301 Ideas to Proof-of-Concept	6	NOC	
CN3103 Mass Transfer and Separation Processes	4		
CN3104 Computer-Aided Chemical Process Simulation	4		
Additional technical course 2	4		
GEC/GEN	4		
Sub-total	**22**	**Sub-total**	**20**

Semester 7 – NOC	Units	Semester 8	Units
NOC		CN4101 Process Control and Safety	4
		CN4102 Chemical Engineering Lab	4
		Additional technical course 3	4
		GEC/GEN	4
Sub-total	**20**	**Sub-total**	**16**

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A year-long NOC programme comprises the following courses (up to 40 units):

- ETP3206L Innovation & Enterprise Internship (16 units) – replaces EG3611A (10 units), EG2401A (2 units), and UE (4 units)
- ETP3202L Innovation & Enterprise Case Study & Analysis (8 units) – replaces CDE4301A (8 units out of 12 units)
- ETP3203L Innovation & Enterprise Internship Practicum (8 units) – replaces CDE4301A (4 units out of 12 units) and UE (4 units)
- Entrepreneurship courses (up to 8 units) – replaces Innovation & Enterprise electives (up to 8 units – students will need to complete additional Innovation & Enterprise Electives in NUS if they are unable to complete 8 units of entrepreneurship courses during NOC)

(updated 15 July 2025)

NUS Innovation & Design Programme
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Recommended semester schedule – JC-intake students or equivalent

(for students in one-semester NOC programmes)

Semester 1	Units	Semester 2	Units
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	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 Second Major	4
Sub-total	**20**	**Sub-total**	**20**

Semester 3	Units	Semester 4	Units
CN2103 Mass & Energy Balance	4	CN2105 Reaction Engineering	4
CN2104 Chemical Engineering Thermodynamics	4	CN2106 Fluid Mechanics & Heat Transfer	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
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
Sub-total	**20**	**Sub-total**	**22**

Semester 5	Units	Semester 6 – NOC	Units
CDE3301 Ideas to Proof-of-Concept	6	NOC	
CN3103 Mass Transfer and Separation Processes	4		
CN3104 Computer-Aided Chemical Process Simulation	4		
Additional technical course 2	4		
GEC/GEN	4		
Sub-total	**22**	**Sub-total**	**20**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6	CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6
CN4101 Process Control and Safety	4	CN4102 Chemical Engineering Lab	4
Additional technical course 3	4	UE	4
GEC/GEN	4	UE	4
Sub-total	**18**	**Sub-total**	**18**

A one-semester NOC programme comprises the following courses (up to 40 units):

- ETP3201S Innovation & Enterprise Internship (12 units) – replaces EG3611A (10 units) and EG2401A (2 units)
- ETP3204S Innovation & Enterprise Internship Practicum (4 units) – replaces Innovation & Enterprise Elective 1 (4 units)
- Entrepreneurship course (4 units) – replaces Innovation & Enterprise Elective 2 (4 units)

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Recommended semester schedule – JC-intake students or equivalent

(for students in Engineering Scholars Programme)

Semester 1	Units	Semester 2	Units
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	4
CN2103 Mass & Energy Balance	4	CN2104 Chemical Engineering Thermodynamics	4
GEA1000 Quantitative Reasoning with Data	4	MA1512 Differential Equations for Engineering	2
DTK1234 Design Thinking	4	PF1101 Fundamentals of Project Management	4
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
UTCP course 1 (replaces GE)	4	Group A/B course for Second Major	4
Sub-total	**24**	**Sub-total**	**28**

Semester 3	Units	Semester 4 – NOC	Units
CN2105 Reaction Engineering	4	NOC	
CN2106 Fluid Mechanics & Heat Transfer	4		
CN3103 Mass Transfer and Separation Processes	4		
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
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6	CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6
Group A/B course for Second Major	4	CN4101 Process Control and Safety	4
UTCP course 4 (replaces ES2631 Critique and Communication of Thinking and Design)	4	CN4102 Chemical Engineering Lab	4
Additional technical course 2	4	Additional technical course 3	4
CN3104 Computer-Aided Chemical Process Simulation	4	UE	4
EE2211 Introduction to Machine Learning or EE2213 Introduction to Artificial Intelligence	4	UE	2
Sub-total	**26**	**Sub-total**	**24**

Students are highly encouraged to 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) – replaces Innovation & Enterprise Elective 1 (4 units)
- Entrepreneurship course (4 units) – replaces Innovation & Enterprise Elective 2 (4 units)

(updated 15 July 2025)

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Recommended semester schedule – poly-intake students

Semester 1	Units	Semester 2	Units
CN1101A Chemical Engineering Principles and Practice I	4	CN2102 Chemical Engineering Principles and Practice II	4
GEA1000 Quantitative Reasoning with Data	4	CS1010E Programming Methodology	4
PF1101 Fundamentals of Project Management	4	MA1511 Engineering Calculus	2
MA1301 Introductory Mathematics * (UE)	4	MA1512 Differential Equations for Engineering	2
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
		Group A/B course for Second Major	4
Sub-total	**20**	**Sub-total**	**22**

Semester 3	Units	Semester 4	Units
CN2103 Mass & Energy Balance	4	CN2105 Reaction Engineering	4
CN2104 Chemical Engineering Thermodynamics	4	CN2106 Fluid Mechanics & Heat Transfer	4
MA1513 Linear Algebra with Differential Equations *	2	ES2631 Critique and Communication of Thinking and Design	4
CE2407A Uncertainty Analysis for Engineers *	2	Additional technical course 2	4
CDE2501 Liveable Cities	4	GEC/GEN	4
Additional technical course 1	4	GEC/GEN	4
CDE3301 Ideas to Proof-of-Concept	6		
Sub-total	**26**	**Sub-total**	**24**

Semester 5	Units	Semester 6	Units
CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6	CDE4301 Innovation & Design Capstone or CDE4301A Ideas to Start-up	6
CN3103 Mass Transfer and Separation Processes	4	Innovation & Enterprise Elective 1	4
CN3104 Computer-Aided Chemical Process Simulation	4	Innovation & Enterprise Elective 2	4
CN4101 Process Control and Safety	4	CN4102 Chemical Engineering Lab	4
EE2211 Introduction to Machine Learning or EE2213 Introduction to Artificial Intelligence	4	Additional technical course 3	4
EG2401A Engineering Professionalism	2		
Sub-total	**24**	**Sub-total**	**22**

* 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)
- EG3611A Industrial Attachment (10 units)
- Unrestricted electives (20 units)

(updated 15 July 2025)