CVEN9892

Sustainability Assessment and Risk Analysis

Term One // 2021

School of Civil and Environmental Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

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Lecturers

Name	Email	Availability	Location	Phone
Richard Collins	richard.collins@unsw.edu.au		Room 103, WRC / Vallentine Annexe (Bld H22)	
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School Contact Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

Course Details

Credit Points 6

Summary of the Course

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.

Course Aims

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 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.

The aim of this course is to introduce sustainability assessment tools, in particular life cycle assessment (LCA) and risk assessment (RA). These tools will be put into the context of strategic planning processes with regards to water and energy services and will 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 and
- a respect for environmental sustainability, ethical practice and social responsibility

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Enable students 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.	PE3.1, PE1.6, PE1.1
2. Enable students to conduct a simplified life cycle assessment using professional software.	PE1.2, PE1.3, PE3.2, PE3.4, PE3.6, PE3.3
3. Enable students 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	PE1.1, PE1.2, PE1.3, PE1.4, PE1.6, PE2.1, PE2.2, PE3.6, PE3.5

Learning Outcome	EA Stage 1 Competencies
processes.	
4. 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

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

Additional Course Information

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

Assessment

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 to develop their work. The quizzes, 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.

If you are unwell or have other extenuating circumstances which prevent you from completing an assessment, you **always have to apply for Special Consideration** before the submission deadline through official University channels: https://student.unsw.edu.au/special-consideration. Otherwise the fit-to-submit rule applies, i.e. by sitting or submitting an assessment on the scheduled assessment date, the student is declaring that they are fit to do so and cannot later apply for Special Consideration.

All assignment reports are to be submitted electronically via Turnitin on UNSW Moodle. No hard copies or 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**.

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 assignment 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.

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.

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Quizzes	20%	Week 4 and Week 10	1, 4
Group Assignment	20%	22/03/2021 08:00 PM	1, 2
Individual Assessment	20%	09/04/2021 08:00 PM	3, 4
Final Exam	40%	Final exam period	1, 3, 4

Assessment Details

Assessment 1: Quizzes

Start date: Not Applicable

Length: 15 minutes for Quiz 1 and 45 minutes for Quiz 2

Details:

Online Quiz 1: Students will be expected to demonstrate a conceptual understanding of the topics taught in the first three weeks of the course.

Online Quiz 2: This is a brain-storming activity where students will be asked to provide a number of solutions to prevent the spread of COVID in a particular situation.

Additional details:

The two quizzes will be held in Week 4 and Week 10, during workshop times.

Turnitin setting: This is not a Turnitin assignment

Assessment 2: Group Assignment

Start date: Week 2

Length: 8 pages

Details:

This 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.

Turnitin setting: This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment 3: Individual Assessment

Start date: Week 5

Details:

This is an individual assignment where students will apply skills learnt in the course to determine the risk of a particular environmental contaminant. The assessment encourages analytical and critical thinking and creative problem solving using industry guidelines.

Turnitin setting: This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment 4: Final Exam

Start date: Not Applicable

Length: 2 hours

Details: The exam is 2-hour open book exam during the normal exam period conducted online. 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 must be available at the stipulated exam time no matter the time zone in the country they may be currently residing in.

Additional details:

The Exam date is set by Exams Branch and is confirmed in about Week 8 of session. You can access the time and date of the exam via 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. You are required to be available during all exam dates, including supplementary examinations, should you require one. The final examination is compulsory. 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.

Turnitin setting: This is not a Turnitin assignment

Attendance Requirements

80% attendance of lectures and workshops is compulsory.

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 15 February - 19 February	Lecture	Life Cycle Assessment 1 (LCI, LCIA)
	Workshop	Life cycle inventories, Introduction to openLCA
Week 2: 22 February - 26 February	Lecture	Life Cycle Assessment 2 (LCSA, TBL)
	Workshop	openLCA exercises
Week 3: 1 March - 5 March	Lecture	Sustainable engineering and sustainable resource management
	Workshop	Sustainability Principles and MFA
Week 4: 8 March - 12 March	Lecture	GHG emissions accounting and environmental footprints
	Workshop	Online Quiz 1 (10%), Carbon and water footprints, TBL exercises
Week 5: 15 March - 19 March	Lecture	Environmental chemical risk assessment
	Workshop	Environmental chemical risk assessment
Week 6: 22 March - 26 March	Homework	Week 6 is Flexibility Week, i.e. there is no lecture and no workshop. Use the time to work on assignments.
Week 7: 29 March - 2 April	Lecture	Environmental microbial risk assessment
	Workshop	Environmental microbial risk assessment
Week 8: 5 April - 9 April	Lecture	Risk analysis: Concepts, Frameworks, and Management in engineered systems
	Workshop	Risk analysis, Risk Management
Week 9: 12 April - 16 April	Lecture	Disability Adjusted Life Years (DALYs)
	Workshop	Disability Adjusted Life Years (DALYs)
Week 10: 19 April - 23 April	Lecture	Multicriteria analysis
	Workshop	Online Quiz 2 (10%), Multicriteria analysis

Resources

Recommended Resources

There is no required textbook for this course. However, we **strongly recommend** the following textbook:

- Peters, G. and Svanström, M. 2019. ***Environmental Sustainability for Engineers and Applied Scientists***. Cambridge University Press, Cambridge. https://doi.org/10.1017/9781316711408 [Available through UNSW Library at https://www.library.unsw.edu.au].

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

Course Evaluation and Development

We welcome student feedback throughout the course (e.g. through the Moodle Discussion Forum). This is very important to us – let us know what you think works well and what we can do better. This information will be used to continually improve the course.

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

Academic Honesty and 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 Information

Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.

Final Examinations:

Final exams in Term 1 will be held online between 30th April - 13th May inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

Supplementary Examinations:

Supplementary Examinations for Term 1 2021 will be held on 24th - 28th May inclusive should you be required to sit one. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

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

Image Credit

Coxs River, Kanimbla Valley (photo taken by T. Wiedmann)

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering 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	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in 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	✓