

COURSE DETAILS

Units of Credit	6	
Contact hours	4-5 hours per week	
Class	Wednesday, 9:00 – 11:00	Online via Moodle (Blackboard Ultra)
Workshop	Wednesday, 12:00 – 14:00* or Wednesday, 15:00 – 17:00* or Thursday, 12:00 – 14:00* or Thursday, 15:00 – 17:00*	Online via Moodle (Blackboard Ultra) Online via Moodle (Blackboard Ultra) Civil Engineering 701 (K-H20-701) Online via Moodle (Blackboard Ultra)
	*The duration of workshops for Week 9-10 will be three hours	

INFORMATION ABOUT THE COURSE

This course will provide fundamental knowledge and hands-on experience for practising sustainability in construction. The aim is to teach the environmental, social and economic impacts of buildings and built environment and demonstrating how sustainable construction design can avoid global warming, resource depletion and other environmental issues. The contents of this course are designed to provide hands-on experience in analytical thinking and decision making with regards to the application of sustainability in construction projects. This course explains the history and drivers of sustainability in construction and review sustainability policies, programs, and incentives in Australia. Principles of life cycle assessment (LCA) and life cycle costs (LCC) will be explained, and hands-on experience of evaluating LCA and LCC will be offered in the workshop classes and group assignment. This course also provides an overview of the current green rating systems for buildings and built environment in Australia. Additionally, examples of 'circular economy' in construction, sustainable construction design, materials and energy resources, as well as case studies of best sustainable practices and future trends of sustainable construction will be demonstrated. A number of alternative strategies available in design, procurement, construction, operation and end-of-life phases to reduce the overall environmental impact of a construction project are discussed. Students are expected to learn how the available strategies, standards and guidelines can be applied to analyse and improve sustainability and circular economy in construction practice.

HANDBOOK DESCRIPTION

See link to the virtual handbook:

<https://www.handbook.unsw.edu.au/postgraduate/courses/2021/cven4104/>

OBJECTIVES

The objectives of this course are to:

- Introduce the history and drivers of sustainability in construction, as well as sustainability policies, programs, and incentives in Australia
- Teach how to use life cycle assessment tools to quantify sustainability for decision making
- Introduce major green rating schemes in Australia
- Provide insight into the sustainable construction design, materials and energy solutions with lower environmental impacts as well as the circular economy in construction
- Demonstrate high-impact case studies of practising sustainability and circular economy in construction

List of programme attributes:

- An in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context
- Capacity for analytical and critical thinking and creative problem solving
- Ability to engage independent and reflective learning
- Skills for collaborative and multi-disciplinary work
- Respect for ethical practice and social responsibility
- Skills for effective communication

TEACHING STRATEGIES

Private Study	<ul style="list-style-type: none">• Review lecture material and textbook• Do set problems and assignments• Join Moodle discussions of problems• Reflect on class problems and assignments• Download materials from Moodle• Keep up with notices and find out marks via Moodle
Lectures	<ul style="list-style-type: none">• Find out what you must learn• See methods that are not in the textbook• Follow worked examples• Hear announcements on course changes
Workshops	<ul style="list-style-type: none">• Be guided by Demonstrators• Practice solving set problems• Ask questions
Assessments	<ul style="list-style-type: none">• Demonstrate your knowledge and skills• Demonstrate higher understanding and problem solving
Assignment	<ul style="list-style-type: none">• Practising the knowledge for sustainability assessment and decision making in groups

EXPECTED LEARNING OUTCOMES

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards is listed in Appendix A.

After successfully completing this course, you should be able to:

Learning Outcome		EA Stage 1 Competencies
1.	Understand the history and drivers of sustainability in construction, as well as sustainability policies, programs, and incentives in Australia	PE1.1, PE1.3, PE1.6, PE3.1, PE3.4
2.	Demonstrate hands-on skills in evaluating life cycle assessment and life cycle cost assessment in a construction-related activity	PE1.1, PE1.2, PE1.6, PE2.1, PE2.2, PE3.1, PE3.2, PE3.3, PE3.4, PE3.5, PE3.6
3.	Understand how major green rating schemes in Australia work	PE1.6, PE3.4
4.	Learn sustainable construction design, materials and energy resources used in case studies of best sustainable practices, circular economy, and future trends in sustainable construction	PE1.3, PE1.4, PE1.5, PE2.4, PE1.6, PE 3.3, PE3.4

For each hour of contact, it is expected that you will put in at least 1.5 hours of private study.

COURSE PROGRAM

TERM 2 2021

Date	Topic	Lecture Content	Demonstration Content
Week 1	History and drivers of sustainability in construction	<ul style="list-style-type: none"> ▪ Construction industry and its environmental impacts ▪ Definition of sustainability in construction and its pillars ▪ Sources of energy consumptions in building construction ▪ Demand versus supply and its impacts on sustainability ▪ A brief history of sustainability in construction 	No workshop
Week 2	Sustainability policies, programs, and incentives	<ul style="list-style-type: none"> ▪ Sustainability stakeholders, risks & rewards and implement-ability of sustainability policies ▪ General knowledge of sustainability policies, programs and incentives in Australia ▪ Sustainability in construction from the corporate perspective and engineering challenges ▪ Decision-making based on sustainability pillars, goals and objectives 	<ul style="list-style-type: none"> ▪ Case studies of sustainable projects (three pillars, risks and rewards) ▪ Sustainability objectives in construction (three pillars, SMART) ▪ Assessment questions from last year

Week 3	Principles of life cycle assessments (LCA) – part 1	<ul style="list-style-type: none"> ▪ LCA goal and scope definition and life cycle inventory analysis 	<ul style="list-style-type: none"> ▪ Group Assignment Introduction ▪ Recap on LCA Goal and Scope definition ▪ Practising the use of decision context mapping in Goal Definition ▪ Practising on drawing a simple LCA diagram ▪ Assessment questions from last year
Week 4	Principles of LCA – part 2	<ul style="list-style-type: none"> ▪ Life cycle inventory diagram ▪ Life cycle impact assessment 	<ul style="list-style-type: none"> ▪ A quick recap of Unit Process, Flows, Boundaries, and Process Levels ▪ Practising on drawing a more detailed LCI according to ISO14040/14044 ▪ Assessment questions from last year
Week 5	Life cycle cost analysis (LCC)	<ul style="list-style-type: none"> ▪ An Introduction to life cycle costing (LCC) for decision-making ▪ Description of several approaches and terms, fundamental principles and different types of costs 	<ul style="list-style-type: none"> ▪ Group assignment discussion (confirmation of topics by group appointments)
Week 6		<i>Non-teaching week for all courses</i>	No workshop
Week 7	Green rating systems in Australia	<p>Major voluntarily and mandatory green rating systems in Australia:</p> <ul style="list-style-type: none"> ▪ Green star ▪ NABERS ▪ NatHERS ▪ BASIX ▪ GECA 	<ul style="list-style-type: none"> ▪ Evaluation practice of LCC ▪ Assessment questions from last year
Week 8	Sustainable construction design, materials and energy – part 1	<ul style="list-style-type: none"> ▪ Introduction of sustainable alternative options of construction design, materials and energy resources for buildings and built environment 	<ul style="list-style-type: none"> ▪ Recap on mandatory items of LCA and LCC for the group assignment, Q&A, and troubleshooting ▪ Assessment questions from last year
Week 9	Sustainable construction design, materials and energy – part 2	<ul style="list-style-type: none"> ▪ Introduction of sustainable alternative options of construction design, materials and energy resources for buildings and built environment 	<ul style="list-style-type: none"> ▪ Group assignment consultations by appointments

Week 10	Case studies of best practices and future trends of sustainable construction and circular economy	<ul style="list-style-type: none"> ▪ Understand how sustainable construction is currently practised ▪ Understand the basic implementation of sustainability and circular economy ▪ Understand the future trends in sustainable construction 	<ul style="list-style-type: none"> ▪ Group assignment consultations by appointments
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ASSESSMENT

- **Hurdle requirement: to pass the course you need to get a minimum of 40% score for both group assignment and final exam.**
- **Both final exam and group assignment will be checked for plagiarism. A similarity of equal or above 35% to other submitted works based on the Turnitin report will result in failing the course and the 2nd submissions are not allowed.**
- **You will not get any scores for any questions of the assessments if a major similarity is detected based on the Turnitin report even if the similarity of the whole assessment is below 35%.**

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Final Examination is worth 60% of the Final Mark, the Group Assignment is 30% and the Quiz is 10%. A mark of at least 40% (hurdle) in the final examination and the group assignment is required to pass this course regardless of the total mark. Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned, and the dates of submission are set out below.

Note: The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Supplementary Examinations for Term 2 2021 will be held on Monday 06th September – Friday 10th September 2021 (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

PENALTIES

Late work will be not allowed and results in failure of the course for late group assignment and final exam submission.

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
1. Quiz	10 multiple choices	10%	LO1, part of LO2	The quiz covers the lecture contents of Week 1, 2 and 3 (inclusive).	Week 4	N/A	Week 4
2. Group Assignment	A report submitted via Turnitin (approx. 20 pages for groups of 3-5 students)	30%	LO2	Group assignment is based on the lecture and demonstration contents of Week 2 to 5 (inclusive).	Week 10	before the final exam	before the final exam
3. Final exam	Calculations, and analytical questions (5-10 questions)	60%	LO1, LO2, LO3, LO4	The exam covers the entire contents of the course.	TBA	TBA	TBA

RELEVANT RESOURCES

- **Book:** Life Cycle Assessment: Theory and Practice (2018) by Hauschild, Michael, Rosenbaum, Ralph K., Olsen, Stig. (ebook is available in UNSW library)
- **Book:** Sustainable Buildings and Infrastructure: Paths to the Future by Annie R. Pearce , Yong Han Ahn, and HanmiGlobal Co Ltd (ebook is available in UNSW library)
- Recommended websites in the lecture contents.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

<https://student.unsw.edu.au/dates>

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

<https://student.unsw.edu.au/plagiarism>

ACADEMIC ADVICE

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: [The Nucleus: Student Hub](#)
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

Refer to Academic Advice on the School website available at:

<https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice>

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership