Innovation & Design Programme
NUS 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
GE: Cultures and Connections [1]	4
GE: Singapore Studies [1]	4
GE: Communities and Engagement [1]	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
CDE4301 Innovation & Design Capstone or CDE4301A 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	
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) [2]	4

(updated 10 July 2024)

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] 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.

The 12 units for CDE4301/CDE4301A will be fully counted as UE for students who are pursuing a specialisation with CN4119 Final Year Design Project (8 units) as a compulsory requirement to fulfil Integrated Project.

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

Innovation & Design Programme
NUS College of Design and Engineering

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 & 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	IE2141 Systems Thinking & Dynamics	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	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	GE *	4
CN3104 Computer-Aided Chemical Process Simulation	4	GE *	4
EG2401A Engineering Professionalism	2	GE *	4
CDE2000 Creating Narratives	4	UE	4
Sub-total	**20**	**Sub-total**	**20**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	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**

* Students in UTCP and RVRC will need to overload in Semesters 2 to 4 in order to clear these courses earlier.

(updated 10 July 2024)

Innovation & Design Programme
NUS College of Design and Engineering

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 & 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	IE2141 Systems Thinking & Dynamics	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	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	GE	4
CN3104 Computer-Aided Chemical Process Simulation	4	GE	4
EG2401A Engineering Professionalism	2	GE	4
CDE2000 Creating Narratives	4	Specialisation course 1	4
Sub-total	**20**	**Sub-total**	**20**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	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**

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

(updated 10 July 2024)

Innovation & Design Programme
NUS College of Design and Engineering

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 & 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	IE2141 Systems Thinking & Dynamics	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	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		
CDE2000 Creating Narratives	4		
GE *	4		
Sub-total	**24**	**Sub-total**	**10**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	6
Innovation & Enterprise Elective 1	4	Innovation & Enterprise Elective 2	4
CN4101 Process Control and Safety	4	CN4102 Chemical Engineering Lab	4
GE *	4	UE	4
GE *	4	UE	4
Sub-total	**22**	**Sub-total**	**22**

* Students in UTCP and RVRC will need to overload in Semesters 2 to 4 in order to clear these courses earlier.

(updated 10 July 2024)

Innovation & Design Programme
NUS College of Design and Engineering

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 & 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
		GE	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	IE2141 Systems Thinking & Dynamics	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	4
Group A/B course for Second Major	4	CDE3301 Ideas to Proof-of-Concept	6
GE	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		
CDE2000 Creating Narratives	4		
GE *	4		
Sub-total	**24**	**Sub-total**	**14**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	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**

* Students in UTCP and RVRC will need to overload in Semesters 2 to 4 in order to clear these courses earlier.

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

(updated 10 July 2024)

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	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 & 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	IE2141 Systems Thinking & Dynamics	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	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		
CDE2000 Creating Narratives	4		
GE *	4		
Sub-total	**22**	**Sub-total**	**22**

Semester 7 – NOC	Units	Semester 8	Units
NOC		CN4101 Process Control and Safety	4
		CN4102 Chemical Engineering Lab	4
		GE *	4
		GE *	4
		UE	2
Sub-total	**20**	**Sub-total**	**18**

* Students in UTCP and RVRC will need to overload in Semesters 2 to 4 in order to clear these courses earlier.

A year-long NOC programme comprises the following courses:

- 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)

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- ETP2271 Discovering Resilience and Purpose (2 units) – counted as UE (2 units)
- Entrepreneurship courses (4 or 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)

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	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 & 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	IE2141 Systems Thinking & Dynamics	4
EE2211 Introduction to Machine Learning	4	ES2631 Critique and Communication of Thinking and Design	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		
CDE2000 Creating Narratives	4		
GE *	4		
Sub-total	**22**	**Sub-total**	**22**

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	6
CN4101 Process Control and Safety	4	CN4102 Chemical Engineering Lab	4
GE *	4	UE	4
GE *	4	UE	2
Sub-total	**18**	**Sub-total**	**16**

* Students in UTCP and RVRC will need to overload in Semesters 2 to 4 in order to clear these courses earlier.

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) – replaces Innovation & Enterprise Elective 1 (4 units)
- Entrepreneurship course (4 units) – replaces Innovation & Enterprise Elective 2 (4 units)
- ETP2271 Discovering Resilience and Purpose (2 units) – counted as UE (2 units)

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Innovation & Design Programme
NUS College of Design and Engineering

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
CDE2501 Liveable Cities	4	NOC	
CN2105 Reaction Engineering	4		
CN2106 Fluid Mechanics & Heat Transfer	4		
CN3103 Mass Transfer and Separation Processes	4		
UTCP course 3 (replaces GE)	4		
CDE3301 Ideas to Proof-of-Concept	6		
Sub-total	**26**	**Sub-total**	**22**

Semester 5	Units	Semester 6	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	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
CDE2000 Creating Narratives	4	UE	4
CN3104 Computer-Aided Chemical Process Simulation	4	UE (or IE2141 Systems Thinking & Dynamics if not in RC4)	4
EE2211 Introduction to Machine Learning	4		
Sub-total	**26**	**Sub-total**	**22**

Students are highly encouraged to 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) – replaces Innovation & Enterprise Elective 1 (4 units)
- Entrepreneurship course (4 units) – replaces Innovation & Enterprise Elective 2 (4 units)
- ETP2271 Discovering Resilience and Purpose (2 units) – counted as UE (2 units)

(updated 10 July 2024)

Innovation & Design Programme
NUS College of Design and Engineering

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	IE2141 Systems Thinking & Dynamics	4
CE2407A Uncertainty Analysis for Engineers *	2	ES2631 Critique and Communication of Thinking and Design	4
CDE2000 Creating Narratives	4	GE	4
CDE2501 Liveable Cities	4	GE	4
CDE3301 Ideas to Proof-of-Concept	6		
Sub-total	**26**	**Sub-total**	**24**

Semester 5	Units	Semester 6	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	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	4	GE	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 & Make (4 units)
- EG3611A Industrial Attachment (10 units)
- Unrestricted electives (20 units)

(updated 10 July 2024)