# Bachelor of Engineering (Environmental Engineering) with Second Major in Innovation & Design

# Cohort AY2023/2024

Course Requirements	Units
Common Curriculum	
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
CDE4301 Innovation & Design Capstone <u>or</u> CDE4301A Ideas to Start-up	8
(over 2 consecutive semesters) <sup>2</sup>	
Sub-total for Common Curriculum	60
Engineering Core	
MA1511 Engineering Calculus	2
MA1512 Differential Equations for Engineering	2
MA1512 Linear Algebra with Differential Equations	2
CE2407A Uncertainty Analysis for Engineers	2
EG2401A Engineering Professionalism	2
EG3611A Industrial Attachment <u>or</u>	10
CFG2101 NUS Vacation Internship Programme <sup>3</sup> and EG3612 Vacation Industrial	
Attachment	
Sub-total for Engineering Core	20
Engineering Programme Requirements	
ESE2101 Environmental Science and Engineering Principles and Practice	4
ESE2102 Principles and Practice in Environmental Monitoring	4
ESE2000 Chemistry for An Environmentally Sustainable Future	4
ESE2001 Environmental Challenges in the Anthropocene	4
ESE3101 Resource Management and Circular Economy	4
ESE3201 Air Quality in Changing Environment	4
ESE3301 Microbiology in Natural and Built Environment	4
ESE3401 Sustainable Urban Water Technology	4
Technical electives	8
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/EG3301R Ideas to Proof-of-Concept (over 2 consecutive semesters)	12
CDE4301 Innovation & Design Capstone <u>or</u> CDE4301A Ideas to Start-up	4
(over 2 consecutive semesters) <sup>2</sup>	
Other unrestricted electives	8
Sub-total for Unrestricted Electives	40
Total	160

#### 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> 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.
- <sup>3</sup> May be replaced by CDE2605 Undergraduate Research Opportunities Programme or CDE2605R Undergraduate Research Experience (UREx).

(for students who opt for vacation internships)

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and	4	ESE2102 Principles and Practice in	4
Engineering Principles and Practice	4	Environmental Monitoring	4
GEA1000 Quantitative Reasoning with	4	CC1010E Drogramming Mathedalagy	4
Data	4	CS1010E Programming Methodology	4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential	2		2
Equations	2	MA1511 Engineering Calculus	2
CE2407A Uncertainty Analysis for	2	MA1512 Differential Equations for	2
Engineers	2	Engineering	2
PF1101 Fundamentals of Project	4	Crown A/D course for Second Major	4
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
ESE2000 Chemistry for An	4	ESE3101 Resource Management and	Δ
Environmentally Sustainable Future	4	Circular Economy	4
ESE2001 Environmental Challenges in the	4	ESE3301 Microbiology in Natural and	4
Anthropocene	4	Built Environment	4
CD2501 Liveable Cities	4	ES2631 Critique and Communication of	4
CD2501 Liveable Cities	4	Thinking and Design	4
EE2211 Introduction to Machine	4	IE2141 Systems Thinking & Dynamics	4
Learning		122141 Systems minking & Bynamics	-
EG2401A Engineering Professionalism	2	CDE3301/EG3301R Ideas to Proof-of-	6
	Z	Concept	0
Group A/B course for Second Major	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/EG3301R Ideas to Proof-of-	6	Innovation & Enterprise Elective 1	4
Concept	U	milovation & Enterprise Elective 1	7
ESE3201 Air Quality in Changing	4	GE	4
Environment	4		4
ESE3401 Sustainable Urban Water	4	GE	4
Technology	4	GE	4
GE	4	UE	4
		UE	4
Sub-total	18	Sub-total	20

#### Innovation & Design Programme NUS College of Design and Engineering

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	6
Technical Elective 1	4	Innovation & Enterprise Elective 2	4
CDE2000 Creating Narratives	4	Technical Elective 2	4
Sub-total	14	Sub-total	14

(for students who opt for vacation internships plus a specialisation)

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and	4	ESE2102 Principles and Practice in	4
Engineering Principles and Practice	4	Environmental Monitoring	4
GEA1000 Quantitative Reasoning with	4	CS1010E Programming Methodology	4
Data	4		4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential	2	MA1511 Engineering Calculus	2
Equations	Z		Z
CE2407A Uncertainty Analysis for	2	MA1512 Differential Equations for	2
Engineers	Z	Engineering	2
PF1101 Fundamentals of Project	4	Group A/B course for Second Major	4
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
ESE2000 Chemistry for An	4	ESE3101 Resource Management and	Δ
Environmentally Sustainable Future	4	Circular Economy	4
ESE2001 Environmental Challenges in the	4	ESE3301 Microbiology in Natural and	Λ
Anthropocene	4	Built Environment	4
CD2501 Liveable Cities	4	ES2631 Critique and Communication of	4
CD2501 Liveable Cities	4	4 Thinking and Design	4
EE2211 Introduction to Machine	4	IE2141 Systems Thinking & Dynamics	4
Learning	4	122141 Systems minking & Dynamics	-
EG2401A Engineering Professionalism	2	CDE3301/EG3301R Ideas to Proof-of-	6
EG2401A Engineering Professionalism	Z	Concept	0
Group A/B course for Second Major	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/EG3301R Ideas to Proof-of-	6	Innovation & Enterprise Elective 1	4
Concept	0		4
ESE3201 Air Quality in Changing	4	GE	4
Environment	4		4
ESE3401 Sustainable Urban Water	4	GE	4
Technology	4	SE	4
GE	4	Specialisation course 1	4
		Specialisation course 2	4
Sub-total	18	Sub-total	20

#### Innovation & Design Programme NUS College of Design and Engineering

Semester 7	Units	Semester 8	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	6
Specialisation course 3	4	Innovation & Enterprise Elective 2	4
Specialisation course 4	4	Specialisation course 5	4
CDE2000 Creating Narratives	4		
Sub-total	18	Sub-total	14

(for students who opt for industrial attachment)

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and	4	ESE2102 Principles and Practice in	Δ
Engineering Principles and Practice	4	Environmental Monitoring	4
GEA1000 Quantitative Reasoning with	4	CS1010E Programming Methodology	4
Data	4		4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential	2	2 MA1511 Engineering Calculus	2
Equations	Z		Z
CE2407A Uncertainty Analysis for	2	MA1512 Differential Equations for	2
Engineers	Z	Engineering	2
PF1101 Fundamentals of Project	4	Group A/B course for Second Major	4
Management	4	Group A/B course for Second Major	4
Sub-total	20	Sub-total	20

Semester 3	Units	Semester 4	Units
ESE2000 Chemistry for An	4	ESE3101 Resource Management and	4
Environmentally Sustainable Future	4	Circular Economy	4
ESE2001 Environmental Challenges in the	1	ESE3301 Microbiology in Natural and	4
Anthropocene	4	Built Environment	4
CD2501 Liveable Cities	4	ES2631 Critique and Communication of	4
CD2501 Liveable Cities		Thinking and Design	
EE2211 Introduction to Machine	4	IE2141 Systems Thinking & Dynamics	4
Learning	4	122141 Systems minking & Dynamics	4
EG2401A Engineering Professionalism	2	CDE3301/EG3301R Ideas to Proof-of-	6
EG2401A Engineering Professionalism	Z	Concept	0
Group A/B course for Second Major	4		
Sub-total	22	Sub-total	22

Semester 5	Units	Semester 6	Units
CDE3301/EG3301R Ideas to Proof-of- Concept	6	EG3611A Industrial Attachment	10
ESE3201 Air Quality in Changing Environment	4		
ESE3401 Sustainable Urban Water Technology	4		
GE *	4		
GE *	4		
Sub-total	22	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
Technical Elective 1	4	Technical Elective 2	4
CDE2000 Creating Narratives	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.

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

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and	4	ESE2102 Principles and Practice in	4
Engineering Principles and Practice	4	Environmental Monitoring	4
GEA1000 Quantitative Reasoning with	4	CS1010E Programming Methodology	4
Data	4		4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential	2	MA1511 Engineering Calculus	2
Equations	Z		2
CE2407A Uncertainty Analysis for	2	MA1512 Differential Equations for	2
Engineers	2	Engineering	2
PF1101 Fundamentals of Project	4	Group A/B course for Second Major	4
Management	4		4
Sub-total	20	Sub-total	20

Semester 3	Units	Semester 4	Units
ESE2000 Chemistry for An	4	ESE3101 Resource Management and	4
Environmentally Sustainable Future	4	Circular Economy	4
ESE2001 Environmental Challenges in the	Λ	ESE3301 Microbiology in Natural and	4
Anthropocene	4	Built Environment	4
CD2501 Liveable Cities	Λ	ES2631 Critique and Communication of	4
CD2501 Liveable Cities	4	Thinking and Design	
EE2211 Introduction to Machine	4	IE2141 Systems Thinking & Dynamics	4
Learning	4	122141 Systems minking & Dynamics	4
EG2401A Engineering Professionalism	2	CDE3301/EG3301R Ideas to Proof-of-	6
EG2401A Engineering Professionalism	2	Concept	0
Group A/B course for Second Major	4		
Sub-total	22	Sub-total	22

Semester 5	Units	Semester 6	Units
CDE3301/EG3301R Ideas to Proof-of- Concept	6	EG3611A Industrial Attachment	10
ESE3201 Air Quality in Changing Environment	4	Specialisation course 1	4
ESE3401 Sustainable Urban Water Technology	4		
GE *	4		
GE *	4		
Sub-total	22	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
Specialisation course 2	4	Specialisation course 3	4
CDE2000 Creating Narratives	4	Specialisation course 4	4
GE *	4	Specialisation course 5	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.

(for students in year-long NOC programmes)

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and	4	ESE2102 Principles and Practice in	Δ
Engineering Principles and Practice	4	Environmental Monitoring	4
GEA1000 Quantitative Reasoning with	4	CS1010E Programming Methodology	4
Data	4		4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential	2	2 MA1511 Engineering Calculus	2
Equations	Z		Z
CE2407A Uncertainty Analysis for	2	MA1512 Differential Equations for	2
Engineers	Z	Engineering	2
PF1101 Fundamentals of Project	4	Group A/B course for Second Major	4
Management	4	Group A/B course for Second Major	4
Sub-total	20	Sub-total	20

Semester 3	Units	Semester 4	Units
ESE2000 Chemistry for An	4	ESE3101 Resource Management and	4
Environmentally Sustainable Future	4	Circular Economy	4
ESE2001 Environmental Challenges in the	4	ESE3301 Microbiology in Natural and	4
Anthropocene	4	Built Environment	4
CD2501 Liveable Cities	4	ES2631 Critique and Communication of	4
CD2501 Liveable Cities		Thinking and Design	
EE2211 Introduction to Machine	4	IE2141 Systems Thinking & Dynamics	4
Learning	4	122141 Systems minking & Dynamics	4
Group A/B course for Second Major	Λ	CDE3301/EG3301R Ideas to Proof-of-	6
Group Are course for second Major	4	Concept	0
Sub-total	20	Sub-total	22

Semester 5	Units	Semester 6 – NOC	Units
CDE3301/EG3301R Ideas to Proof-of-	6		
Concept			
ESE3201 Air Quality in Changing	4		
Environment	4	NOC	
ESE3401 Sustainable Urban Water	Δ	4	
Technology	4		
GE *	4		
GE *	4		
Sub-total	22	Sub-total	22

Semester 7 – NOC	Units	Semester 8	Units
		Technical Elective 1	4
		Technical Elective 2	4
NOC		CDE2000 Creating Narratives	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)
- 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)

(for students in one-semester NOC programmes)

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and	Λ	ESE2102 Principles and Practice in	4
Engineering Principles and Practice	4	Environmental Monitoring	4
GEA1000 Quantitative Reasoning with	1	CS1010E Programming Mathedalagy	4
Data	4	CS1010E Programming Methodology	4
DTK1234 Design Thinking	4	EG1311 Design & Make	4
MA1513 Linear Algebra with Differential	2	MA1511 Engineering Coloulus	2
Equations	Z	MA1511 Engineering Calculus	2
CE2407A Uncertainty Analysis for	2	MA1512 Differential Equations for	2
Engineers	Z	Engineering	Z
PF1101 Fundamentals of Project	4	Group A/B course for Second Major	4
Management	4	Group Arb course for second Major	4
Sub-total	20	Sub-total	20

Semester 3	Units	Semester 4	Units
ESE2000 Chemistry for An	4	ESE3101 Resource Management and	4
Environmentally Sustainable Future	4	Circular Economy	4
ESE2001 Environmental Challenges in the	4	ESE3301 Microbiology in Natural and	4
Anthropocene	4	Built Environment	4
CD2501 Liveable Cities	4	ES2631 Critique and Communication of	4
CD2501 Liveable Cities	4	Thinking and Design	4
EE2211 Introduction to Machine	4	IE2141 Systems Thinking & Dynamics	4
Learning	4	122141 Systems minking & Dynamics	4
Group A/B course for Second Major	4	CDE3301/EG3301R Ideas to Proof-of-	6
Group Are course for second Major	4	Concept	0
Sub-total	20	Sub-total	22

Semester 5	Units	Semester 6 – NOC	Units
CDE3301/EG3301R Ideas to Proof-of- Concept	6		
ESE3201 Air Quality in Changing Environment	4	NOC	
ESE3401 Sustainable Urban Water Technology	4	NOC	
GE	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
Technical Elective 1	4	Technical Elective 2	4
CDE2000 Creating Narratives	4	UE	4
GE	4	UE	2
Sub-total	18	Sub-total	16

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)

(for students in Engineering Scholars Programme)

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and	4	ESE2102 Principles and Practice in	4
Engineering Principles and Practice	4	Environmental Monitoring	4
GEA1000 Quantitative Reasoning with	4	ESE3101 Resource Management and	4
Data	4	Circular Economy	4
DTK1224 Decign Thinking	4	ESE3301 Microbiology in Natural and	4
DTK1234 Design Thinking		Built Environment	
MA1513 Linear Algebra with Differential	2	MA1512 Differential Equations for	2
Equations	2	Engineering	Z
CE2407A Uncertainty Analysis for	2	UTCP course 2 (replaces GE)	4
Engineers	2	orer course 2 (replaces GL)	4
PF1101 Fundamentals of Project	4	CDE3301/EG3301R Ideas to Proof-of-	6
Management	4	Concept	0
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
ESE2000 Chemistry for An	4		
Environmentally Sustainable Future	4		
ESE2001 Environmental Challenges in the	4		
Anthropocene	4		
ESE3201 Air Quality in Changing	4	NOC	
Environment	4	NOC	
CDE2501 Liveable Cities	4		
UTCP course 3 (replaces GE)	4		
CDE3301/EG3301R Ideas to Proof-of-	6		
Concept	D		
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	Technical Elective 1	4
UTCP course 4 (ES2631 Critique and Communication of Thinking and Design)	4	Technical Elective 2	4
CDE2000 Creating Narratives	4	UE	4
EE2211 Introduction to Machine Learning	4	UE (or IE2141 Systems Thinking & Dynamics if not in RC4)	4
ESE3401 Sustainable Urban Water Technology	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)

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)

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

Semester 1	Units	Semester 2	Units
ESE2101 Environmental Science and Engineering Principles and Practice	4	ESE2102 Principles and Practice in Environmental Monitoring	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	Group A/B course for Second Major	4
		CDE3301/EG3301R Ideas to Proof-of- Concept	6
Sub-total	20	Sub-total	22

Semester 3	Units	Semester 4	Units
ESE2000 Chemistry for An	4	ESE3101 Resource Management and	4
Environmentally Sustainable Future	4	Circular Economy	4
ESE2001 Environmental Challenges in the	4	ESE3301 Microbiology in Natural and	4
Anthropocene	4	Built Environment	4
MA1513 Linear Algebra with Differential	2	ES2631 Critique and Communication of	4
Equations *	Z	Thinking and Design	
CE2407A Uncertainty Analysis for	2	IE2141 Systems Thinking & Dynamics	4
Engineers *	Z		4
CDE2501 Liveable Cities	4	GE	4
EE2211 Introduction to Machine	4	4 GE	4
Learning	4	GE	4
CDE3301/EG3301R Ideas to Proof-of-	6		
Concept	0		
Sub-total	26	Sub-total	24

Semester 5	Units	Semester 6	Units
CDE4301 Innovation & Design Capstone	6	CDE4301 Innovation & Design Capstone	6
Innovation & Enterprise Elective 1	4	Innovation & Enterprise Elective 2	4
CDE2000 Creating Narratives	4	Technical Elective 1	4
ESE3201 Air Quality in Changing	4	Technical Elective 2	4
Environment	4		4
ESE3401 Sustainable Urban Water	4	4 GE	4
Technology	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)