



GSOE9340

Life Cycle Engineering

Term Two // 2021

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Sami Kara	S.Kara@unsw.edu.au	There will be Microsoft video chat hours scheduled from 5:00-6:00 pm prior to the online class. The dedicated MsTeams channel should be used for discussion for all course related communication.	Ainsworth Building, 301A	+61-2-93855757

Lecturers

Name	Email	Availability	Location	Phone
Sami Kara	S.Kara@unsw.edu.au	There will be Microsoft video chat hours scheduled from 5:00-6:00 pm prior to the online class. The dedicated MsTeams channel should be used for discussion for all course related communication.	Ainsworth building, 301A	+61-2-93855757

Demonstrators

Name	Email	Availability	Location	Phone
Gwen Foo	gwendolyn.foo@unsw.edu.au		Ainsworth Building, 301A	+61-2-93856851
Sepideh Moshrefi	s.moshrefi@unsw.edu.au		Ainsworth building, 301	+61-2-93856851

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

[School of Mechanical and Manufacturing Engineering](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

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)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, 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

[School Office](#) – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

Course Details

Credit Points 6

Summary of the Course

Manufacturing has always been by far the largest contributor to waste generation in our society and therefore provides a huge potential for waste reduction. This is due to the fact that current manufacturing systems are considered to be of an open loop style, whereby manufacturers' main interests are focused in the areas of design, development, sales and distribution. A shift to a closed loop manufacturing system is proposed to enable manufacturers to take into account the whole product life cycle and move away from open loop manufacturing. This will require engineering of the whole product life cycle of a product from raw material selection, production, usage to disposal in order to reduce the environmental impact of industrial society.

This course is designed to provide postgraduate students with high level knowledge of Life Cycle Engineering principles and practices. The course will follow a typical product life cycle and the associated tools and techniques available. It starts with defining the concept of life cycle engineering, history and potential benefits (ecological and environmental). It then introduces the drivers behind this concept such as legislation and standards, environmental requirements. Next, the concepts of life cycle thinking, Cradle-to-Grave, Cradle-to-Cradle, Energy and Eco-efficiency are introduced. In the following section, generic environmental impact assessment tools and the concept of sustainable product development and the associated eco-design tools are introduced. The course continues with concepts related to usage and the end-of-life stages of product life cycle. These topics include Product collection, Reverse logistics and End-of-Life decision making, Tools and technologies, Disassemble sequence planning, Disassembly technologies, Reuse and remanufacturing principles, product monitoring and testing, materials recycling techniques. The course finally finishes with economics and future trends such as Economic models, Life Cycle Costing (LCC) and Product Service Systems (PSS).

Course Aims

The aim of this course is to introduce the tools and techniques associated with engineering of a product life cycle to postgraduate students from technical backgrounds so that they can have an in-depth understanding of how to engineer the entire life of a product from material selection to disposal.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Have gained knowledge in the inter-disciplinary field of Life Cycle Engineering	PE1.3, PE1.5, PE1.6
2. Develop in-depth understanding of various tools and techniques associated with engineering and managing the whole life cycle of a product	PE2.2
3. Develop an appreciation of the future trends in the area of triple	PE1.4

Learning Outcome	EA Stage 1 Competencies
bottom line of sustainability (economic, ecological and social)	

Teaching Strategies

This course is included to give you the skills to appreciate the engineering of product life cycles in order to reduce environmental impact and ultimately to achieve the three pillars of sustainability: namely economic, environmental and social sustainability. The content reflects my experience as a lecturer as well as my practical experience in the manufacturing environment, and practical examples drawn from that experience are used throughout the lectures and demonstrations. Effective learning is supported when you are actively engaged in the learning process and by a climate of inquiry, and these are both achieved in the lectures and demonstrations by way of practical case studies. You become more engaged in the learning process if you can see the relevance of your studies to professional, disciplinary, and/or personal contexts, and the relevance is shown in all parts of the lectures and assignments by way of examples drawn from industry.

Dialogue is encouraged between you, others in the class, and the lecturers. Diversity of experiences is acknowledged, as some students in each class have prior experience in a manufacturing environment. Your experiences are drawn on to illustrate various aspects, and this helps to increase motivation and engagement.

It is expected that assignments will be marked and handed back as soon as possible. You will have feedback and discussion while the assignment is fresh in your mind, to improve the learning experience.

The subject will be presented in the form of online lectures and demonstrations via MsTeams, where it is relevant. Each weekly class will consist of 1-1.5 hrs. lecture followed by a demonstration example or case study related to the material covered in the lecture. A typical session would consist of a lecture covering the main elements of the topic for the week, interspersed with several individuals or group exercises.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Group Assignment 1	30%	Wednesday, Week 4, by 11:59pm	1, 2, 3
Group Assignment 2	30%	Wednesday, Week 7, by 11:59 PM	1, 2
Group assignment 3	40%	Tuesday, Week 10, by 11:59 PM	1, 2, 3

Assessment Details

Assessment 1: Group Assignment 1

Start date: Wednesday, Week 2, 9:00am

Length: Maximum 1500 words

Details:

Assessment description: This is a group assignment about demonstrating and understanding the first step of denationalizing the framework for LCE, which is the total space allocation based on Science-Based Targets (SBTs). Although the work will be done as a group of four, the assessment will be as an individual based on the % contribution. Assessments will be marked and returned within 2 weeks of the due date

Assessment criteria: A detailed assessment description and a rubric will be uploaded to Moodle.

Deadline for absolute fail: Midnight Monday the 28 June 2021.

Additional details:

Further information about the assignment and the assessment rubric will be provided on Moodle.

Submission notes: Submission will be done via Moodle

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 2: Group Assignment 2

Start date: Wednesday, Week 4, 9:00am

Length: Maximum 1500 words

Details:

Assessment description: This is a group assignment about investigating the environmental impact (LCA) of a selected product, which should come from the industry sector selected in assignment 1. Although the work will be done as a group of four, the assessment will be as an individual based on the % contribution. Assessments will be marked and returned within 2 weeks of the due date

Assessment criteria: A detailed assessment description and a rubric will be uploaded to Moodle.

Deadline for absolute fail: Midnight Monday the 19 July 2021.

Additional details:

Further information about the assignment and the assessment rubric will be provided on Moodle.

Submission notes: The submission will be made via Moodle

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 3: Group assignment 3

Start date: Wednesday, Week 7, 09:00 AM

Length: Maximum 2000 words

Details:

Assessment description: This is a group assignment about demonstrating an understanding of the third and fourth steps of operationalizing the framework for LCE, which are the selection of mitigation strategy/strategies and suggesting possible engineering solutions. Although the work will be done as a group of four, the assessment will be as an individual based on the % contribution. Assessments will be marked and returned within 2 weeks of the due date

Assessment criteria: A detailed assessment description and a rubric will be uploaded to Moodle.

Deadline for absolute fail: Midnight Sunday the 8 August 2021.

Additional details:

Further information about the assignment and the assessment rubric will be provided on Moodle.

Submission notes: Submission will be done via Moodle

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
O Week: 25 May - 28 May	Reading	Release of course outline and course requirements.
Week 1: 31 May - 4 June	Lecture	<i>Introduction, Sustainability, and Sustainability Drivers</i>
Week 2: 7 June - 11 June	Lecture	<i>Life Cycle Engineering (LCE) Framework and Mitigation Strategies</i>
Week 3: 14 June - 18 June	Lecture	<i>LCE Tools: Environmental Footprint of Products and Processes</i>
Week 4: 21 June - 25 June	Lecture	<i>LCE Tools: Life Cycle Costing, Material Flow Cost Accounting and Eco-Efficiency</i>
Week 5: 28 June - 2 July	Lecture	<i>Operational Mitigation Strategies: Energy and Resource Efficiency of Products and Processes</i>
Week 6: 5 July - 9 July	Lecture	<i>Operational Mitigation Strategies: Environmental Sustainability in Supply Chains</i>
Week 7: 12 July - 16 July	Lecture	Design and Development Mitigation Strategies: Environmentally Sustainable Product Development
Week 8: 19 July - 23 July	Lecture	<i>Use Stage Mitigation Strategies: Product Usage</i>
Week 9: 26 July - 30 July	Lecture	<i>End-of-Life Mitigation Strategies: Reverse Logistics</i>

Week 10: 2 August - 6 August	Lecture	<i>End-of-Life Mitigation Strategies: EoL Product Hierarchy - Reduce, Reuse, Remanufacture, Recycle</i>
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Resources

Prescribed Resources

A list of reference books and reading materials will be provided during the course delivery, some of which can be found in the UNSW Library: <https://www.library.unsw.edu.au/>

Additional readings will be handed out during each class.

The course will be administered using Moodle. Therefore course administration and some lecture materials may be uploaded to Moodle. Students are advised to use Moodle for class communications.

UNSW Library website: <https://www.library.unsw.edu.au/>

Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

Recommended Resources

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include revising the course to make it suitable for online delivery.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Late policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the [Exams](#) webpage.

Special Consideration

If you have experienced an illness or misadventure beyond your control that will interfere with your

assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a [Fit to Sit / Submit rule](#), which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID 19 illness or isolation** will be required.

Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

On-campus class attendance

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to a **limited** number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the FAQs: <https://www.covid-19.unsw.edu.au/safe-return-campus-faqs>

Guidelines

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)

Important Links

- [Moodle](#)
- [Lab Access](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Faculty Transitional Arrangements for COVID-19](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)
- [Equitable Learning Services](#)

Image Credit

The image has been provided by the UNSW PVCE during the digital uplift of the course.

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	