School of Civil and Environmental Engineering

Term 1, 2020

CVEN9892
SUSTAINABILITY ASSESSMENT AND RISK ANALYSIS

COURSE DETAILS

Units of Credit	6	
Contact hours	4 hours per week	
Lecture	Tuesday, 14:00 – 16:00	**Location of Lecture:** **Webster Theatre A (K-G15-190 – Wks 1-5)** **Webster Theatre B (K-G15-290 – Wks 7-10)**
Workshop	Tuesday, 16:00 – 18:00	**Workshops in either of these three rooms:** - Old Main Building 151 (K-K15-151) - Science & Engineering G07 (K-E8-G07) - Science & Engineering G05 (K-E8-G05) **Find your workshop room in the class timetable link on your myUNSW!**
Course Coordinators and Lecturers	Sustainability Section (Wks 1-4): Dr Soo Huey Teh Email: soohuey.teh@unsw.edu.au Room 135, Water Research Centre, Level 1, Vallentine Annex (Building H22) Risk Analysis Section (Wks 5 and then 7-10): Dr Adele Jones Email: adele.jones1@unsw.edu.au Room 133b, Water Research Centre, Level 1, Vallentine Annex (Building H22)	

INFORMATION ABOUT THE COURSE

This course will introduce students to a series of practical tools for sustainability assessment and risk assessment. Although many of the tools are widely applicable, the focus and practical examples are most generally related to the water industry. There are no specific prerequisites for this course but it assumes some familiarity with water supply technologies and environmental issues, will involve computational activities and is aimed at students with an undergraduate degree in engineering.

HANDBOOK DESCRIPTION

The design of water and energy systems has advanced from a cost-benefit basis to the incorporation of quantitative assessments of environmental burdens and the human and environmental risks associated with competing options. This course will equip students with the ability to apply life cycle assessment for quantifying environmental burdens, and an understanding of the factors that define human health and environmental risks. The latter include the presence of chemicals and pathogenic organisms, and the reliability of engineered systems.

http://www.handbook.unsw.edu.au/postgraduate/courses/2020/CVEN9892.html

OBJECTIVES

The aim of this course is to introduce sustainability assessment tools – in particular life cycle assessment (LCA), triple bottom line analysis (TBL) and risk assessment (RA) - to put them into the context of strategic planning processes with regards to water and energy services and to enable students to make more informed decisions towards increased sustainable outcomes.

In addition, the course aims to foster:

- Capacity for analytical and critical thinking and for creative problem solving
- Ability to engage independent and reflective learning
- Skills for collaborative and multi-disciplinary work
- A respect for environmental sustainability, ethical practice and social responsibility

TEACHING STRATEGIES

This course will be presented as a series of lectures, each accompanied by additional reading material. Following each lecture, a workshop will be conducted for students to practice implementation of key knowledge acquired from the lecture. Specific teaching and learning strategies include the following:

Private Study	• Review lecture material and additional reading • Complete all assignments • Download materials from UNSW Moodle • Keep up with notices and find out marks via UNSW Moodle
Lectures	• Find out what you must learn • Summarise essential course material from lectures and associated reading • Hear announcements on course changes
Workshops	• Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments	• Enhance your knowledge by undertaking necessary research to complete given tasks • Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving • Do not copy sections from textbooks or websites, always use appropriate references for sourced material

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**
LO1	*Be able to assess a problem and to know which tools are appropriate in quantitatively understanding it, and how information from the application of these tools can be applied in solution development.*	PE1.1, PE1.6, PE3.1
LO2	*Be able to conduct simple footprint and life cycle assessments using professional software.*	PE1.2, PE1.3, PE3.2, PE3.4, PE3.6
LO3	*Be able to plan and describe a decision-making process, interpret the outcomes from each assessment method, evaluate them by using multicriteria analysis (MCA) and make recommendations towards more sustainable decision-making processes.*	PE1.1, PE1.2, PE1.3, PE1.4, PE1.6, PE2.1, PE2.2, PE3.6
LO4	*Describe the basic principles of risk assessment and be able to undertake risk assessment calculations and formulate reasonable conclusions based on risk assessment activities.*	PE1.1, PE1.2, PE1.3, PE1.4, PE1.6, PE2.1, PE2.2

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

COURSE PROGRAM

Term 1, 2020

Lecturers: Soo Huey Teh (lectures in blue) and Adele Jones (lectures in red)

Date	2h Lecture Tuesdays, 2-4pm Room: Webster Theatre A (Wks 1-5) Webster Theatre B (Wks 7-10)	2h Workshop Tuesdays, 4-6pm Various rooms (find your room in the class timetable link on your myUNSW!)
18 February (Week 1)	Life Cycle Assessment 1 (LCI, LCIA)	Life cycle inventories, Introduction to openLCA
25 February (Week 2)	Life Cycle Assessment 2 (LCSA, TBL)	OpenLCA exercises
3 March (Week 3)	Introduction to sustainable engineering and sustainable resource management	**Online Quiz (10%)** Sustainability Principles and MFA
10 March (Week 4)	GHG emissions accounting and environmental footprints	Carbon and water footprints, TBL exercises
Group Assignment 1 (20%) due on Monday, 16 March 2020, 8pm		
17 March Week 5	Environmental chemical risk assessment	Environmental chemical risk assessment
Week 6 (23-27 March)	**NO LECTURE – FIELD TRIP/FLEXIBILITY WEEK**	**NO WORKSHOP – FIELD TRIP/FLEXIBILITY WEEK**
31 March (Week 7)	Environmental microbial risk assessment	Environmental microbial risk assessment
7 April (Week 8)	Risk analysis: Concepts, Frameworks, and Management in engineered systems	Risk analysis, Risk Management
Individual Assignment 2 (30%) due on Thursday, 16 April 2020, 8pm		
14 April (Week 9)	Disability Adjusted Life Years (DALYs)	Disability Adjusted Life Years (DALYs)
21 April (Week 10)	Multicriteria analysis	Multicriteria analysis
Examination period: 2 May – 15 May		**Final exam (40%)** **(date to be announced)**

ASSESSMENT

Students who perform poorly in quick quizzes and workshops are recommended to discuss progress with the lecturer and demonstrators during the term.

Online Quiz: Students will be expected to demonstrate an understanding of the qualitative and quantitative concepts that underpin decision making.

Assignment 1 is a GROUP assignment where a quantitative life cycle assessment (LCA) is undertaken on a real-world example and summarised in a group report. The aim is to demonstrate an understanding of environmental sustainability and LCA methodology, the capacity for analytical and critical thinking and for creative problem solving and skills for collaborative and multi-disciplinary work. The assessment criteria refer to the context of the case study, detail and systems coverage of the LCA, assumptions and explanations, results, conclusions, summary and the overall report quality. The contributions of individual students are assessed separately in this group assignment; students will receive individual marks.

Assignment 2 is an INDIVIDUAL assignment where students will apply new skills and techniques to undertake an environmental chemical risk assessment. The aims are to demonstrate an understanding of environmental risk assessment methodology, the capacity for analytical and critical thinking and for creative problem solving.

Students must actively project-manage their assignment work in order to gain a good mark in the major assignments. Students should expect to spend a significant amount of time working with their team (where applicable) to develop their work. Individual assignments cannot be worked on as a group and then handed in as an individual piece of work – note that the Turnitin will be able to detect similarities between assignments. The assignments and the exam will test the students' ability to synthesise the overall course. All material presented during the session will be examinable in the exam unless otherwise noted.

Students who struggle with the material set in workshops are recommended to discuss progress with the lecturer during the session. The Course Coordinator reserves the right to adjust the final scores by scaling if agreed with the Head of School. 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.

The exam will be a 2-hour closed book exam during the normal exam period. You are allowed to bring in one A4 sheet of paper with hand or typewritten notes, formulae, diagrams on both sides. The questions will generally be similar to the shorter questions in the Guided Learning Unit Exercises.

The Exam date is set by the Exams Branch, and is confirmed in about Week 8 of the term. You can access the time and date of the exam via your MyUNSW. Do not make arrangements that will prevent you from doing the exam in the Exam Period, or after the exam date is set in Week 8, on the day of the exam.

The final examination is compulsory. You have to sit the final exam on Kensington Campus. **A mark of at least 40% in the final examination is required before the class work (quiz and assignments) is included in the final mark.**

Distance Students: All Distance/Short course mode students are expected to sit their final examination at the Kensington campus (Sydney). If you reside further than 40 km from the Kensington campus, and you wish to sit your exam externally (by distance), you must register for an external exam by the UNIVERSITY CENSUS DATE (Term 1, 2020 - 15th March).

Supplementary Examinations for T1 2020 will be held on Monday 25th – Friday 29th May (inclusive). You are required to be available during all exam dates. Please do not to make any personal or travel arrangements during this period.

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Online Quiz	15 minutes	10%	LO1	Students will be expected to demonstrate an understanding of the qualitative and quantitative concepts that underpin decision making.	**Tuesday, 3 March 2020** (during workshop session)	same day	after quiz is submitted
Assignment 1: Life Cycle Assessment (group work with individual marks)	6 pages (tbc)	20%	LO1, LO2	This is a group assignment where a LCA of a system or product is undertaken. The aim is to demonstrate an understanding of environmental sustainability and LCA methodology, the capacity for analytical and critical thinking, for creative problem solving and skills for collaborative team work. The assessment criteria refer to the study context, methodology and calculations, assumptions and explanations, results, discussion, recommendations, conclusions, summary and the overall report quality.	**Monday, 16 March 2020, 8pm** Via Turnitin on Moodle. **One student per group submits one single document once. The first submission is final.** Include the Group ID in the file name!	1 week after submission deadline	2 weeks after submission deadline
Assignment 2: Environmental Chemical Risk Assessment (individual work)	3000 words maximum (not including tables or references).	30%	LO1, LO4	This is an individual assignment where a chemical risk assessment will be undertaken. Students will be expected to demonstrate that they can understand and follow the steps for a chemical risk assessment outlined in the enHealth 2012 guidance document Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards.	**Thursday, 16 April 2020, 8pm** Via Turnitin on Moodle. **The first submission is final.** Include your surname and ZID in the file name.	1 week after submission deadline	2 weeks after submission deadline
Final exam	2 hours	40%	LO1, LO3, LO4	The exam will test the students' ability to synthesise the overall course. All material presented during the session will be examinable in the exam unless otherwise noted.	Final exam period	Date of exam	Official release of results

All assignments and reports are to be submitted electronically via Turnitin on UNSW Moodle. No hard copies will be accepted. No emailed copies will be accepted. Assignments and reports are due at the time indicated above on the due date. Late assignments will receive a 10% penalty per day late.

All requests for extensions and/or special consideration are to be submitted through the Special Consideration portal on MyUNSW (My Student Profile tab > My Student Services > Online Services > Special Consideration). See the following website for further information: **https://student.unsw.edu.au/special-consideration**

Marking criteria: All assignments will be marked on the basis of whether the student demonstrates an understanding of the material. Where numerical errors can be identified as simple slips, penalties will not be as large as when errors appear to be a result of a conceptual misunderstanding, or the source of the error is difficult to determine from the work. The major assignments will be additionally assessed with respect to the depth of the analysis, the breadth of its consideration of the question at hand and the clarity of the way in which the answer is presented. The use of tables and diagrams is encouraged. **Please make sure you do not exceed the imposed word/page limits**.

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

RELEVANT RESOURCES

There are no specific textbooks recommended for this course.

However, the students will be introduced to a large range of standards and guideline documents throughout the lecture series. Relevant documentation will be provided on UNSW Moodle with each lecture.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

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

ACADEMIC ADVICE

(Formerly known as Common School Information)
For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations,
- 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