



School of Civil and Environmental Engineering

Term 2, 2020

CVEN4104 SUSTAINABILITY IN CONSTRUCTION

COURSE DETAILS

Units of Credit	6	
Contact hours	5 hours per week	
Class	Tuesday, 15:00 – 17:00 and Thursday, 13:00 – 14:00	Online via Moodle (Blackboard Ultra)
Workshop	Friday, 9:00 – 11:00 or Friday, 12:00 – 14:00 or Friday, 15:00 – 17:00	Online via Moodle (Blackboard Ultra)
Course Coordinator and Lecturer	Dr Ali Kashani email: ali.kashani@unsw.edu.au	

INFORMATION ABOUT THE COURSE

This course will provide fundamental knowledge and hands-on experience for practising sustainability in construction. The aim is teaching the environmental, social and economic impacts of buildings and built environment and demonstrating how sustainable construction design can avoid global warming and resource depletion 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 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 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 in practice.

HANDBOOK DESCRIPTION

See link to the virtual handbook:

<https://www.handbook.unsw.edu.au/postgraduate/courses/2020/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 available green rating schemes in Australia
- Provide insight into the sustainable construction design, materials and energy solutions with lower environmental impacts
- Demonstrate high-impact case studies of practising sustainability 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
- Information literacy
- 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 may be found 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 green rating schemes in Australia work	PE1.6, PE3.4
4.	Distinguish sustainable construction design, materials and energy resources used in case studies of best sustainable practices 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 2020

Date	Topic	Lecture Content	Demonstration Content
01/06/2020 (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
08/06/2020 (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

15/06/2020 (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"> ▪ 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
22/06/2020 (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
06/07/2020 (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"> ▪ Evaluation practice of LCC
13/07/2020 (Week 6)		<i>Non-teaching week for all courses</i>	No workshop
20/07/2020 (Week 7)	Green rating systems in Australia	<p>Voluntarily and mandatory green rating systems in Australia:</p> <ul style="list-style-type: none"> ▪ Green star ▪ NABERS ▪ NatHERS ▪ BASIX 	<ul style="list-style-type: none"> ▪ Case study and hands-on practice of green rating evaluation
27/07/2020 (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"> ▪ Group assignment Q&A and troubleshooting
03/08/2020 (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 presentation or consultation
10/08/2020 (Week 10)	Case studies of best practices and future trends of sustainable construction	<ul style="list-style-type: none"> ▪ Understand how sustainable construction is currently practised ▪ Understand the basic implementation of sustainability ▪ Understand the future trends in sustainable construction 	<ul style="list-style-type: none"> ▪ Group assignment presentation or consultation

ASSESSMENT

Hurdle requirement: to pass the course you need to get minimum 40% score for both group assignment and final exam.

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. Students who perform poorly in the quiz and the group assignment are recommended to discuss progress with the lecturer during the term. 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 2020 will be held on Monday 7th September – Friday 11th September (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 penalised at the rate of 10% per day after the due time and date have expired.

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
1. Quiz	Multiple choices and/or short answers	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 (groups of four students)	30%	LO2	Group assignment is based on the lecture and demonstration contents of Week 2 to 5 (inclusive). LCA and LCC analysis of a sustainable construction alternative must be reported which the full details are available in the assessment section of Moodle.	Monday, August the 17th at 9 am	5 days before the final exam	5 days before the final exam
3. Final exam	Short answers, calculations, and analytical 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

(Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations: student.unsw.edu.au/special-consideration
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

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