CVENAH Civil Engineering

Introduction

This report shows how the CVENAH Civil Engineering stream of the 3707 Bachelor of Engineering (Honours) program at UNSW fosters the Engineers Australia Level 1 Graduate Competencies in its students. It starts by addressing the overall aims of the stream and its uniqueness. It then covers the stream plan followed by the Stream Learning Outcomes. The process for developing and obtaining feedback to improve these SLOs is detailed. This is followed by the curriculum mapping that relates the individual courses to the Stream Learning Outcomes, the Stream Learning Outcomes to the Graduate Capabilities and the individual courses to the Graduate Capabilities.

Aims of the Stream

The Civil Engineering stream prepares students to become responsible for projects that enhance overall quality of life. Students learn how to design, construct, manage, operate and maintain the infrastructure that supports modern society including buildings, bridges, roads and highways, tunnels, airfields, dams, ports and harbours, railways, new mines, water supply and sewerage schemes, irrigation systems and flood mitigation works. The profession is very broad and affords opportunities for involvement in many specialist activities.

In the final year of the Civil Engineering stream students may choose electives in structural engineering, geotechnical engineering, transport engineering, water engineering or engineering construction and management.

The program is normally taken on a four-year full-time basis and sits at level 8 in the Australian Qualifications Framework giving students advanced cognitive, technical and communication skills to allow them to demonstrate autonomy, well-developed judgement, adaptability, and responsibility.

The School of Civil and Environmental Engineering, which offers the stream, is the largest Civil and Environmental Engineering School in Australia and is rated as number one in the country across each one of Shanghai Jiao ARWU Rankings, QS World University Rankings, THE and US News Best Global Universities. The School has outstanding strengths in all areas of Civil Engineering, enabling it to offer a wide selection of electives in the final year when students choose their preferred areas of specialisation.

Stream Plan

Course code	Course name
Year 1	
Term 1	
DESN1000	Introduction to Engineering Design and Innovation

MATH1131 or MATH1141	Mathematics 1A Higher Mathematics 1A
PHYS1121 or PHYS1131	Physics 1A Higher Physics 1A
Term 2	
ENGG1300	Engineering Mechanics
MATH1231 or MATH1241	Mathematics 1B Higher Mathematics 1B
First Year Elective	Recommended: MATS1110 Materials and Chemistry
Term 3	
First Year Elective	Recommended: ENGG1400 Engineering Infrastructure Systems or GMAT 1110 Surveying and Geospatial Engineering
ENGG1811	Computing for Engineers
CVEN2101	Engineering Construction
Year 2	
Term 1	
ENGG2400	Mechanics of Solids 1
ENGG2500	Fluid Mechanics for Engineers
MATH2019	Engineering Mathematics 2E
Term 2	
CVEN2002	Civil and Environmental Engineering Computations
CVEN2303	Structural Analysis and Modelling
DESN2000	Engineering Design and Professional Practice
Term 3	
CVEN3101	Engineering Operations and Control
CVEN3202	Soil Mechanics
General Education	General Education
Year 3	
Term 1	
CVEN3303	Steel Structures
CVEN3501	Water Resources Engineering
CVEN3203	Applied Geotechnics and Engineering Geology
Term 2	
CVEN3401	Sustainable Transport and Highway Engineering
CVEN3304	Concrete Structures
CVEN3502	Water and Wastewater Engineering
Term 3	
Industrial Training	Industrial Training
Year 4	
Term 1	

CVEN4951 or CVEN4050	Research Thesis A Thesis A
CVEN Elective	CVEN Elective
CVEN Elective	CVEN Elective
Term 2	
CVEN4952 or CVEN4051	Research Thesis B Thesis B
CVEN Elective	CVEN Elective
General Education	General Education
Term 3	
CVEN4953	Research Thesis C
CVEN Elective	CVEN Elective
CVEN Elective	CVEN Elective

Stream Learning Outcomes

On successful completion of this stream, graduates will be able to:

Knowledge

1. Show proficiency in the enabling sciences (maths, physics and materials science) that underpin Civil Engineering

2. Demonstrate proficiency in Civil Engineering specialist technical knowledge areas such as: Structural Engineering, Geotechnical Engineering, Engineering Construction and Management, Transport Engineering and Water Engineering.

3. Critically evaluate, and apply information and current research to the solution of complex problems in Civil Engineering

Skills

4. Use appropriate design, analysis and computational tools, including: structural modelling and design programs, hydraulic modelling, simulation software, laboratory procedures and analysis, Australian Standards, industry design codes, management of digital data sets and project management and control tools to analyse complex problems in Civil Engineering

5. Design and implement innovative engineering solutions and systems in Civil Engineering

Application of Knowledge and Skills

6. Manage Civil Engineering projects, individually or as part of a team under a team leader, in a systematic and professional manner

7. Apply professional judgement that contributes to the ethical and sustainable practice of Civil Engineering

8. Communicate professionally and effectively in work teams, across the profession and the wider community.

Development of Stream Learning Outcomes

Initial development of the Stream Learning Outcomes (SLOs) involved a working party consisting of the Stream Coordinators for Civil Engineering (undergraduate), Civil Engineering (postgraduate) and Civil with Architecture. The draft was then presented to the School Teaching and Learning Committee (TLC) for discussion. This discussion included student opinion collected from representatives of the Civil and Environmental Engineering Student Society (CEVSOC). After including amendments from TLC, the draft was presented to the School Management Committee (SMC) for discussion. After approval from the SMC the draft was submitted to the Industry Advisory Committee (IAC) for comment. The final set of suggested improvements were received from the Faculty Accreditation Working Group (FAWG).

The final version of the SLOs incorporated all the comments from the TLC, SMC, IAC and FAWG. The final SLOs were then resubmitted to the TLC, SMC and IAC in turn for final endorsement.

Curriculum Mapping

Note on elective courses used in mapping: Students can select two electives in first year and five electives in fourth year.

For the first-year electives students are recommended to enrol in MATS1110 and either ENGG1400 or GMAT1110. The most popular elective choices are MATS1110 and GMAT1110 and so these have been included in the mapping.

Similarly, the fourth-year electives that have been included in the mapping are the most popular courses selected by the students enrolled in the stream.

Table 1. Mapping from courses to Stream Learning Outcomes

CVENAH Civil Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → SLO Mapping	Stream Learning Outcomes (SLOs)							
Courses (CO)	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8
DESN1000	0.0	0.0	0.0	0.0	43.8	39.2	0.0	17.1
ENGG1300	81.2	0.0	0.0	3.8	0.0	0.0	0.0	15.0
ENGG1400	36.7	10.0	0.0	20.0	6.7	0.0	6.7	20.0
ENGG1811	0.0	0.0	0.0	76.7	23.3	0.0	0.0	0.0
MATH1131	54.0	0.0	16.3	9.4	0.0	0.0	0.0	20.2
MATH1231	54.0	0.0	16.3	9.4	0.0	0.0	0.0	20.2
MATS1101	64.2	0.0	0.0	0.0	23.3	6.2	0.0	6.2
PHYS1121	98.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
CVEN2002	75.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0
CVEN2101	0.0	62.5	0.0	0.0	20.8	8.3	0.0	8.3
CVEN2303	20.6	45.6	0.0	25.0	0.0	4.4	0.0	4.4
DESN2000	0.0	15.0	14.0	0.0	4.0	27.0	10.0	30.0
ENGG2400	3.0	72.8	0.0	24.2	0.0	0.0	0.0	0.0
ENGG2500	11.9	59.6	0.0	15.9	0.0	12.6	0.0	0.0
MATH2018	36.7	0.0	26.7	36.7	0.0	0.0	0.0	0.0
CVEN3101	0.0	50.0	0.0	16.7	16.7	0.0	16.7	0.0
CVEN3202	20.0	10.0	20.0	10.0	20.0	0.0	20.0	0.0
CVEN3203	20.0	20.0	0.0	20.0	20.0	0.0	0.0	20.0
CVEN3303	0.0	40.0	0.0	20.0	20.0	0.0	0.0	20.0
CVEN3304	14.2	17.9	0.0	34.0	34.0	0.0	0.0	0.0
CVEN3401	0.0	12.5	0.0	25.0	37.5	12.5	0.0	12.5
CVEN3501	0.0	12.5	0.0	50.0	12.5	0.0	25.0	0.0
CVEN3502	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0
CVEN4050	0.0	0.0	20.0	0.0	4.0	40.0	26.0	10.0
CVEN4051	0.0	0.0	17.8	0.0	8.9	22.2	13.3	37.8
CVEN4102	0.0	25.0	0.0	0.0	50.0	12.5	0.0	12.5
CVEN4301	0.0	23.8	15.8	15.8	39.6	0.0	0.0	5.0
CVEN4309	0.0	25.0	25.0	25.0	25.0	0.0	0.0	0.0
CVEN4402	0.0	30.0	0.0	50.0	20.0	0.0	0.0	0.0
CVEN4404	0.0	33.4	13.7	33.4	4.9	9.7	4.9	0.0

Table 2. Mapping from Stream Learning Outcomes to EA Stage 1 Graduate Capabilities

CVENAH Civil Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Engineers Australia Stage 1 Competencies

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SLO → GC Mapping	Engineers Australia Stage 1 Competencies															
Learning Outcomes (LO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
SLO1 Show proficiency in th...	✓	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLO2 Demonstrate proficienc...	-	-	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
SLO3 Critically evaluate, a...	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
SLO4 Use appropriate design...	-	-	-	-	-	-	✓	✓	-	-	-	-	-	✓	-	-
SLO5 Design and implement i...	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SLO6 Manage Civil Engineeri...	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	✓
SLO7 Apply professional jud...	-	-	-	-	✓	✓	-	-	-	-	✓	-	-	-	-	-
SLO8 Communicate profession...	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-

Table 3. Mapping from courses to EA Stage 1 Graduate Capabilities

CVENAH Civil Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Curriculum Mapping	Engineers Australia Stage 1 Competencies															
Courses (CO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
DESN1000	-	-	-	-	-	-	-	-	43.8	9.8	-	17.1	9.8	-	9.8	9.8
ENGG1300	40.6	40.6	-	-	-	-	1.2	1.2	-	-	-	15.0	-	1.2	-	-
ENGG1400	18.3	18.3	5.0	-	7.2	2.2	6.7	6.7	6.7	-	2.2	20.0	-	6.7	-	-
ENGG1811	-	-	-	-	-	-	25.6	25.6	23.3	-	-	-	-	25.6	-	-
MATH1131	27.0	27.0	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
MATH1231	27.0	27.0	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
MATS1101	32.1	32.1	-	-	-	-	-	-	23.3	1.6	-	6.2	1.6	-	1.6	1.6
PHYS1121	49.0	49.0	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-
CVEN2002	37.5	37.5	-	-	-	-	8.3	8.3	-	-	-	-	-	8.3	-	-
CVEN2101	-	-	31.2	-	31.2	-	-	-	20.8	2.1	-	8.3	2.1	-	2.1	2.1
CVEN2303	10.3	10.3	22.8	-	22.8	-	8.3	8.3	-	1.1	-	4.4	1.1	8.3	1.1	1.1
DESN2000	-	-	7.5	14.0	10.8	3.3	-	-	4.0	6.8	3.3	30.0	6.8	-	6.8	6.8
ENGG2400	1.5	1.5	36.4	-	36.4	-	8.1	8.1	-	-	-	-	-	8.1	-	-
ENGG2500	6.0	6.0	29.8	-	29.8	-	5.3	5.3	-	3.1	-	-	3.1	5.3	3.1	3.1
MATH2018	18.3	18.3	-	26.7	-	-	12.2	12.2	-	-	-	-	-	12.2	-	-
CVEN3101	-	-	25.0	-	30.6	5.6	5.6	5.6	16.7	-	5.6	-	-	5.6	-	-
CVEN3202	10.0	10.0	5.0	20.0	11.7	6.7	3.3	3.3	20.0	-	6.7	-	-	3.3	-	-
CVEN3203	10.0	10.0	10.0	-	10.0	-	6.7	6.7	20.0	-	-	20.0	-	6.7	-	-
CVEN3303	-	-	20.0	-	20.0	-	6.7	6.7	20.0	-	-	20.0	-	6.7	-	-
CVEN3304	7.1	7.1	9.0	-	9.0	-	11.3	11.3	34.0	-	-	-	-	11.3	-	-
CVEN3401	-	-	6.2	-	6.2	-	8.3	8.3	37.5	3.1	-	12.5	3.1	8.3	3.1	3.1
CVEN3501	-	-	6.2	-	14.6	8.3	16.7	16.7	12.5	-	8.3	-	-	16.7	-	-
CVEN3502	-	-	25.0	-	25.0	-	16.7	16.7	-	-	-	-	-	16.7	-	-
CVEN4050	-	-	-	20.0	8.7	8.7	-	-	4.0	10.0	8.7	10.0	10.0	-	10.0	10.0
CVEN4051	-	-	-	17.8	4.4	4.4	-	-	8.9	5.6	4.4	37.8	5.6	-	5.6	5.6
CVEN4102	-	-	12.5	-	12.5	-	-	-	50.0	3.1	-	12.5	3.1	-	3.1	3.1
CVEN4301	-	-	11.9	15.8	11.9	-	5.3	5.3	39.6	-	-	5.0	-	5.3	-	-
CVEN4309	-	-	12.5	25.0	12.5	-	8.3	8.3	25.0	-	-	-	-	8.3	-	-
CVEN4402	-	-	15.0	-	15.0	-	16.7	16.7	20.0	-	-	-	-	16.7	-	-
CVEN4404	-	-	16.7	13.7	18.3	1.6	11.1	11.1	4.9	2.4	1.6	-	2.4	11.1	2.4	2.4
Cognitive Scale	11.4	11.4	8.8	9.2	9.0	2.8	4.9	4.9	11.7	2.4	2.8	8.8	2.4	4.9	2.4	2.4

Reflection on Strengths Weaknesses and Future Action

Strengths

The stream is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, and design of innovative engineering solutions and systems. Thus, students will graduate with a sound ability to perform technical engineering work. The stream also rates well in terms of project management / teamwork skills and communication skills.

Weaknesses

The stream appears to have weaknesses in the areas of ethics and research skills. This is caused by those skills being developed in courses that also focus on other skills such as teamwork and communication and so the Cognitive Scale Contribution tends to be shared with these other skills.

Future Action

The School is in the process of implementing a strategic direction of embedding ethics more generally in the stream from start to finish, whereas previously the coverage of ethics had been concentrated in a smaller number of courses.

Assessment and Academic Integrity

Table 4. Assessment Map

CVENAH Civil Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → AT Mapping	Assessment Types (AT)											
Courses (CO)	Assi	Essa	Exam	Lab	Othe	Perf	Port	Pres	Proj	Repo	Test	Tut
DESN1000	-	5	-	-	20	-	15	15	-	45	-	-
ENGG1300	15	-	75	-	10	-	-	-	-	-	-	-
ENGG1400	40	-	40	-	-	-	-	-	-	-	20	-
ENGG1811	20	-	70	10	-	-	-	-	-	-	-	-
MATH1131	10	-	50	-	40	-	-	-	-	-	-	-
MATH1231	10	-	50	-	40	-	-	-	-	-	-	-
MATS1101	-	-	70	30	-	-	-	-	-	-	-	-
PHYS1121	-	-	50	20	30	-	-	-	-	-	-	-
CVEN2002	-	-	60	6	-	-	-	-	-	-	34	-
CVEN2101	40	-	60	-	-	-	-	-	-	-	-	-
CVEN2303	35	-	50	-	-	-	-	-	-	-	15	-
DESN2000	25	-	-	-	60	-	-	15	-	-	-	-
ENGG2400	15	-	50	-	15	-	-	-	-	-	20	-
ENGG2500	20	-	80	-	-	-	-	-	-	-	-	-
MATH2018	-	-	60	-	10	-	-	-	-	-	30	-
CVEN3101	-	-	60	-	-	-	-	-	-	-	40	-
CVEN3202	-	-	90	10	-	-	-	-	-	-	-	-
CVEN3203	25	-	70	-	5	-	-	-	-	-	-	-
CVEN3303	40	-	60	-	-	-	-	-	-	-	-	-
CVEN3304	35	-	55	-	-	-	-	-	-	-	10	-
CVEN3401	25	-	70	-	-	-	-	-	-	-	5	-
CVEN3501	30	-	70	-	-	-	-	-	-	-	-	-
CVEN3502	10	-	80	10	-	-	-	-	-	-	-	-
CVEN4050	-	-	-	-	-	-	-	-	-	100	-	-
CVEN4051	-	5	-	-	-	-	-	15	-	80	-	-
CVEN4102	20	-	80	-	-	-	-	-	-	-	-	-
CVEN4301	40	-	60	-	-	-	-	-	-	-	-	-
CVEN4309	-	-	100	-	-	-	-	-	-	-	-	-
CVEN4402	40	-	50	-	-	-	-	-	-	-	10	-
CVEN4404	40	-	60	-	-	-	-	-	-	-	-	-

For the technical courses in the stream 50% to 70% of the assessment is in the form of quizzes and exams (see Table 4). The remainder of the assessment is usually in the form of assignments, most commonly in a report format. Additionally, assessment in laboratories occurs in Materials, Soil and Water Engineering courses.

The enquiry-based courses, ie Thesis and Design courses, revolve around a major work of the thesis or design project, with draft sections of these works assessed as the course progresses to give the students formative feedback. Assessments such as posters, video presentations and interviews are also used to improve student communication skills and increase academic integrity.

The School has implemented many processes to ensure that academic integrity is maintained:

- All exam papers are reviewed by another academic. The reviewer will also be given the rubric and worked solution. When a paper is written by a new academic it will be reviewed by a professor or A/Prof to ensure standards are being maintained. Admin staff follow up to ensure all papers have been reviewed.
- Reports are submitted using TurnItIn, which ensures that students are not plagiarising or colluding.
- Academics provide rubrics and worked solutions to markers. In this case the academic will re-mark a sample of the reports or exam papers to ensure the rubric is being used correctly.
- Important works, such as thesis, will have two markers to ensure consistency.

Due to COVID all exams have moved online, so standard practices have been adopted including:

- Standard 10 minutes reading time and 20 minutes upload time (if required)
- Exams take place at a set time, so that students need to focus on their own exams
- The School has invested heavily in STACK, which allows randomised questions. New questions are written for each exam. Question papers are not reused. Since this is time intensive the School has employed a team of programmers to code the questions as specified in detail by the academics.
- Questions are Googled before and after the exam. Before ensures the questions are not easy to answer with simple searches. After ensures that the papers have not been uploaded during the exam.

Summary

A curriculum mapping exercise has been carried out for the CVENAH Civil Engineering stream of the 3707 Bachelor of Engineering (Honours) program at UNSW. The stream provides good coverage of all the Engineers Australia Stage 1 Graduate Competencies. It is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, and design of innovative engineering solutions and systems. Future direction for the stream involves working on embedding ethics more widely throughout the stream instead of focusing it in a limited number of courses. The stream has rigorous and varied assessment tasks, which have been updated and adapted to deal with the advent of COVID-19.

CVENBH Environmental Engineering

Introduction

This report shows how the CVENBH Environmental Engineering stream of the 3707 Bachelor of Engineering (Honours) program at UNSW fosters the Engineers Australia Level 1 Graduate Competencies in its students. It starts by addressing the

overall aims of the stream and its uniqueness. It then covers the stream plan followed by the Stream Learning Outcomes. The process for developing and obtaining feedback to improve these SLOs is detailed. This is followed by the curriculum mapping that relates the individual courses to the Stream Learning Outcomes, the Stream Learning Outcomes to the Graduate Capabilities and the individual courses to the Graduate Capabilities.

Aims of the Stream

The Environmental Engineering stream prepares students to manage the environmental impact of engineering activities. Students will be able to apply their broad knowledge of engineering and environmental processes in identifying environmental problems and in developing effective solutions to them. They also learn how to coordinate the activities of specialist groups such as biologists, ecologists and geologists within major projects. The discipline of environmental engineering embraces parts of civil engineering, with emphasis on management, systems design, water, geotechnical and transport engineering, together with aspects of chemical engineering, applied and biological sciences and environmental studies.

In the final year of the Environmental Engineering stream students may choose electives in Sustainability, Transport, Geotechnical Engineering, Water Engineering, Humanitarian Engineering and Engineering Construction and Management.

The program is normally taken on a four-year full-time basis and sits at level 8 in the Australian Qualifications Framework giving students advanced cognitive, technical and communication skills to allow them to demonstrate autonomy, well-developed judgement, adaptability, and responsibility.

The School of Civil and Environmental Engineering was the first to offer an Environmental Engineering degree in Australia, is the largest Civil and Environmental Engineering School in Australia and is rated as number one in the country across each one of Shanghai Jiao ARWU Rankings, QS World University Rankings, THE and US News Best Global Universities. The School has outstanding strength in all areas of water engineering, being ranked fifth in the world for water resources.

Stream Plan

Course code	Course name
Year 1	
Term 1	
DESN1000	Introduction to Engineering Design and Innovation
MATH1131 or MATH1141	Mathematics 1A Higher Mathematics 1A

PHYS1121 or PHYS1131	Physics 1A Higher Physics 1A
Term 2	
First Year Elective	Recommended: CVEN1701 Environmental Principles and Systems
MATH1231 or MATH1241	Mathematics 1B Higher Mathematics 1B
CHEM1811 or CHEM1011 or CHEM1031	Engineering Chemistry 1A Chemistry 1A: Atoms, Molecules and Energy Higher Chemistry 1A: Atoms, Molecules and Energy
Term 3	
CEIC2009	Material and Energy Balances in the Chemical Process Industry
ENGG1811	Computing for Engineers
First Year Elective	Recommended: ENGG1400 Engineering Infrastructure Systems
Year 2	
Term 1	
BIOS1301	Ecology, Sustainability and Environmental Science
ENGG2500	Fluid Mechanics for Engineers
MATH2019	Engineering Mathematics 2E
Term 2	
CVEN2002	Civil and Environmental Engineering Computations
DESN2000	Engineering Design and Professional Practice
CVEN2701	Water and Atmospheric Chemistry
Term 3	
CVEN3702	Solid Wastes and Contaminant Transport
CVEN3101	Engineering Operations and Control
CVEN3202	Soil Mechanics
Year 3	
Term 1	
CVEN3701	Environmental Frameworks, Law and Economics
CVEN3501	Water Resources Engineering
CVEN3203	Applied Geotechnics and Engineering Geology
Term 2	
CVEN3402	Transport Engineering and Environmental Sustainability
General Education	General Education
CVEN3502	Water and Wastewater Engineering
Term 3	
Industrial Training	Industrial Training
Year 4	

Term 1	
CVEN4951 or CVEN4050	Research Thesis A Thesis A
CVEN Elective	CVEN Elective
CVEN Elective	CVEN Elective
Term 2	
CVEN4701	Planning Sustainable Infrastructure
CVEN4952 or CVEN4051	Research Thesis B Thesis B
General Education	General Education
Term 3	
CVEN4953	Research Thesis C
CVEN Elective	CVEN Elective
CVEN Elective	CVEN Elective

Stream Learning Outcomes

On successful completion of this program, graduates will be able to:

Knowledge

1. Show proficiency in the enabling sciences (maths, chemistry, physics, sustainability, and ecology) that underpin Environmental Engineering.

2. Demonstrate expertise in Environmental Engineering specialist technical knowledge such as: sustainability assessment, regulatory and environmental frameworks, thermodynamics and contaminant fate and transport, water treatment and resources management, hydrology/hydraulics, wastewater and solid waste management and the intersection of human activities with the preservation and utilisation of the biosphere and its ecological functions, now and in the future under climate change.

3. Critically evaluate and apply current research and/or industry best practice to solve complex problems in Environmental Engineering

Skills

4. Use appropriate analytical and computational tools as well as data literacy and analysis to analyse complex problems in Environmental Engineering

5. Design and implement innovative and sustainable engineering solutions and systems in Environmental Engineering

Application of Knowledge and Skills

6. Lead and manage Environmental Engineering projects, individually or as part of a team, in a systematic and professional manner

7. Apply professional judgement that contributes to the ethical and sustainable practice of Environmental Engineering

8. Communicate professionally and effectively within and outside of the field of Environmental Engineering

Development of Stream Learning Outcomes

Initial development of the Stream Learning Outcomes (SLOs) involved a working party consisting of most of the staff teaching into the Environmental Engineering specific courses of the stream. The draft was then presented to the School Teaching and Learning Committee (TLC) for discussion. This discussion included student opinion collected from representatives of the Civil and Environmental Engineering Student Society (CEVSOC). After including amendments from TLC, the draft was presented to the School Management Committee (SMC) for discussion. After approval from the SMC the draft was submitted to the Industry Advisory Committee (IAC) for comment. The final set of suggested improvements were received from the Faculty Accreditation Working Group (FAWG).

The final version of the SLOs incorporated all the comments from the TLC, SMC, IAC and FAWG. The final SLOs were then resubmitted to the TLC, SMC and IAC in turn for final endorsement.

Curriculum Mapping

Note on elective courses used in mapping: Students can select two electives in first year and four electives in fourth year.

For the first-year electives students are recommended to enrol in CVEN1701 and ENGG1400 so these have been included in the mapping.

The fourth-year electives that have been included in the mapping are the most popular courses selected by the students enrolled in the stream.

Table 1. Mapping from courses to Stream Learning Outcomes

CVENBH Environmental Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → SLO Mapping	Stream Learning Outcomes (SLOs)							
Courses (CO)	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8
BIOS1301	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHEM1011	80.0	0.0	10.0	0.0	0.0	10.0	0.0	0.0
CVEN1701	0.0	43.8	0.0	51.2	5.0	0.0	0.0	0.0
DESN1000	0.0	0.0	0.0	0.0	43.8	39.2	0.0	17.1
ENGG1400	36.7	10.0	0.0	20.0	6.7	0.0	6.7	20.0
ENGG1811	0.0	0.0	0.0	76.7	23.3	0.0	0.0	0.0
MATH1131	37.7	0.0	16.3	9.4	0.0	0.0	0.0	20.2
MATH1231	54.0	0.0	16.3	9.4	0.0	0.0	0.0	20.2
PHYS1121	98.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
CEIC2009	20.0	60.0	0.0	20.0	0.0	0.0	0.0	0.0
CVEN2002	75.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0
CVEN2701	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
DESN2000	0.0	15.0	14.0	0.0	4.0	27.0	10.0	30.0
ENGG2500	11.9	59.6	0.0	15.9	0.0	12.6	0.0	0.0
MATH2018	36.7	0.0	26.7	36.7	0.0	0.0	0.0	0.0
CVEN3101	0.0	50.0	0.0	16.7	16.7	0.0	16.7	0.0
CVEN3202	20.0	20.0	20.0	0.0	20.0	0.0	20.0	0.0
CVEN3203	20.0	20.0	0.0	20.0	20.0	0.0	0.0	20.0
CVEN3402	0.0	40.1	0.0	49.4	10.6	0.0	0.0	0.0
CVEN3501	0.0	12.5	0.0	50.0	12.5	0.0	25.0	0.0
CVEN3502	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0
CVEN3701	0.0	41.7	0.0	25.0	8.3	0.0	8.3	16.7
CVEN3702	0.0	45.0	0.0	25.0	20.0	0.0	0.0	0.0
ENGG3001	0.0	28.1	0.0	16.7	5.6	0.0	39.7	10.0
CVEN4050	0.0	0.0	20.0	0.0	4.0	40.0	26.0	10.0
CVEN4051	0.0	0.0	17.8	0.0	8.9	22.2	13.3	37.8
CVEN4402	0.0	30.0	0.0	50.0	20.0	0.0	0.0	0.0
CVEN4507	11.5	25.7	11.5	17.2	19.9	0.0	14.2	0.0
CVEN4701	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
CVEN4703	33.3	66.7	0.0	0.0	0.0	0.0	0.0	0.0

Table 2. Mapping from Stream Learning Outcomes to EA Stage 1 Graduate Capabilities

CVENBH Environmental Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Engineers Australia Stage 1 Competencies

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SLO → GC Mapping	Engineers Australia Stage 1 Competencies															
Learning Outcomes (LO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
SLO1 Show proficiency in th...	✓	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLO2 Demonstrate expertise ...	-	-	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
SLO3 Critically evaluate an...	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
SLO4 Use appropriate analyt...	-	-	-	-	-	-	✓	✓	-	-	-	-	-	✓	-	-
SLO5 Design and implement i...	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SLO6 Lead and manage Enviro...	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	✓
SLO7 Apply professional iud...	-	-	-	-	✓	✓	-	-	-	-	✓	-	-	-	-	-
SLO8 Communicate profession...	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-

Bottom Margin

Table 3. Mapping from courses to EA Stage 1 Graduate Capabilities

CVENBH Environmental Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Curriculum Mapping	Engineers Australia Stage 1 Competencies															
Courses (CO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
BIOS1301	50.0	50.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHEM1011	40.0	40.0	-	10.0	-	-	-	-	-	2.5	-	-	2.5	-	2.5	2.5
CVEN1701	-	-	21.9	-	21.9	-	17.1	17.1	5.0	-	-	-	-	17.1	-	-
DESN1000	-	-	-	-	-	-	-	-	43.8	9.8	-	17.1	9.8	-	9.8	9.8
ENGG1400	18.3	18.3	5.0	-	7.2	2.2	6.7	6.7	6.7	-	2.2	20.0	-	6.7	-	-
ENGG1811	-	-	-	-	-	-	25.6	25.6	23.3	-	-	-	-	25.6	-	-
MATH1131	18.8	18.8	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
MATH1231	27.0	27.0	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
PHYS1121	49.0	49.0	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-
CEIC2009	10.0	10.0	30.0	-	30.0	-	6.7	6.7	-	-	-	-	-	6.7	-	-
CVEN2002	37.5	37.5	-	-	-	-	8.3	8.3	-	-	-	-	-	8.3	-	-
CVEN2701	25.0	25.0	25.0	-	25.0	-	-	-	-	-	-	-	-	-	-	-
DESN2000	-	-	7.5	14.0	10.8	3.3	-	-	4.0	6.8	3.3	30.0	6.8	-	6.8	6.8
ENGG2500	6.0	6.0	29.8	-	29.8	-	5.3	5.3	-	3.1	-	-	3.1	5.3	3.1	3.1
MATH2018	18.3	18.3	-	26.7	-	-	12.2	12.2	-	-	-	-	-	12.2	-	-
CVEN3101	-	-	25.0	-	30.6	5.6	5.6	5.6	16.7	-	5.6	-	-	5.6	-	-
CVEN3202	10.0	10.0	10.0	20.0	16.7	6.7	-	-	20.0	-	6.7	-	-	-	-	-
CVEN3203	10.0	10.0	10.0	-	10.0	-	6.7	6.7	20.0	-	-	20.0	-	6.7	-	-
CVEN3402	-	-	20.0	-	20.0	-	16.5	16.5	10.6	-	-	-	-	16.5	-	-
CVEN3501	-	-	6.2	-	14.6	8.3	16.7	16.7	12.5	-	8.3	-	-	16.7	-	-
CVEN3502	-	-	25.0	-	25.0	-	16.7	16.7	-	-	-	-	-	16.7	-	-
CVEN3701	-	-	20.8	-	23.6	2.8	8.3	8.3	8.3	-	2.8	16.7	-	8.3	-	-
CVEN3702	-	-	22.5	-	22.5	-	8.3	8.3	20.0	-	-	-	-	8.3	-	-
ENGG3001	-	-	14.0	-	27.3	13.2	5.6	5.6	5.6	-	13.2	10.0	-	5.6	-	-
CVEN4050	-	-	-	20.0	8.7	8.7	-	-	4.0	10.0	8.7	10.0	10.0	-	10.0	10.0
CVEN4051	-	-	-	17.8	4.4	4.4	-	-	8.9	5.6	4.4	37.8	5.6	-	5.6	5.6
CVEN4402	-	-	15.0	-	15.0	-	16.7	16.7	20.0	-	-	-	-	16.7	-	-
CVEN4507	5.8	5.8	12.8	11.5	17.6	4.7	5.8	5.8	19.9	-	4.7	-	-	5.8	-	-
CVEN4701	-	-	-	-	33.3	33.3	-	-	-	-	33.3	-	-	-	-	-
CVEN4703	16.7	16.7	33.3	-	33.3	-	-	-	-	-	-	-	-	-	-	-
Cognitive Scale	11.0	11.0	9.0	7.5	9.8	4.1	5.0	5.0	7.1	3.0	4.1	9.7	3.0	5.0	3.0	3.0

Reflection on Strengths Weaknesses and Future Action

Strengths

The stream is particularly strong in enabling sciences, specialist engineering knowledge, and the use of design, analysis and computation tools. Thus, students will graduate with a sound ability to assess the environmental impacts of engineering projects on environmental processes and society. The stream also rates well in terms of design of innovative engineering solutions and systems, so students will be able to address environmental issues with well-considered solutions.

Weaknesses

The stream appears to have weaknesses in the areas of project management and teamwork. This is caused by those skills being developed in courses that also focus on other skills such as research and communication and so the Cognitive Scale Contribution tends to be shared with these other skills.

Future Action

Whilst teamwork and project management skills appear weak because the courses assessing these skills also assess many other skills, the School is examining ways of incorporating these skills across a greater number of courses, especially given the importance of these skills to professional environmental engineers.

Assessment and Academic Integrity

Table 4. Assessment Map

CVENBH Environmental Engineering

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → AT Mapping — Assessment Types (AT)

Courses (CO)	Assi	Essa	Exam	Lab	Othe	Perf	Port	Pres	Proj	Repo	Test	Tut
BIOS1301	20	-	-	15	-	-	-	-	15	-	50	-
CHEM1011	-	-	40	20	-	-	-	-	-	-	40	-
CVEN1701	50	-	40	-	-	-	-	-	-	-	10	-
DESN1000	-	5	-	-	20	-	15	15	-	45	-	-
ENGG1400	40	-	40	-	-	-	-	-	-	-	20	-
ENGG1811	20	-	70	10	-	-	-	-	-	-	-	-
MATH1131	10	-	50	-	40	-	-	-	-	-	-	-
MATH1231	10	-	50	-	40	-	-	-	-	-	-	-
PHYS1121	-	-	50	20	30	-	-	-	-	-	-	-
CEIC2009	-	-	60	-	-	-	-	-	-	-	40	-
CVEN2002	-	-	60	6	-	-	-	-	-	-	34	-
CVEN2701	30	-	50	-	-	-	-	-	-	-	20	-
DESN2000	25	-	-	-	60	-	-	15	-	-	-	-
ENGG2500	20	-	80	-	-	-	-	-	-	-	-	-
MATH2018	-	-	60	-	10	-	-	-	-	-	30	-
CVEN3101	-	-	60	-	-	-	-	-	-	-	40	-
CVEN3202	-	-	90	10	-	-	-	-	-	-	-	-
CVEN3203	25	-	70	-	5	-	-	-	-	-	-	-
CVEN3402	-	-	70	-	-	-	-	-	-	-	30	-
CVEN3501	30	-	70	-	-	-	-	-	-	-	-	-
CVEN3502	10	-	80	10	-	-	-	-	-	-	-	-
CVEN3701	20	-	30	-	-	-	-	-	-	-	50	-
CVEN3702	40	-	60	-	-	-	-	-	-	-	-	-
ENGG3001	-	20	-	-	10	-	-	20	-	50	-	-
CVEN4050	-	-	-	-	-	-	-	-	-	100	-	-
CVEN4051	-	5	-	-	-	-	-	15	-	80	-	-
CVEN4402	40	-	50	-	-	-	-	-	-	-	10	-
CVEN4507	-	-	60	-	-	-	-	-	-	40	-	-
CVEN4701	40	-	-	-	-	-	-	15	-	30	15	-
CVEN4703	25	-	50	-	-	-	-	-	-	-	25	-

For the technical courses in the stream 40% to 70% of the assessment is in the form of quizzes and exams (see Table 4). The remainder of the assessment is usually in the form of assignments, most commonly in a report format. Additionally, assessment in laboratories occurs in Biology, Chemistry, Soil and Water Engineering courses.

The enquiry-based courses, ie Thesis and Design courses, revolve around a major work of the thesis or design project, with draft sections of these works assessed as the course progresses to give the students formative feedback. Assessments such as posters, video presentations and interviews are also used to improve student communication skills and increase academic integrity.

The School has implemented many processes to ensure that academic integrity is maintained:

- All exam papers are reviewed by another academic. The reviewer will also be given the rubric and worked solution. When a paper is written by a new academic it will be reviewed by a professor or A/Prof to ensure standards are being maintained. Admin staff follow up to ensure all papers have been reviewed.
- Reports are submitted using TurnItIn, which ensures that students are not plagiarising or colluding.
- Academics provide rubrics and worked solutions to markers. In this case the academic will re-mark a sample of the reports or exam papers to ensure the rubric is being used correctly.
- Important works, such as thesis, will have two markers to ensure consistency.

Due to COVID all exams have moved online, so standard practices have been adopted including:

- Standard 10 minutes reading time and 20 minutes upload time (if required)
- Exams take place at a set time, so that students need to focus on their own exams
- The School has invested heavily in STACK, which allows randomised questions. New questions are written for each exam. Question papers are not reused. Since this is time intensive the School has employed a team of programmers to code the questions as specified in detail by the academics.
- Questions are Googled before and after the exam. Before ensures the questions are not easy to answer with simple searches. After ensures that the papers have not been uploaded during the exam.

Summary

A curriculum mapping exercise has been carried out for the CVENBH Environmental Engineering stream of the 3707 Bachelor of Engineering (Honours) program at UNSW. The stream provides good coverage of all the Engineers Australia Stage 1 Graduate Competencies. It is particularly strong in enabling sciences, specialist engineering knowledge, and the use of design, analysis and computation tools. Future direction for the stream involves working on embedding ethics more widely throughout the stream instead of focusing it in a limited number of courses. The stream has rigorous and varied assessment tasks, which have been updated and adapted to deal with the advent of COVID-19.

CVENL1 Civil with Architecture

Introduction

This report shows how the CVENL1 Civil Engineering with Architecture stream of the 3635 Bachelor of Engineering (Honours) program at UNSW fosters the Engineers Australia Level 1 Graduate Competencies in its students. It starts by addressing the

overall aims of the stream and its uniqueness. It then covers the stream plan followed by the Stream Learning Outcomes. The process for developing and obtaining feedback to improve these SLOs is detailed. This is followed by the curriculum mapping that relates the individual courses to the Stream Learning Outcomes, the Stream Learning Outcomes to the Graduate Capabilities and the individual courses to the Graduate Capabilities.

Aims of the Program

The Civil Engineering with Architecture program extends the current Civil Engineering degree by the inclusion of a stream of courses in Architecture from the School of Built Environment. The Civil Engineering with Architecture program provides for an appreciation of architectural principles and an understanding of both the architect's role in construction and the interaction between architects and engineers. The ultimate aim is to help students become conceptual thinkers, inspired by beautiful creations to build even better ones, to develop an appreciation for beauty with the mathematical ability to challenge the traditional boundaries of structural design. Students graduating from this degree will be well qualified to collaborate with architects and other professionals in the built environment to produce integrated and sustainable design. Creativity and inventiveness are the key attributes of this program.

In the final year of the Civil Engineering with Architecture program students may choose electives in structural engineering, geotechnical engineering, transport engineering, water engineering or engineering construction and management, as well as architecture courses.

The program is normally taken on a four-year full-time basis and sits at level 8 in the Australian Qualifications Framework giving students advanced cognitive, technical and communication skills to allow them to demonstrate autonomy, well-developed judgement, adaptability, and responsibility.

The School of Civil and Environmental Engineering, which offers the stream, is the largest Civil and Environmental Engineering School in Australia and is rated as number one in the country across each one of Shanghai Jiao ARWU Rankings, QS World University Rankings, THE and US News Best Global Universities. The School has outstanding strengths in all areas of Civil Engineering, enabling it to offer a wide selection of electives in the final year when students choose their preferred areas of specialisation.

Stream Plan

Course code	Course name
Year 1	
Term 1	
ARCH1080	Introduction to Architecture and Enabling Skills

MATH1131 or MATH1141	Mathematics 1A Higher Mathematics 1A
PHYS1121 or PHYS1131	Physics 1A Higher Physics 1A
Term 2	
ENGG1300	Engineering Mechanics
BENV1015	History of Design Thinking
First Year Elective	Recommended: MATS1110 Materials and Chemistry
Term 3	
CVEN2101	Engineering Construction
DESN1000	Introduction to Engineering Design and Innovation
MATH1231 or MATH1241	Mathematics 1B Higher Mathematics 1B
Year 2	
Term 1	
ENGG2400	Mechanics of Solids 1
ENGG2500	Fluid Mechanics for Engineers
ARCH1101	Architectural Design Studio 1
Term 2	
CVEN2002	Civil and Environmental Engineering Computations
CVEN2303	Structural Analysis and Modelling
Arch Elective	Architecture Elective
Term 3	
ARCH1102	Architectural Design Studio 2
MATH2019	Engineering Mathematics 2E
CVEN3202	Soil Mechanics
Year 3	
Term 1	
CVEN3303	Steel Structures
CVEN3203	Applied Geotechnics and Engineering Geology
ARCH1201	Architectural Design Studio 3
Term 2	
Arch Elective	Architecture Elective
CVEN3304	Concrete Structures
CVEN3502	Water and Wastewater Engineering
Term 3	
CVEN3101	Engineering Operations and Control
CVEN Elective	CVEN Elective
Year 4	
Term 1	

CVEN4951 or CVEN4050	Research Thesis A Thesis A
BENV1010	Communication in the Built Environment
CVEN3501	Water Resources Engineering
Term 2	
CVEN4952 or CVEN4051	Research Thesis B Thesis B
CVEN4701	Planning Sustainable Infrastructure
CVEN Elective	CVEN Elective
Term 3	
CVEN4953	Research Thesis C

Stream Learning Outcomes

On successful completion of this program, graduates will be able to:

Knowledge

1. Show proficiency in the enabling sciences (maths, physics and materials science) that underpin Civil Engineering and Architecture

2. Demonstrate proficiency in Civil Engineering and Architectural specialist technical knowledge areas such as: Structural Engineering, Geotechnical Engineering, Engineering Construction and Management, Water Engineering and Architectural history and design.

3. Critically evaluate and apply information and current research to the solution of complex problems in Civil Engineering and Architecture.

Skills

4. Use appropriate design, analysis and computational tools, including: structural modelling and design programs, hydraulic modelling, simulation software, laboratory procedures and analysis, Australian Standards, industry design codes, management of digital data sets, project management and control tools, CAD and BIM, and physical model construction to analyse complex problems in Civil Engineering and Architecture

5. Design and implement innovative solutions and systems covering Civil Engineering and Architecture

Application of Knowledge and Skills

6. Manage Civil Engineering projects, individually or as part of a team under a team leader, and liaise with professional architects in a systematic and professional manner

7. Apply professional judgement that contributes to ethical and sustainable practices.

8. Communicate professionally and effectively in work teams, across the professions of engineering and architecture and the wider community.

Development of Stream Learning Outcomes

Initial development of the Stream Learning Outcomes (SLOs) involved a working party consisting of the Stream Coordinators for Civil Engineering (undergraduate), Civil Engineering (postgraduate) and Civil with Architecture. The draft was then presented to the School Teaching and Learning Committee (TLC) for discussion. This discussion included student opinion collected from representatives of the Civil and Environmental Engineering Student Society (CEVSOC). After including amendments from TLC, the draft was presented to the School Management Committee (SMC) for discussion. After approval from the SMC the draft was submitted to the Industry Advisory Committee (IAC) for comment. The final set of suggested improvements were received from the Faculty Accreditation Working Group (FAWG).

The final version of the SLOs incorporated all the comments from the TLC, SMC, IAC and FAWG. The final SLOs were then resubmitted to the TLC, SMC and IAC in turn for final endorsement.

Curriculum Mapping

Note on elective courses used in mapping: Students can select one elective in first year and two electives each from Civil Engineering and from Architecture in fourth year.

For the first-year elective students are recommended to enrol in MATS1110 so this has been included in the mapping.

Civil Engineering and Architecture electives that have been included in the mapping are the most popular courses in each of those categories selected by the students enrolled in the program.

Note: Since the Civil with Architecture Program is cross faculty it does not have a General Education requirement. Therefore 32 courses have been mapped.

Table 1. Mapping from courses to Stream Learning Outcomes

CVENL1 Civil Engineering with Architecture

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → SLO Mapping — Stream Learning Outcomes (SLOs)

Courses (CO)	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8
ARCH1080	0.0	25.0	25.0	12.5	0.0	0.0	25.0	12.5
ARCH1101	0.0	33.0	0.0	0.0	11.0	0.0	34.0	22.0
ARCH1102	0.0	30.0	0.0	10.0	30.0	0.0	10.0	20.0
ARCH1201	0.0	2.5	0.0	20.5	20.5	0.0	36.0	20.5
ARCH1222	0.0	25.0	20.0	0.0	0.0	0.0	5.0	50.0
BENV1010	0.0	0.0	0.0	38.3	13.3	0.0	0.0	48.3
BENV1015	0.0	38.8	33.8	0.0	0.0	0.0	0.0	27.5
DESN1000	0.0	0.0	0.0	0.0	43.8	39.2	0.0	17.1
ENGG1300	81.2	0.0	0.0	3.8	0.0	0.0	0.0	15.0
MATH1131	54.0	0.0	16.3	9.4	0.0	0.0	0.0	20.2
MATH1231	54.0	0.0	16.3	9.4	0.0	0.0	0.0	20.2
MATS1101	64.2	0.0	0.0	0.0	23.3	6.2	0.0	6.2
PHYS1121	98.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
CODE2170	0.0	30.0	0.0	22.5	12.5	25.0	0.0	10.0
CVEN2002	75.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0
CVEN2101	0.0	62.5	0.0	0.0	20.8	8.3	0.0	8.3
CVEN2303	20.6	45.6	0.0	25.0	0.0	4.4	0.0	4.4
ENGG2400	3.0	72.8	0.0	24.2	0.0	0.0	0.0	0.0
ENGG2500	11.9	59.6	0.0	15.9	0.0	12.6	0.0	0.0
MATH2018	36.7	0.0	26.7	36.7	0.0	0.0	0.0	0.0
CVEN3101	0.0	50.0	0.0	16.7	16.7	0.0	16.7	0.0
CVEN3202	20.0	10.0	20.0	10.0	20.0	0.0	20.0	0.0
CVEN3203	20.0	20.0	0.0	20.0	0.0	20.0	0.0	20.0
CVEN3303	0.0	40.0	0.0	20.0	20.0	0.0	0.0	20.0
CVEN3304	14.2	17.9	0.0	34.0	34.0	0.0	0.0	0.0
CVEN3501	0.0	12.5	0.0	50.0	12.5	0.0	25.0	0.0
CVEN3502	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0
CVEN4050	0.0	0.0	20.0	0.0	4.0	40.0	26.0	10.0
CVEN4051	0.0	0.0	17.8	0.0	8.9	22.2	13.3	37.8
CVEN4104	0.0	32.8	12.5	16.9	0.0	0.0	37.8	0.0
CVEN4309	0.0	25.0	25.0	25.0	25.0	0.0	0.0	0.0
CVEN4701	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0

Table 2. Mapping from Stream Learning Outcomes to EA Stage 1 Graduate Capabilities

CVENL1 Civil Engineering with Architecture

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Engineers Australia Stage 1 Competencies

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SLO → GC Mapping	Engineers Australia Stage 1 Competencies															
Learning Outcomes (LO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
SLO1 Show proficiency in th...	✓	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLO2 Demonstrate proficienc...	-	-	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
SLO3 Critically evaluate an...	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
SLO4 Use appropriate design...	-	-	-	-	-	-	✓	✓	-	-	-	-	-	✓	-	-
SLO5 Design and implement i...	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SLO6 Manage Civil Engineeri...	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	✓
SLO7 Apply professional jud...	-	-	-	-	✓	✓	-	-	-	-	✓	-	-	-	-	-
SLO8 Communicate profession...	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-

Table 3. Mapping from courses to EA Stage 1 Graduate Capabilities

CVENL1 Civil Engineering with Architecture

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Curriculum Mapping	Engineers Australia Stage 1 Competencies															
Courses (CO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
ARCH1080	-	-	12.5	25.0	20.8	8.3	4.2	4.2	-	-	8.3	12.5	-	4.2	-	-
ARCH1101	-	-	16.5	-	27.8	11.3	-	-	11.0	-	11.3	22.0	-	-	-	-
ARCH1102	-	-	15.0	-	18.3	3.3	3.3	3.3	30.0	-	3.3	20.0	-	3.3	-	-
ARCH1201	-	-	1.2	-	13.2	12.0	6.8	6.8	20.5	-	12.0	20.5	-	6.8	-	-
ARCH1222	-	-	12.5	20.0	14.2	1.7	-	-	-	-	1.7	50.0	-	-	-	-
BENV1010	-	-	-	-	-	-	12.8	12.8	13.3	-	-	48.3	-	12.8	-	-
BENV1015	-	-	19.4	33.8	19.4	-	-	-	-	-	-	27.5	-	-	-	-
DESN1000	-	-	-	-	-	-	-	-	43.8	9.8	-	17.1	9.8	-	9.8	9.8
ENGG1300	40.6	40.6	-	-	-	-	1.2	1.2	-	-	-	15.0	-	1.2	-	-
MATH1131	27.0	27.0	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
MATH1231	27.0	27.0	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
MATS1101	32.1	32.1	-	-	-	-	-	-	23.3	1.6	-	6.2	1.6	-	1.6	1.6
PHYS1121	49.0	49.0	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-
CODE2170	-	-	15.0	-	15.0	-	7.5	7.5	12.5	6.2	-	10.0	6.2	7.5	6.2	6.2
CVEN2002	37.5	37.5	-	-	-	-	8.3	8.3	-	-	-	-	-	8.3	-	-
CVEN2101	-	-	31.2	-	31.2	-	-	-	20.8	2.1	-	8.3	2.1	-	2.1	2.1
CVEN2303	10.3	10.3	22.8	-	22.8	-	8.3	8.3	-	1.1	-	4.4	1.1	8.3	1.1	1.1
ENGG2400	1.5	1.5	36.4	-	36.4	-	8.1	8.1	-	-	-	-	-	8.1	-	-
ENGG2500	6.0	6.0	29.8	-	29.8	-	5.3	5.3	-	3.1	-	-	3.1	5.3	3.1	3.1
MATH2018	18.3	18.3	-	26.7	-	-	12.2	12.2	-	-	-	-	-	12.2	-	-
CVEN3101	-	-	25.0	-	30.6	5.6	5.6	5.6	16.7	-	5.6	-	-	5.6	-	-
CVEN3202	10.0	10.0	5.0	20.0	11.7	6.7	3.3	3.3	20.0	-	6.7	-	-	3.3	-	-
CVEN3203	10.0	10.0	10.0	-	10.0	-	6.7	6.7	-	5.0	-	20.0	5.0	6.7	5.0	5.0
CVEN3303	-	-	20.0	-	20.0	-	6.7	6.7	20.0	-	-	20.0	-	6.7	-	-
CVEN3304	7.1	7.1	9.0	-	9.0	-	11.3	11.3	34.0	-	-	-	-	11.3	-	-
CVEN3501	-	-	6.2	-	14.6	8.3	16.7	16.7	12.5	-	8.3	-	-	16.7	-	-
CVEN3502	-	-	25.0	-	25.0	-	16.7	16.7	-	-	-	-	-	16.7	-	-
CVEN4050	-	-	-	20.0	8.7	8.7	-	-	4.0	10.0	8.7	10.0	10.0	-	10.0	10.0
CVEN4051	-	-	-	17.8	4.4	4.4	-	-	8.9	5.6	4.4	37.8	5.6	-	5.6	5.6
CVEN4104	-	-	16.4	12.5	29.0	12.6	5.6	5.6	-	-	12.6	-	-	5.6	-	-
CVEN4309	-	-	12.5	25.0	12.5	-	8.3	8.3	25.0	-	-	-	-	8.3	-	-
CVEN4701	-	-	-	-	33.3	33.3	-	-	-	-	33.3	-	-	-	-	-
Cognitive Scale	10.6	10.6	8.5	9.7	9.9	4.8	3.7	3.7	9.8	2.4	4.8	10.2	2.4	3.7	2.4	2.4

Reflection on Strengths Weaknesses and Future Action

Strengths

The stream is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, design of innovative engineering solutions and systems and communication. Thus, students will graduate with a sound ability to perform technical engineering work. The strength in communication is important because one of the aims of the program is that engineers will be able to communicate with architects.

Weaknesses

The stream appears to have weaknesses in the areas of ethics and research skills. This is caused by those skills being developed in courses that also focus on other

skills such as teamwork and communication and so the Cognitive Scale Contribution tends to be shared with these other skills.

Future Action

The School is in the process of implementing a strategic direction of embedding ethics more generally in the stream from start to finish, whereas previously the coverage of ethics had been concentrated in a smaller number of courses.

Assessment and Academic Integrity

Table 4. Assessment Map

CVENL1 Civil Engineering with Architecture

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → AT Mapping	Assessment Types (AT)											
Courses (CO)	Assi	Essa	Exam	Lab	Othe	Perf	Port	Pres	Proj	Repo	Test	Tut
ARCH1080	-	-	-	-	-	-	-	-	100	-	-	-
ARCH1101	-	-	-	-	-	-	-	-	100	-	-	-
ARCH1102	-	-	-	-	-	-	-	-	100	-	-	-
ARCH1201	-	-	-	-	-	-	-	-	100	-	-	-
ARCH1222	-	20	-	-	30	-	-	-	50	-	-	-
BENV1010	100	-	-	-	-	-	-	-	-	-	-	-
BENV1015	100	-	-	-	-	-	-	-	-	-	-	-
DESN1000	-	5	-	-	20	-	15	15	-	45	-	-
ENGG1300	15	-	75	-	10	-	-	-	-	-	-	-
MATH1131	10	-	50	-	40	-	-	-	-	-	-	-
MATH1231	10	-	50	-	40	-	-	-	-	-	-	-
MATS1101	-	-	70	30	-	-	-	-	-	-	-	-
PHYS1121	-	-	50	20	30	-	-	-	-	-	-	-
CODE2170	-	-	60	-	-	-	-	-	40	-	-	-
CVEN2002	-	-	60	6	-	-	-	-	-	-	34	-
CVEN2101	40	-	60	-	-	-	-	-	-	-	-	-
CVEN2303	35	-	50	-	-	-	-	-	-	-	15	-
ENGG2400	15	-	50	-	15	-	-	-	-	-	20	-
ENGG2500	20	-	80	-	-	-	-	-	-	-	-	-
MATH2018	-	-	60	-	10	-	-	-	-	-	30	-
CVEN3101	-	-	60	-	-	-	-	-	-	-	40	-
CVEN3202	-	-	90	10	-	-	-	-	-	-	-	-
CVEN3203	25	-	70	-	5	-	-	-	-	-	-	-
CVEN3303	40	-	60	-	-	-	-	-	-	-	-	-
CVEN3304	35	-	55	-	-	-	-	-	-	-	10	-
CVEN3501	30	-	70	-	-	-	-	-	-	-	-	-
CVEN3502	10	-	80	10	-	-	-	-	-	-	-	-
CVEN4050	-	-	-	-	-	-	-	-	-	100	-	-
CVEN4051	-	5	-	-	-	-	-	15	-	80	-	-
CVEN4104	30	-	50	-	-	-	-	-	-	-	20	-
CVEN4309	-	-	100	-	-	-	-	-	-	-	-	-
CVEN4701	40	-	-	-	-	-	-	15	-	30	15	-

For the technical courses in the stream 50% to 70% of the assessment is in the form of quizzes and exams (see Table 4). The remainder of the assessment is usually in the form of assignments, most commonly in a report format. Additionally, assessment in laboratories occurs in Materials, Soil and Water Engineering courses.

The enquiry-based engineering courses, ie Thesis and Design courses, revolve around a major work of the thesis or design project, with draft sections of these works assessed as the course progresses to give the students formative feedback. Assessments such as posters, video presentations and interviews are also used to improve student communication skills and increase academic integrity.

The architectural courses are generally project based where students will be developing several architectural concept projects in each course based on the concepts in that course.

The School has implemented many processes to ensure that academic integrity is maintained:

- All exam papers are reviewed by another academic. The reviewer will also be given the rubric and worked solution. When a paper is written by a new academic it will be reviewed by a professor or A/Prof to ensure standards are being maintained. Admin staff follow up to ensure all papers have been reviewed.
- Reports are submitted using TurnItIn, which ensures that students are not plagiarising or colluding.
- Academics provide rubrics and worked solutions to markers. In this case the academic will re-mark a sample of the reports or exam papers to ensure the rubric is being used correctly.
- Important works, such as thesis, will have two markers to ensure consistency.

Due to COVID all exams have moved online, so standard practices have been adopted including:

- Standard 10 minutes reading time and 20 minutes upload time (if required)
- Exams take place at a set time, so that students need to focus on their own exams
- The School has invested heavily in STACK, which allows randomised questions. New questions are written for each exam. Question papers are not reused. Since this is time intensive the School has employed a team of programmers to code the questions as specified in detail by the academics.
- Questions are Googled before and after the exam. Before ensures the questions are not easy to answer with simple searches. After ensures that the papers have not been uploaded during the exam.

Summary

A curriculum mapping exercise has been carried out for CVENL1 Civil Engineering with Architecture stream of the 3635 Bachelor of Engineering (Honours) program at UNSW. The program provides good coverage of all the Engineers Australia Stage 1 Graduate Competencies. It is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, design of innovative engineering

solutions and systems and communication. Future direction for the stream involves working on embedding ethics more widely throughout the stream instead of focusing it in a limited number of courses. The stream has rigorous and varied assessment tasks, which have been updated and adapted to deal with the advent of COVID-19.

GMATDH Surveying

Introduction

This report shows how the GMATDH Surveying stream of the 3707 Bachelor of Engineering (Honours) program at UNSW fosters the Engineers Australia Level 1 Graduate Competencies in its students. It starts by addressing the overall aims of the stream and its uniqueness. It then covers the stream plan followed by the Stream Learning Outcomes. The process for developing and obtaining feedback to improve these SLOs is detailed. This is followed by the curriculum mapping that relates the individual courses to the Stream Learning Outcomes, the Stream Learning Outcomes to the Graduate Capabilities and the individual courses to the Graduate Capabilities.

Aims of the Stream

The Surveying stream aims to prepare a graduate for a broad range of career opportunities in the various branches of Surveying and the numerous Spatial Information disciplines. To this end the stream covers general scientific and IT principles, as well as specialised Surveying and Spatial Information topics. Specialisation is provided for through the provision of elective courses offered in the third and fourth years of the program and the choice of a targeted final year thesis project often aligned with an external industry partner.

In the final year of the Surveying stream students may choose electives in Land Management, Geospatial Information Science, Humanitarian Engineering, Civil Engineering and other electives.

The program is normally taken on a four-year full-time basis and sits at level 8 in the Australian Qualifications Framework giving students advanced cognitive, technical and communication skills to allow them to demonstrate autonomy, well-developed judgement, adaptability, and responsibility.

The School of Civil and Environmental Engineering, which offers the stream, is the largest Civil and Environmental Engineering School in Australia and is rated as number one in the country across each one of Shanghai Jiao ARWU Rankings, QS World University Rankings, THE and US News Best Global Universities.

Stream Plan

Course code	Course name
Year 1	

Term 1	
DESN1000	Introduction to Engineering Design and Innovation
MATH1131 or MATH1141	Mathematics 1A Higher Mathematics 1A
PHYS1121 or PHYS1131	Physics 1A Higher Physics 1A
Term 2	
GMAT1110	Surveying and Geospatial Engineering
MATH1231 or MATH1241	Mathematics 1B Higher Mathematics 1B
First Year Elective	First Year Elective
Term 3	
ENGG1811	Computing for Engineers
First Year Elective	First Year Elective
Year 2	
Term 1	
GMAT2700	Foundations of Geodesy and Spatial Reference Frames
ENGG2500	Fluid Mechanics for Engineers
MATH2019	Engineering Mathematics 2E
Term 2	
GMAT2500	Surveying Computations A
CVEN2002	Civil and Environmental Engineering Computations
DESN2000	Engineering Design and Professional Practice
Term 3	
GMAT2120	Surveying and Geospatial Technology
GMAT2550	Surveying Computations B
Year 3	
Term 1	
GMAT3100	Surveying Applications and Design
GMAT3150	Surveying Field Projects
GMAT3220	Geospatial Information Systems
Term 2	
GMAT3700	Geodetic Positioning and Applications
General Education	General Education
Term 3	
GMAT3420	Cadastral Surveying and Land Law
GMAT3500	Remote Sensing and Photogrammetry
CVEN3101	Engineering Operations and Control
Year 4	
Term 1	
GMAT Elective	GMAT Elective
CVEN3501	Water Resources Engineering

CVEN4951 or CVEN4050	Research Thesis A Thesis A
Term 2	
GMAT4150	Field Projects 2
CVEN4952 or CVEN4051	Research Thesis B Thesis B
GMAT Elective	GMAT Elective
Term 3	
GMAT Elective	GMAT Elective
General Education	General Education
CVEN4953	Research Thesis C

Stream Learning Outcomes

On successful completion of this program, graduates will be able to:

Knowledge

1. Show proficiency in the enabling sciences (maths, computer science and physics) that underpin Surveying

2. Demonstrate expertise in Surveying specialist technical knowledge such as: surveying, geospatial engineering, cadastral, remote sensing, satellite positioning, GIS and geodesy.

3. Critically evaluate and apply current research to the solution of complex problems in surveying and geospatial engineering

Skills

4. Use appropriate data acquisition, analytical and computational tools, including: total stations, digital levels, GNSS, laser scanners, UAVs, and their analysis, CAD, GIS and least squares to analyse complex problems in surveying

5. Design and implement innovative engineering solutions and systems in surveying

Application of Knowledge and Skills

6. Lead and manage surveying projects, individually or as part of a team, in a

systematic and professional manner

7. Apply nuanced professional judgement that contributes to the ethical and

sustainable practice of surveying

8. Communicate professionally and effectively within and outside of surveying

Development of Stream Learning Outcomes

Initial development of the Stream Learning Outcomes (SLOs) involved a working party consisting of most of the staff teaching into the Environmental Engineering specific courses of the stream.

Initial development of the Stream Learning Outcomes (SLOs) involved a working party consisting of the Associate Head of School (Academic) and the Education Focussed academics teaching into the Surveying specific courses of the stream. The draft was then presented to the School Teaching and Learning Committee (TLC) for discussion. This discussion included student opinion collected from representatives of the Civil and Environmental Engineering Student Society (CEVSOC). After including amendments from TLC, the draft was presented to the School Management Committee (SMC) for discussion. After approval from the SMC the draft was submitted to the Industry Advisory Committee (IAC) for comment. The final set of suggested improvements were received from the Faculty Accreditation Working Group (FAWG).

The final version of the SLOs incorporated all the comments from the TLC, SMC, IAC and FAWG. The final SLOs were then resubmitted to the TLC, SMC and IAC in turn for final endorsement.

Curriculum Mapping

Note on elective courses used in mapping: Students can select two electives in first year and three electives in fourth year.

There are no recommended first year electives in Surveying. Therefore, first year electives have not been mapped. Similarly General Education electives have not been mapped. Thus, there are 28 courses included in the mapping.

The fourth-year electives that have been included in the mapping are the most popular courses selected by the students enrolled in the stream. Importantly, the recommended electives of GMAT4220 and GMAT4400 are included.

Table 1. Mapping from courses to Stream Learning Outcomes

GMATDH Surveying

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → SLO Mapping	Stream Learning Outcomes (SLOs)							
Courses (CO)	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8
DESN1000	0.0	0.0	0.0	0.0	43.8	39.2	0.0	17.1
ENGG1811	0.0	0.0	0.0	76.7	23.3	0.0	0.0	0.0
GMAT1110	8.3	8.3	0.0	41.7	0.0	0.0	0.0	8.3
MATH1131	54.0	0.0	16.3	9.4	0.0	0.0	0.0	20.2
MATH1231	54.0	0.0	16.3	9.4	0.0	0.0	0.0	20.2
PHYS1121	98.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
CVEN2002	75.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0
DESN2000	0.0	15.0	14.0	0.0	4.0	27.0	10.0	30.0
ENGG2500	11.9	59.6	0.0	15.9	0.0	12.6	0.0	0.0
GMAT2120	0.0	50.0	0.0	37.5	0.0	12.5	0.0	0.0
GMAT2500	6.8	24.8	0.0	24.8	0.0	6.8	12.0	24.8
GMAT2550	17.9	32.1	3.6	32.1	3.6	0.0	7.1	3.6
GMAT2700	14.3	35.7	0.0	50.0	0.0	0.0	0.0	0.0
MATH2018	36.7	0.0	26.7	36.7	0.0	0.0	0.0	0.0
CVEN3101	0.0	50.0	0.0	16.7	16.7	0.0	16.7	0.0
CVEN3501	0.0	12.5	0.0	50.0	12.5	0.0	25.0	0.0
GMAT3100	0.0	25.0	0.0	25.0	50.0	0.0	0.0	0.0
GMAT3150	0.0	12.5	0.0	12.5	12.5	50.0	0.0	12.5
GMAT3220	0.0	25.0	0.0	45.8	20.8	0.0	8.3	0.0
GMAT3420	0.0	33.3	8.3	0.0	0.0	25.0	16.7	16.7
GMAT3500	0.0	10.0	0.0	30.0	20.0	0.0	20.0	0.0
GMAT3700	0.0	29.2	29.2	29.2	12.5	0.0	0.0	0.0
CVEN4402	0.0	30.0	0.0	0.0	50.0	20.0	0.0	0.0
GMAT4060	0.0	0.0	34.2	0.0	11.2	32.3	9.4	12.9
GMAT4061	0.0	0.0	14.9	0.0	14.6	33.8	12.9	23.9
GMAT4150	0.0	0.0	0.0	30.0	30.0	40.0	0.0	0.0
GMAT4220	0.0	18.8	12.5	31.2	31.2	0.0	6.2	0.0
GMAT4400	0.0	20.0	0.0	0.0	20.0	20.0	20.0	20.0

Table 2. Mapping from Stream Learning Outcomes to EA Stage 1 Graduate Capabilities

GMATDH Surveying

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Engineers Australia Stage 1 Competencies

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SLO → GC Mapping	Engineers Australia Stage 1 Competencies															
Learning Outcomes (LO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
SLO1 Show proficiency in th...	✓	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLO2 Demonstrate expertise ...	-	-	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
SLO3 Critically evaluate an...	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
SLO4 Use appropriate data a...	-	-	-	-	-	-	✓	✓	-	-	-	-	-	✓	-	-
SLO5 Design and implement i...	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SLO6 Lead and manage survey...	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	✓
SLO7 Apply nuanced professi...	-	-	-	-	✓	✓	-	-	-	-	✓	-	-	-	-	-
SLO8 Communicate profession...	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-

Table 3. Mapping from courses to EA Stage 1 Graduate Capabilities

GMATDH Surveying

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Curriculum Mapping	Engineers Australia Stage 1 Competencies															
Courses (CO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
DESN1000	-	-	-	-	-	-	-	-	43.8	9.8	-	17.1	9.8	-	9.8	9.8
ENGG1811	-	-	-	-	-	-	25.6	25.6	23.3	-	-	-	-	25.6	-	-
GMAT1110	4.2	4.2	4.2	-	4.2	-	13.9	13.9	-	-	-	8.3	-	13.9	-	-
MATH1131	27.0	27.0	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
MATH1231	27.0	27.0	-	16.3	-	-	3.1	3.1	-	-	-	20.2	-	3.1	-	-
PHYS1121	49.0	49.0	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-
CVEN2002	37.5	37.5	-	-	-	-	8.3	8.3	-	-	-	-	-	8.3	-	-
DESN2000	-	-	7.5	14.0	10.8	3.3	-	-	4.0	6.8	3.3	30.0	6.8	-	6.8	6.8
ENGG2500	6.0	6.0	29.8	-	29.8	-	5.3	5.3	-	3.1	-	-	3.1	5.3	3.1	3.1
GMAT2120	-	-	25.0	-	25.0	-	12.5	12.5	-	3.1	-	-	3.1	12.5	3.1	3.1
GMAT2500	3.4	3.4	12.4	-	16.4	4.0	8.3	8.3	-	1.7	4.0	24.8	1.7	8.3	1.7	1.7
GMAT2550	8.9	8.9	16.1	3.6	18.5	2.4	10.7	10.7	3.6	-	2.4	3.6	-	10.7	-	-
GMAT2700	7.1	7.1	17.9	-	17.9	-	16.7	16.7	-	-	-	-	-	16.7	-	-
MATH2018	18.3	18.3	-	26.7	-	-	12.2	12.2	-	-	-	-	-	12.2	-	-
CVEN3101	-	-	25.0	-	30.6	5.6	5.6	5.6	16.7	-	5.6	-	-	5.6	-	-
CVEN3501	-	-	6.2	-	14.6	8.3	16.7	16.7	12.5	-	8.3	-	-	16.7	-	-
GMAT3100	-	-	12.5	-	12.5	-	8.3	8.3	50.0	-	-	-	-	8.3	-	-
GMAT3150	-	-	6.2	-	6.2	-	4.2	4.2	12.5	12.5	-	12.5	12.5	4.2	12.5	12.5
GMAT3220	-	-	12.5	-	15.3	2.8	15.3	15.3	20.8	-	2.8	-	-	15.3	-	-
GMAT3420	-	-	16.7	8.3	22.2	5.6	-	-	-	6.2	5.6	16.7	6.2	-	6.2	6.2
GMAT3500	-	-	5.0	-	11.7	6.7	10.0	10.0	20.0	-	6.7	-	-	10.0	-	-
GMAT3700	-	-	14.6	29.2	14.6	-	9.7	9.7	12.5	-	-	-	-	9.7	-	-
CVEN4402	-	-	15.0	-	15.0	-	-	-	50.0	5.0	-	-	5.0	-	5.0	5.0
GMAT4060	-	-	-	34.2	3.1	3.1	-	-	11.2	8.1	3.1	12.9	8.1	-	8.1	8.1
GMAT4061	-	-	-	14.9	4.3	4.3	-	-	14.6	8.4	4.3	23.9	8.4	-	8.4	8.4
GMAT4150	-	-	-	-	-	-	10.0	10.0	30.0	10.0	-	-	10.0	10.0	10.0	10.0
GMAT4220	-	-	9.4	12.5	11.5	2.1	10.4	10.4	31.2	-	2.1	-	-	10.4	-	-
GMAT4400	-	-	10.0	-	16.7	6.7	-	-	20.0	5.0	6.7	20.0	5.0	-	5.0	5.0
Cognitive Scale	9.9	9.9	7.2	8.6	7.9	2.4	5.5	5.5	11.7	3.5	2.4	9.2	3.5	5.5	3.5	3.5

Reflection on Strengths Weaknesses and Future Action

Strengths

The stream is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, and design of innovative engineering solutions and systems. Thus, students will graduate with a sound ability to design surveys and analyse their data. Project management / teamwork skills tend to increase in importance towards the latter part of the degree, while communication skills are addressed consistently throughout the degree.

Weaknesses

There are less courses that focus on ethics and on researching new techniques, although the latest equipment and techniques are covered in the relevant courses.

Future Action

The School is in the process of implementing a strategic direction of embedding ethics more generally in the stream from start to finish, whereas previously the coverage of ethics had been concentrated in a smaller number of courses.

Assessment and Academic Integrity

Table 4. Assessment Map

GMATDH Surveying

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → AT Mapping — Assessment Types (AT)

Courses (CO)	Assi	Essa	Exam	Lab	Othe	Perf	Port	Pres	Proj	Repo	Test	Tut
DESN1000	-	5	-	-	20	-	15	15	-	45	-	-
ENGG1811	20	-	70	10	-	-	-	-	-	-	-	-
GMAT1110	-	-	40	-	-	-	-	-	-	30	30	-
MATH1131	10	-	50	-	40	-	-	-	-	-	-	-
MATH1231	10	-	50	-	40	-	-	-	-	-	-	-
PHYS1121	-	-	50	20	30	-	-	-	-	-	-	-
CVEN2002	-	-	60	6	-	-	-	-	-	-	34	-
DESN2000	25	-	-	-	60	-	-	15	-	-	-	-
ENGG2500	20	-	80	-	-	-	-	-	-	-	-	-
GMAT2120	5	-	45	-	-	-	-	-	-	50	-	-
GMAT2500	-	-	45	18	-	-	-	-	12	-	25	-
GMAT2550	-	-	40	15	-	-	-	-	-	-	45	-
GMAT2700	-	-	40	-	-	-	-	15	-	20	25	-
MATH2018	-	-	60	-	10	-	-	-	-	-	30	-
CVEN3101	-	-	60	-	-	-	-	-	-	-	40	-
CVEN3501	30	-	70	-	-	-	-	-	-	-	-	-
GMAT3100	20	-	45	-	10	-	-	-	-	-	25	-
GMAT3150	-	-	-	-	-	-	-	-	100	-	-	-
GMAT3220	16	-	44	20	-	-	-	-	20	-	-	-
GMAT3420	30	-	40	30	-	-	-	-	-	-	-	-
GMAT3500	55	-	45	-	-	-	-	-	-	-	-	-
GMAT3700	-	20	33	-	22	-	-	-	-	25	-	-
CVEN4402	40	-	50	-	-	-	-	-	-	-	10	-
GMAT4060	-	-	-	-	-	-	-	30	-	70	-	-
GMAT4061	-	-	-	-	-	-	-	30	-	70	-	-
GMAT4150	-	-	-	-	10	-	-	-	-	90	-	-
GMAT4220	-	-	46	24	-	-	-	-	30	-	-	-
GMAT4400	-	-	-	-	100	-	-	-	-	-	-	-

For the technical courses in the stream 40% to 70% of the assessment is in the form of quizzes and exams (see Table 4). The remainder of the assessment is usually in the form of assignments, most commonly in a report format. There is a substantial amount of assessment across many of the courses for lab work involving using surveying equipment in outdoor settings, including one course with a week-long survey camp.

The enquiry-based courses, ie thesis and design courses, revolve around a major work of the thesis or design project, with draft sections of these works assessed as the course progresses to give the students formative feedback. Assessments such as posters, video presentations and interviews are also used to improve student communication skills and increase academic integrity.

The School has implemented many processes to ensure that academic integrity is maintained:

- All exam papers are reviewed by another academic. The reviewer will also be given the rubric and worked solution. When a paper is written by a new academic it will be reviewed by a professor or A/Prof to ensure standards are being maintained. Admin staff follow up to ensure all papers have been reviewed.
- Reports are submitted using TurnItIn, which ensures that students are not plagiarising or colluding.
- Academics provide rubrics and worked solutions to markers. In this case the academic will re-mark a sample of the reports or exam papers to ensure the rubric is being used correctly.
- Important works, such as thesis, will have two markers to ensure consistency.

Due to COVID all exams have moved online, so standard practices have been adopted including:

- Standard 10 minutes reading time and 20 minutes upload time (if required)
- Exams take place at a set time, so that students need to focus on their own exams
- The School has invested heavily in STACK, which allows randomised questions. New questions are written for each exam. Question papers are not reused. Since this is time intensive the School has employed a team of programmers to code the questions as specified in detail by the academics.
- Questions are Googled before and after the exam. Before ensures the questions are not easy to answer with simple searches. After ensures that the papers have not been uploaded during the exam.

An important factor with the Surveying stream is that there are small enrolment numbers. This means that teaching staff observe (and invigilate) the students doing fieldwork and computer lab work. Survey camps, ie GMAT Field Project courses, have run off campus every year and avoided LGA lockdowns and COVID issues due to fortunate timing and careful management. The survey camps are an excellent example of learning outcomes being achieved with academic integrity.

Summary

A curriculum mapping exercise has been carried out for the GMATDH Surveying stream of the 3707 Bachelor of Engineering (Honours) program at UNSW. The stream provides good coverage of all the Engineers Australia Stage 1 Graduate Competencies. It is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, and design of innovative engineering solutions and systems. Future direction for the stream involves working on embedding ethics more widely throughout the stream instead of it being focused in a limited number of courses. The stream has rigorous and varied assessment tasks, including a strong emphasis on fieldwork, which have been updated and adapted to deal with the advent of COVID-19.

CVENYS Civil Engineering (Postgraduate)

Introduction

This report shows how the CVENYS Civil Engineering stream of the 8621 Master of Engineering program at UNSW fosters the Engineers Australia Level 1 Graduate Competencies in its students. It starts by addressing the overall aims of the stream and its uniqueness. It then covers the stream plan followed by the Stream Learning Outcomes. The process for developing and obtaining feedback to improve these SLOs is detailed. This is followed by the curriculum mapping that relates the individual courses to the Stream Learning Outcomes, the Stream Learning Outcomes to the Graduate Capabilities and the individual courses to the Graduate Capabilities.

Aims of the Stream

The Civil Engineering stream prepares students to become responsible for projects that enhance overall quality of life. Students learn how to design, construct, manage, operate and maintain the infrastructure that supports modern society including buildings, bridges, roads and highways, tunnels, airfields, dams, ports and harbours, railways, new mines, water supply and sewerage schemes, irrigation systems and flood mitigation works. The profession is very broad and affords opportunities for involvement in many specialist activities.

The program is normally taken on a two-year full-time basis and sits at level 9 in the Australian Qualifications Framework giving students expert, specialised cognitive, technical and communication skills to allow them to demonstrate autonomy, expert judgement, adaptability, and responsibility.

The program has been designed to provide students possessing engineering degrees that are not accredited under the Washington Accord with an educational pathway that has recognition under the Washington Accord. Hence, students are required to have previously been awarded an undergraduate degree in Civil, Structural, Geotechnical or Mining Engineering. Thus, instead of focusing on providing students with underpinning science and fundamental engineering knowledge, the ME focuses on broadening their knowledge and introducing them to Australian engineering practice.

The School of Civil and Environmental Engineering, which offers the stream, is the largest Civil and Environmental Engineering School in Australia and is rated as number one in the country across each one of Shanghai Jiao ARWU Rankings, QS World University Rankings, THE and US News Best Global Universities. The School has outstanding strengths in all areas of Civil Engineering, enabling it to offer a wide selection of electives to students.

Stream Plan

Course code	Course name
Year 1	
CVEN3303	Steel Structures
CVEN3304	Concrete Structures
CVEN9525	Fundamentals of Geotechnical Engineering
CVEN9625	Fundamentals of Water Engineering
Elective	Engineering and the Environment Elective
Elective	Management Elective
Elective	Management Elective
Elective	Disciplinary Knowledge Elective
Year 2	
CVEN9000	Civil Engineering Design Practice
CVEN9050	Masters Practice Project A
CVEN9051	Masters Practice Project B
Elective	Advanced Disciplinary Knowledge Elective*
Elective	Advanced Disciplinary Knowledge Elective*
Elective	Advanced Disciplinary Knowledge Elective*
Elective	Advanced Disciplinary Knowledge Elective*
Elective	Advanced Disciplinary Knowledge Elective*
Industrial Training	Industrial Training

*To ensure breadth of learning, students may take a maximum of three electives in any one subdiscipline of Civil Engineering.

Stream Learning Outcomes

On successful completion of this program, graduates will be able to:

Knowledge

1. Show mastery in the enabling sciences (maths, physics and materials science) that underpin Civil Engineering

2. Demonstrate mastery in Civil Engineering specialist technical knowledge areas such as: Structural Engineering, Geotechnical Engineering, Engineering Construction and Management, Transport Engineering and Water Engineering.

3. Source, critically evaluate, and apply information and current research to the solution of complex problems in Civil Engineering

Skills

4. Select and use appropriate design, analysis and computational tools, including: structural modelling and design programs, hydraulic modelling, simulation software, laboratory procedures and analysis, Australian Standards, industry design codes,

management of digital data sets and project management and control tools to analyse complex problems in Civil Engineering

5. Design, critique and implement innovative engineering solutions and systems in Civil Engineering

Application of Knowledge and Skills

6. Lead and manage Civil Engineering projects, individually or as part of a team under a team leader, in a systematic and professional manner

7. Apply nuanced professional judgement that contributes to the ethical and sustainable practice of Civil Engineering

8. Communicate and present professionally and effectively in work teams, across the profession and the wider community.

Development of Stream Learning Outcomes

Initial development of the Stream Learning Outcomes (SLOs) involved a working party consisting of the Stream Coordinators for Civil Engineering (undergraduate), Civil Engineering (postgraduate) and Civil with Architecture. The draft was then presented to the School Teaching and Learning Committee (TLC) for discussion. This discussion included student opinion collected from representatives of the Civil and Environmental Engineering Student Society (CEVSOC). After including amendments from TLC, the draft was presented to the School Management Committee (SMC) for discussion. After approval from the SMC the draft was submitted to the Industry Advisory Committee (IAC) for comment. The final set of suggested improvements were received from the Faculty Accreditation Working Group (FAWG).

The final version of the SLOs incorporated all the comments from the TLC, SMC, IAC and FAWG. The final SLOs were then resubmitted to the TLC, SMC and IAC in turn for final endorsement.

Curriculum Mapping

Note on elective courses used in mapping: To determine the electives to use in the mapping the most popular electives in each category were determined. These were further checked to ensure compliance with stream rules such as enrolling in a maximum of three Advanced Disciplinary Courses from any one subdiscipline.

Table 1. Mapping from courses to Stream Learning Outcomes

CVENYS Civil Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → SLO Mapping	Stream Learning Outcomes (SLOs)							
Courses (CO)	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8
CVEN3303	0.0	40.0	0.0	20.0	20.0	0.0	0.0	20.0
CVEN3304	14.2	17.9	0.0	34.0	34.0	0.0	0.0	0.0
CVEN4102	0.0	25.0	0.0	0.0	50.0	12.5	0.0	12.5
CVEN4301	0.0	23.8	15.8	15.8	39.6	0.0	0.0	5.0
CVEN9000	0.0	0.0	22.5	0.0	0.0	45.0	32.5	0.0
CVEN9050	0.0	0.0	47.0	0.0	26.0	6.0	0.0	21.0
CVEN9051	0.0	0.0	30.3	0.0	12.0	12.0	0.0	45.7
CVEN9405	0.0	7.1	0.0	80.7	0.0	0.0	12.1	0.0
CVEN9525	0.0	20.0	20.0	30.0	10.0	0.0	20.0	0.0
CVEN9625	0.0	33.3	0.0	50.0	16.7	0.0	0.0	0.0
CVEN9701	0.0	0.0	0.0	50.0	12.5	25.0	0.0	12.5
CVEN9702	0.0	27.0	0.0	45.0	14.0	14.0	0.0	0.0
CVEN9809	0.0	50.0	16.7	16.7	16.7	0.0	0.0	0.0
CVEN9820	18.8	28.1	0.0	48.8	4.4	0.0	0.0	0.0
CVEN9824	0.0	40.0	10.0	0.0	40.0	0.0	10.0	0.0
CVEN9888	0.0	0.0	33.3	33.3	16.7	0.0	16.7	0.0

Table 2. Mapping from Stream Learning Outcomes to EA Stage 1 Graduate Capabilities

CVENYS Civil Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Engineers Australia Stage 1 Competencies

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SLO → GC Mapping	Engineers Australia Stage 1 Competencies															
Learning Outcomes (LO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
SLO1 Show mastery in the en...	✓	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLO2 Demonstrate mastery in...	-	-	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
SLO3 Source, critically eva...	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
SLO4 Select and use appropr...	-	-	-	-	-	-	✓	✓	-	-	-	-	-	✓	-	-
SLO5 Design, critique and i...	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SLO6 Lead and manage Civil ...	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	✓
SLO7 Apply nuanced professi...	-	-	-	-	✓	✓	-	-	-	-	✓	-	-	-	-	-
SLO8 Communicate and presen...	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-

Table 3. Mapping from courses to EA Stage 1 Graduate Capabilities

CVENYS Civil Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Curriculum Mapping	Engineers Australia Stage 1 Competencies															
Courses (CO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
CVEN3303	-	-	20.0	-	20.0	-	6.7	6.7	20.0	-	-	20.0	-	6.7	-	-
CVEN3304	7.1	7.1	9.0	-	9.0	-	11.3	11.3	34.0	-	-	-	-	11.3	-	-
CVEN4102	-	-	12.5	-	12.5	-	-	-	50.0	3.1	-	12.5	3.1	-	3.1	3.1
CVEN4301	-	-	11.9	15.8	11.9	-	5.3	5.3	39.6	-	-	5.0	-	5.3	-	-
CVEN9000	-	-	-	22.5	10.8	10.8	-	-	-	11.2	10.8	-	11.2	-	11.2	11.2
CVEN9050	-	-	-	47.0	-	-	-	-	26.0	1.5	-	21.0	1.5	-	1.5	1.5
CVEN9051	-	-	-	30.3	-	-	-	-	12.0	3.0	-	45.7	3.0	-	3.0	3.0
CVEN9405	-	-	3.6	-	7.6	4.0	26.9	26.9	-	-	4.0	-	-	26.9	-	-
CVEN9525	-	-	10.0	20.0	16.7	6.7	10.0	10.0	10.0	-	6.7	-	-	10.0	-	-
CVEN9625	-	-	16.7	-	16.7	-	16.7	16.7	16.7	-	-	-	-	16.7	-	-
CVEN9701	-	-	-	-	-	-	16.7	16.7	12.5	6.2	-	12.5	6.2	16.7	6.2	6.2
CVEN9702	-	-	13.5	-	13.5	-	15.0	15.0	14.0	3.5	-	-	3.5	15.0	3.5	3.5
CVEN9809	-	-	25.0	16.7	25.0	-	5.6	5.6	16.7	-	-	-	-	5.6	-	-
CVEN9820	9.4	9.4	14.1	-	14.1	-	16.2	16.2	4.4	-	-	-	-	16.2	-	-
CVEN9824	-	-	20.0	10.0	23.3	3.3	-	-	40.0	-	3.3	-	-	-	-	-
CVEN9888	-	-	-	33.3	5.6	5.6	11.1	11.1	16.7	-	5.6	-	-	11.1	-	-
Cognitive Scale	4.5	4.5	7.8	13.5	8.0	3.4	7.1	7.1	12.3	2.7	3.4	10.7	2.7	7.1	2.7	2.7

Reflection on Strengths Weaknesses and Future Action

Strengths

The stream is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, and design of innovative engineering solutions and systems. Thus, students will graduate with a sound ability to perform technical engineering work. The stream also rates well in terms of research skills, project management / teamwork skills and communication skills.

Weaknesses

The stream appears to have weaknesses in the areas of enabling sciences and ethics. The lack of coverage of enabling sciences is not considered to be a problem because all students will have already completed an undergraduate degree where these enabling sciences will have been covered. Students who are interested in ethics are encouraged to enrol in the course GSOE9510 Ethics and Leadership, which is not one of the courses included in the mapping.

Future Action

The School is in the process of implementing a strategic direction of embedding ethics more generally throughout all of its courses.

Assessment and Academic Integrity

Table 4. Assessment Map

CVENYS Civil Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → AT Mapping	Assessment Types (AT)											
Courses (CO)	Assi	Essa	Exam	Lab	Othe	Perf	Port	Pres	Proj	Repo	Test	Tut
CVEN3303	40	-	60	-	-	-	-	-	-	-	-	-
CVEN3304	35	-	55	-	-	-	-	-	-	-	10	-
CVEN4102	20	-	80	-	-	-	-	-	-	-	-	-
CVEN4301	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9000	35	-	-	-	-	-	-	20	-	45	-	-
CVEN9050	-	-	-	-	-	-	-	10	-	90	-	-
CVEN9051	5	20	-	-	-	-	-	55	-	20	-	-
CVEN9405	40	-	50	-	-	-	-	-	-	-	10	-
CVEN9525	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9625	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9701	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9702	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9809	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9820	20	-	50	-	-	-	-	-	-	-	30	-
CVEN9824	10	-	60	-	-	-	-	-	-	-	30	-
CVEN9888	30	-	50	-	-	-	-	-	-	-	20	-

For the technical courses in the stream 50% to 60% of the assessment is in the form of quizzes and exams (see Table 4). The remainder of the assessment is usually in the form of assignments, most commonly in a report format.

The enquiry-based courses, i.e. Design Practice and Practice Project courses, revolve around a major work, with draft sections of these works assessed as the course progresses to give the students formative feedback. Assessments such as video presentations and interviews are also used to improve student communication skills and increase academic integrity.

The School has implemented many processes to ensure that academic integrity is maintained:

- All exam papers are reviewed by another academic. The reviewer will also be given the rubric and worked solution. When a paper is written by a new academic it will be reviewed by a professor or A/Prof to ensure standards are being maintained. Admin staff follow up to ensure all papers have been reviewed.
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- Important works, such as Masters Practice Project, will have two markers to ensure consistency.

Due to COVID all exams have moved online, so standard practices have been adopted including:

- Standard 10 minutes reading time and 20 minutes upload time (if required)
- Exams take place at a set time, so that students need to focus on their own exams
- The School has invested heavily in STACK, which allows randomised questions. New questions are written for each exam. Question papers are not reused. Since this is time intensive, the School has employed a team of programmers to code the questions as specified in detail by the academics.
- Questions are Googled before and after the exam. Before ensures the questions are not easy to answer with simple searches. After ensures that the papers have not been uploaded during the exam.

Summary

A curriculum mapping exercise has been carried out for the CVENAH Civil Engineering stream of the 3707 Bachelor of Engineering (Honours) program at UNSW. The stream provides good coverage of all the Engineers Australia Stage 1 Graduate Competencies. It is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, and design of innovative engineering solutions and systems. Future direction for the stream involves working on embedding ethics more widely throughout the stream. The stream has rigorous and varied assessment tasks, which have been updated and adapted to deal with the advent of COVID-19.

CVENLT Environmental Engineering (Postgraduate)

Introduction

This report shows how the CVENLT Environmental Engineering stream of the 8621 Master of Engineering program at UNSW fosters the Engineers Australia Level 1 Graduate Competencies in its students. It starts by addressing the overall aims of the stream and its uniqueness. It then covers the stream plan followed by the Stream Learning Outcomes. The process for developing and obtaining feedback to improve these SLOs is detailed. This is followed by the curriculum mapping that relates the individual courses to the Stream Learning Outcomes, the Stream Learning Outcomes to the Graduate Capabilities and the individual courses to the Graduate Capabilities.

Aims of the Stream

The Environmental Engineering stream prepares students to manage the environmental impact of engineering activities. Students will be able to apply their broad knowledge of engineering and environmental processes in identifying environmental problems and in developing effective solutions to them. They also learn how to coordinate the activities of specialist groups such as biologists, ecologists and geologists within major projects. The discipline of environmental engineering embraces parts of civil engineering, with emphasis on management, systems design, water and wastewater processes, geotechnical, transport engineering and sustainability, together with aspects of chemical engineering, applied and biological sciences and environmental management.

The program is normally taken on a two-year full-time basis and sits at level 9 in the Australian Qualifications Framework giving students expert, specialised cognitive, technical and communication skills to allow them to demonstrate autonomy, expert judgement, adaptability, and responsibility.

For entrance into ME (Environmental Engineering) students are required to already have an undergraduate degree in Environmental Engineering or a related cognate area. Thus, the ME broadens their knowledge and introduces them to Australian engineering practice.

The program has been designed to provide students possessing engineering degrees that are not accredited under the Washington Accord with an educational pathway that has recognition under the Washington Accord. Hence, students are required to have previously been awarded an undergraduate degree in Environmental Engineering or a related cognate area. Thus, instead of focusing on providing students with underpinning science and fundamental engineering knowledge, the ME focuses on broadening their knowledge and introducing them to Australian engineering practice.

The School of Civil and Environmental Engineering was the first to offer an Environmental Engineering degree in Australia, is the largest Civil and Environmental Engineering School in Australia and is rated as number one in the country across each one of Shanghai Jiao ARWU Rankings, QS World University Rankings, THE and US News Best Global Universities. The School has outstanding strength in all areas of water engineering, being ranked fifth in the world for water resources.

Stream Plan

Course code	Course name
Year 1	
CVEN9625	Fundamentals of Water Engineering
CVEN9886	Environmental Microbial Processes
CVEN9887	Environmental Chemical Processes

Elective	Engineering and the Environment Elective
Elective	Management Elective
Elective	Disciplinary Knowledge Elective* Engineering and the Environment Elective* Management Elective*
Elective	
Elective	
Year 2	
CVEN9000	Civil Engineering Design Practice
CVEN9050	Masters Practice Project A
CVEN9051	Masters Practice Project B
Elective	Advanced Disciplinary Knowledge Elective†
Elective	Advanced Disciplinary Knowledge Elective†
Elective	Advanced Disciplinary Knowledge Elective†
Elective	Advanced Disciplinary Knowledge Elective†
Elective	Advanced Disciplinary Knowledge Elective†
Industrial Training	Industrial Training

*A maximum of two of these three electives may be chosen from any one list (in addition to the compulsory Engineering and the Environment Elective and Management Elective).

†Students must take a minimum of three Environmental Engineering electives and may take a maximum of two electives in any one subdiscipline of Civil Engineering.

Stream Learning Outcomes

On successful completion of this program, graduates will be able to:

Knowledge

1. Show mastery in the enabling sciences (maths, chemistry, physics, sustainability, and ecology) that underpin Environmental Engineering.

2. Demonstrate mastery in Environmental Engineering specialist technical knowledge such as: sustainability and risk assessment, regulatory and environmental frameworks, thermodynamics and contaminant transport, water treatment and resources management, hydrology/hydraulics, wastewater and solid waste management and the intersection of human activities with the preservation and utilisation of the biosphere and its ecological functions, now and in the future under climate change.

3. Source, critically evaluate and apply current research and/or industry best practice to solve complex problems in Environmental Engineering

Skills

4. Select and use appropriate analytical and computational tools as well as data literacy and analysis to analyse complex problems in Environmental Engineering

5. Design, critique and implement innovative and sustainable engineering solutions and systems in Environmental Engineering

Application of Knowledge and Skills

6. Lead manage, and integrate Environmental Engineering projects, individually or as part of a team, in a systematic and professional manner

7. Apply nuanced professional judgement that contributes to the ethical and sustainable practice of Environmental Engineering

8. Communicate and present professionally and effectively within and outside of the field of Environmental Engineering

Development of Stream Learning Outcomes

Initial development of the Stream Learning Outcomes (SLOs) involved a working party consisting of most of the staff teaching into the Environmental Engineering specific courses of the stream. The draft was then presented to the School Teaching and Learning Committee (TLC) for discussion. This discussion included student opinion collected from representatives of the Civil and Environmental Engineering Student Society (CEVSOC). After including amendments from TLC, the draft was presented to the School Management Committee (SMC) for discussion. After approval from the SMC the draft was submitted to the Industry Advisory Committee (IAC) for comment. The final set of suggested improvements were received from the Faculty Accreditation Working Group (FAWG).

The final version of the SLOs incorporated all the comments from the TLC, SMC, IAC and FAWG. The final SLOs were then resubmitted to the TLC, SMC and IAC in turn for final endorsement.

Curriculum Mapping

Note on elective courses used in mapping: To determine the electives to use in the mapping the most popular electives in each category were determined. These were further checked to ensure compliance with stream rules such as enrolling in a minimum of three Advanced Disciplinary Courses from Environmental Engineering.

Table 1. Mapping from courses to Stream Learning Outcomes

CVENLT Environmental Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → SLO Mapping — Stream Learning Outcomes (SLOs)

Courses (CO)	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7	SLO8
CVEN4102	0.0	25.0	0.0	0.0	50.0	12.5	0.0	12.5
CVEN9000	0.0	0.0	22.5	0.0	0.0	45.0	32.5	0.0
CVEN9050	0.0	0.0	47.0	0.0	26.0	16.5	0.0	10.5
CVEN9051	0.0	0.0	30.3	0.0	12.0	12.0	0.0	45.7
CVEN9405	0.0	7.1	0.0	80.7	0.0	0.0	12.1	0.0
CVEN9625	0.0	33.3	0.0	50.0	16.7	0.0	0.0	0.0
CVEN9701	0.0	0.0	0.0	50.0	12.5	25.0	0.0	12.5
CVEN9702	0.0	27.0	0.0	45.0	14.0	14.0	0.0	0.0
CVEN9856	0.0	75.0	0.0	0.0	25.0	0.0	0.0	0.0
CVEN9857	0.0	50.0	0.0	0.0	33.3	5.6	5.6	5.6
CVEN9872	0.0	20.0	6.7	16.7	56.7	0.0	0.0	0.0
CVEN9886	0.0	35.0	45.0	0.0	10.0	10.0	0.0	0.0
CVEN9887	50.0	13.3	0.0	36.7	0.0	0.0	0.0	0.0
CVEN9888	0.0	0.0	33.3	33.3	16.7	0.0	16.7	0.0
CVEN9892	0.0	16.7	0.0	50.0	33.3	0.0	0.0	0.0
CVEN9898	0.0	33.3	0.0	33.3	16.7	0.0	16.7	0.0

Table 2. Mapping from Stream Learning Outcomes to EA Stage 1 Graduate Capabilities

CVENLT Environmental Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Engineers Australia Stage 1 Competencies

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SLO → GC Mapping	Engineers Australia Stage 1 Competencies															
Learning Outcomes (LO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
SLO1 Show mastery in the en...	✓	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLO2 Demonstrate mastery in...	-	-	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
SLO3 Source, critically eva...	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
SLO4 Select and use appropr...	-	-	-	-	-	-	✓	✓	-	-	-	-	-	✓	-	-
SLO5 Design, critique and i...	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SLO6 Lead manage, and integ...	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	✓
SLO7 Apply nuanced professi...	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-
SLO8 Communicate and presen...	-	-	-	-	✓	✓	-	-	-	-	-	✓	-	-	-	-

Table 3. Mapping from courses to EA Stage 1 Graduate Capabilities

CVENLT Environmental Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

Curriculum Mapping	Engineers Australia Stage 1 Competencies															
Courses (CO)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5	3.6
CVEN4102	-	-	12.5	-	16.7	4.2	-	-	50.0	3.1	-	4.2	3.1	-	3.1	3.1
CVEN9000	-	-	-	22.5	-	-	-	-	-	11.2	32.5	-	11.2	-	11.2	11.2
CVEN9050	-	-	-	47.0	3.5	3.5	-	-	26.0	4.1	-	3.5	4.1	-	4.1	4.1
CVEN9051	-	-	-	30.3	15.2	15.2	-	-	12.0	3.0	-	15.2	3.0	-	3.0	3.0
CVEN9405	-	-	3.6	-	3.6	-	26.9	26.9	-	-	12.1	-	-	26.9	-	-
CVEN9625	-	-	16.7	-	16.7	-	16.7	16.7	16.7	-	-	-	-	16.7	-	-
CVEN9701	-	-	-	-	4.2	4.2	16.7	16.7	12.5	6.2	-	4.2	6.2	16.7	6.2	6.2
CVEN9702	-	-	13.5	-	13.5	-	15.0	15.0	14.0	3.5	-	-	3.5	15.0	3.5	3.5
CVEN9856	-	-	37.5	-	37.5	-	-	-	25.0	-	-	-	-	-	-	-
CVEN9857	-	-	25.0	-	26.9	1.9	-	-	33.3	1.4	5.6	1.9	1.4	-	1.4	1.4
CVEN9872	-	-	10.0	6.7	10.0	-	5.6	5.6	56.7	-	-	-	-	5.6	-	-
CVEN9886	-	-	17.5	45.0	17.5	-	-	-	10.0	2.5	-	-	2.5	-	2.5	2.5
CVEN9887	25.0	25.0	6.7	-	6.7	-	12.2	12.2	-	-	-	-	-	12.2	-	-
CVEN9888	-	-	-	33.3	-	-	11.1	11.1	16.7	-	16.7	-	-	11.1	-	-
CVEN9892	-	-	8.3	-	8.3	-	16.7	16.7	33.3	-	-	-	-	16.7	-	-
CVEN9898	-	-	16.7	-	16.7	-	11.1	11.1	16.7	-	16.7	-	-	11.1	-	-
Cognitive Scale	11.1	11.1	6.8	13.7	6.3	2.6	6.5	6.5	11.0	2.0	7.4	2.6	2.0	6.5	2.0	2.0

Reflection on Strengths Weaknesses and Future Action

Strengths

The stream is particularly strong in specialist engineering knowledge, the use of design, analysis and computation tools, and design of innovative engineering solutions and systems. Thus, students will graduate with a sound ability to assess the impacts of engineering projects on environmental processes and address environmental issues with well-considered solutions.

Weaknesses

The stream appears to have weaknesses in the areas of enabling sciences and ethics. The lack of coverage of enabling sciences is not considered to be a problem because all students will have already completed an undergraduate degree where these enabling sciences will have been covered. Students who are interested in ethics are encouraged to enrol in the course GSOE9510 Ethics and Leadership, which is not one of the courses included in the mapping.

Future Action

The School is in the process of implementing a strategic direction of embedding ethics more generally in the stream from start to finish, whereas previously the coverage of ethics had been concentrated in a smaller number of courses.

Assessment and Academic Integrity

Table 4. Assessment Map

CVENLT Environmental Engineering (8621)

Core | Learning Outcomes | Courses | CO → SLO | SLO → GC | Assessment Map | Curriculum Map

CO → AT Mapping	Assessment Types (AT)											
Courses (CO)	Assi	Essa	Exam	Lab	Othe	Perf	Port	Pres	Proj	Repo	Test	Tut
CVEN4102	20	-	80	-	-	-	-	-	-	-	-	-
CVEN9000	35	-	-	-	-	-	-	20	-	45	-	-
CVEN9050	-	-	-	-	-	-	-	10	-	90	-	-
CVEN9051	5	20	-	-	-	-	-	55	-	20	-	-
CVEN9405	40	-	50	-	-	-	-	-	-	-	10	-
CVEN9625	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9701	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9702	40	-	60	-	-	-	-	-	-	-	-	-
CVEN9856	-	-	50	-	-	-	-	-	30	-	20	-
CVEN9857	10	-	50	-	-	-	-	-	-	30	10	-
CVEN9872	30	-	50	-	-	-	-	-	-	-	20	-
CVEN9886	40	-	50	-	-	-	-	-	-	-	10	-
CVEN9887	40	-	50	10	-	-	-	-	-	-	-	-
CVEN9888	30	-	50	-	-	-	-	-	-	-	20	-
CVEN9892	30	-	30	-	-	-	-	-	-	-	40	-
CVEN9898	20	-	-	-	-	-	-	-	-	30	50	-

For the technical courses in the stream 50% to 60% of the assessment is in the form of quizzes and exams (see Table 4). The remainder of the assessment is usually in the form of assignments, most commonly in a report format.

The enquiry-based courses, ie Design Practice and Practice Project courses, revolve around a major work, with draft sections of these works assessed as the course progresses to give the students formative feedback. Assessments such as video presentations and interviews are also used to improve student communication skills and increase academic integrity.

The School has implemented many processes to ensure that academic integrity is maintained:

- All exam papers are reviewed by another academic. The reviewer will also be given the rubric and worked solution. When a paper is written by a new academic it will be reviewed by a professor or A/Prof to ensure standards are being maintained. Admin staff follow up to ensure all papers have been reviewed.
- Reports are submitted using TurnItIn, which ensures that students are not plagiarising or colluding.
- Academics provide rubrics and worked solutions to markers. In this case the academic will re-mark a sample of the reports or exam papers to ensure the rubric is being used correctly.
- Important works, such as thesis, will have two markers to ensure consistency.

Due to COVID all exams have moved online, so standard practices have been adopted including:

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