



UNSW Course Outline

MATS6007 Sustainable Materials Engineering - 2024

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General Course Information

Course Code : MATS6007

Year : 2024

Term : Term 3

Teaching Period : T3

Is a multi-term course? : No

Faculty : Faculty of Science

Academic Unit : School of Materials Science & Engineering

Delivery Mode : In Person

Delivery Format : Standard

Delivery Location : Kensington

Campus : Sydney

Study Level : Undergraduate, Postgraduate

Units of Credit : 6

[Useful Links](#)

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

This postgraduate course will give an overview of the materials footprint on environment during their life cycle, from extraction to disposal. Through a series of lectures, students will learn a range of different approaches towards creating a sustainable system and explore how these

approaches can improve sustainability and minimise environmental impact of diverse types of materials (metals, ceramics, polymers and composites) in different sectors (i.e., transportation, infrastructure, and energy generation/storage).

Course Aims

This course aims to provide an in-depth understanding of sustainability, the root causes of unsustainability, the environmental impacts, and how to create a sustainable system through applying suitable technologies and materials. This course aims to teach you different sustainable materials systems and introduces latest approaches towards sustainable energy production and storage, transportation, infrastructure, water treatment, soil remediation and carbon management. One of the aims of this course is to enable you to understand the concept of life cycle assessment (LCA) and circular economy and apply it in evaluation of the impact of a sustainable material system on environment and economy.

Relationship to Other Courses

Materials science and engineering is broadly considered to be an enabling technology, providing the foundation upon which other technologies advance. Developments in materials have provided the foundation for entire historical time periods. The huge impact of implementation of these technologies and the utilization of materials on humanity, society, and the planet, indicates the critical roles of material engineers towards sustainable development of the entire system. In this course you will learn about sustainable development and gain knowledge how to improve the sustainability of different types of materials which can be used in different fields of materials science and engineering.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Evaluate the impacts of main groups of materials on the environment at different stages of their life cycle.
CLO2 : Examine key principles underpinning a sustainable system and critique current strategies towards creating a sustainable system in different sectors (i.e., transportation, infrastructure, energy production/storage and etc).
CLO3 : Apply the life cycle assessment framework to evaluate the use of sustainable technologies and materials.
CLO4 : Identify the source of material and energy waste from the sustainable circular system and develop appropriate strategy to minimise the environmental impact.

Course Learning Outcomes	Assessment Item
CLO1 : Evaluate the impacts of main groups of materials on the environment at different stages of their life cycle.	<ul style="list-style-type: none"> Materials Impact on the Environment Final Project Final Exam
CLO2 : Examine key principles underpinning a sustainable system and critique current strategies towards creating a sustainable system in different sectors (i.e., transportation, infrastructure, energy production/storage and etc).	<ul style="list-style-type: none"> Sustainable materials essay Final Project Final Exam
CLO3 : Apply the life cycle assessment framework to evaluate the use of sustainable technologies and materials.	<ul style="list-style-type: none"> Final Project Final Exam
CLO4 : Identify the source of material and energy waste from the sustainable circular system and develop appropriate strategy to minimise the environmental impact.	<ul style="list-style-type: none"> Materials Impact on the Environment Sustainable materials essay Final Project Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Materials Impact on the Environment Assessment Format: Group	15%	Start Date: Not Applicable Due Date: Not Applicable
Sustainable materials essay Assessment Format: Group	20%	Start Date: Not Applicable Due Date: Not Applicable
Final Project Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: 16/11/2024 12:00 AM
Final Exam Assessment Format: Individual	35%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Materials Impact on the Environment

Assessment Overview

You will select one material of your interest and critique the sustainability of the material from an environmental perspective.

As a group (each group should have 4 members), you will be expected:

- To have group discussion with your team and discuss your selected topics.
- To provide/receive feedback to/from your team members.
- Take note of discussion and share the summary of the discussion and what you have learned from group discussion with class via Forum in week 3 – worth 5%
- Give 5 min presentation of summary of your findings to the class in week 4 – worth 10%
- Feedback will be returned within 2 weeks of submission.

Course Learning Outcomes

- CLO1 : Evaluate the impacts of main groups of materials on the environment at different stages of their life cycle.
- CLO4 : Identify the source of material and energy waste from the sustainable circular system and develop appropriate strategy to minimise the environmental impact.

Detailed Assessment Description

You will select one material of your interest and critique the sustainability of the material from an environmental perspective.

Assessment Length

one page group report and 5/10 min presentation

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

NA

Sustainable materials essay

Assessment Overview

In your group, each student will select one real-world example related to one of the five material-focused transformative strategies taught in the course.

In your discussions, you will discuss and assess how the strategy can contribute to creating a sustainable system. Based on your assessment, you will propose recommendations for

improvement and draw implications for efforts to create a sustainable system more broadly.

In this assignment you are expected to:

- To have group discussion with your team and discuss your selected materials.
- To provide/receive feedback to/from your team members.
- To have individual submission (a short essay (1000-1500 words) on the details of the selected strategy and how that strategy improved the sustainability), deadline is end of week 7 (10%)
- To have a short group submission (a summary of the group discussion's main outcome and points around the selected strategies- one page), end of week 7, (5%)
- To fill peer review assessment form, end of week 7, (5%).

Feedback is provided to each individual students two weeks after the submission of the task in Moodle. Group submission feedback is provided within one week after submission.

Course Learning Outcomes

- CLO2 : Examine key principles underpinning a sustainable system and critique current strategies towards creating a sustainable system in different sectors (i.e., transportation, infrastructure, energy production/storage and etc).
- CLO4 : Identify the source of material and energy waste from the sustainable circular system and develop appropriate strategy to minimise the environmental impact.

Detailed Assessment Description

In your group, each student will select one real-world example related to one of the five material-focused transformative strategies taught in the course.

In your discussions, you will discuss and assess how the strategy can contribute to creating a sustainable system. Based on your assessment, you will propose recommendations for improvement and draw implications for efforts to create a sustainable system more broadly.

Assessment Length

1000-1500 words

Assignment submission Turnitin type

This is not a Turnitin assignment

Generative AI Permission Level

No Assistance

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NA

Final Project

Assessment Overview

- i. You will select a sustainable product, as an alternative to a less sustainable one that is currently in use and justify your choice.
- ii. You will then apply the LCA framework to compare these two in terms of environmental impact.
- iii. Based on your evaluation, you will propose strategies to policy makers to introduce and reinforce the use of the sustainable material in a national or an Australian state or a local context of your choice.

Due date for submission is the end of week 10.

You are expected to address the three above-mentioned points clearly but concisely, with a submission length approximately 1500-2500 words. The suggestion should be based on the LCA interpretation and results. Feedback is available through inquiry with the course convenor

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- CLO2 : Examine key principles underpinning a sustainable system and critique current strategies towards creating a sustainable system in different sectors (i.e., transportation, infrastructure, energy production/storage and etc).
- CLO3 : Apply the life cycle assessment framework to evaluate the use of sustainable technologies and materials.
- CLO4 : Identify the source of material and energy waste from the sustainable circular system and develop appropriate strategy to minimise the environmental impact.

Detailed Assessment Description

The details have been described above.

Assessment Length

1500-2500 words.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate

information or answers.

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Final Exam

Assessment Overview

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across the term. The exam is typically 120 minutes long and is scheduled in the formal university examination period.

You will be expected to answer around 15-20 short essay questions.

Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Evaluate the impacts of main groups of materials on the environment at different stages of their life cycle.
- CLO2 : Examine key principles underpinning a sustainable system and critique current strategies towards creating a sustainable system in different sectors (i.e., transportation, infrastructure, energy production/storage and etc).
- CLO3 : Apply the life cycle assessment framework to evaluate the use of sustainable technologies and materials.
- CLO4 : Identify the source of material and energy waste from the sustainable circular system and develop appropriate strategy to minimise the environmental impact.

Detailed Assessment Description

Final exams will cover all the materials from week 1- week 10.

Assessment Length

NA

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

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General Assessment Information

For each assignment, please make sure you follow the detailed instruction and comprehensive explanation which will be provided by lecturer in the class to avoid any confusion.

Short Extensions:

The School of Materials Science and Engineering has reviewed its range of assignments and projects to determine their suitability for automatic short extensions as set out by the UNSW Short Extension Policy. After consultation with teaching staff and examination of our course offerings, we consider our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School does not offer the Short Extension provision in its MATS courses but students, if needed, can apply for formal Special Consideration via the usual procedure.

Grading Basis

Standard

Requirements to pass course

Satisfactory completion of the course includes the requirement to achieve >45% weighted average over final exam and final project and the overall mark >50. Students who fail to achieve this will be awarded an Unsatisfactory Fail (UF) grade for the course regardless if they receive over 50% in total for the course

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	<p>The contents of week1:</p> <ul style="list-style-type: none"> • Definition of sustainable development • Materials life cycle from extraction to disposal <p>Activity for sessions 1 & 2:</p> <ul style="list-style-type: none"> • padlet sel-introduction • pre-class reading • group selection and role allocation
Week 2 : 16 September - 22 September	Lecture	<p>The contents of week 2:</p> <ul style="list-style-type: none"> • Sustianability in metals, ceramic, composite and polymer (part 1) <p>Activity for sessions 1 & 2:</p> <ul style="list-style-type: none"> • Group discussion on assignment 1 • Pre-class reading
Week 3 : 23 September - 29 September	Lecture	<p>The contents of week 3:</p> <ul style="list-style-type: none"> • Sustainability in metals, ceramic, composite and polymer (part 2) • Sustainable materials system through five material-focused transformative strategies <p>Activity for session1:</p> <ul style="list-style-type: none"> • Group discussion on assignment 1 • Pre-class reading <p>Activity for session 2:</p> <ul style="list-style-type: none"> • Group report in Moodle • pre-class reading
Week 4 : 30 September - 6 October	Lecture	<p>The contents of week 4:</p> <ul style="list-style-type: none"> • life cycle sustainable assessment (Environmental, social and economical assessment) • Oral presenation of group (each group 5-10 min) <p>Activity for session1:</p> <ul style="list-style-type: none"> • Group discussion on assignment 2 • Pre-class reading • 10 min group presenation of assignment 1 • peer review assessment
Week 5 : 7 October - 13 October	Lecture	<p>The contents of week 5:</p> <ul style="list-style-type: none"> • life cycle sustainable assessment (Environmental, social and economical assessment) part 2 • workshop on software if you are interested <p>Activity for session1:</p> <ul style="list-style-type: none"> • Group discussion on assignment 2 • Pre-class reading • selection of topic for final project
Week 6 : 14 October - 20 October	Lecture	FLEXIBILITY WEEK
Week 7 : 21 October - 27 October	Lecture	<p>The contents of week 7:</p> <ul style="list-style-type: none"> • A sustainable pathway to produce nanomaterials via converting waste • water purification <p>Activity for session1:</p> <ul style="list-style-type: none"> • submission of assignment 2 • Working on final project • pre-class reading
Week 8 : 28 October - 3 November	Lecture	<p>The contents of week 8:</p> <ul style="list-style-type: none"> • Reduction of carbon footprints • <p>Activity for session1:</p> <ul style="list-style-type: none"> • Peer review assesemnet of assignmnet 2 • Pre-class reading
Week 9 : 4 November - 10 November	Lecture	<p>The contents of week 8:</p> <ul style="list-style-type: none"> • case study workshop <p>Activity for session1:</p> <ul style="list-style-type: none"> • Working on final project • Pre-class reading
Week 10 : 11 November - 17 November	Lecture	<p>The contents of week 10:</p> <ul style="list-style-type: none"> • Oral presentation of final project/online session <p>Activity for session1:</p> <ul style="list-style-type: none"> • Working on final project • Oral presentation of final project

Attendance Requirements

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

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Teaching assistant	Rasoul Khayyam Nekouei		Room 440, Hilmer building, E10			No	Yes

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the [UNSW Student Code of Conduct Website](#).

Academic Honesty and Plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others'

ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The [Current Students site](#),
- The [ELISE training site](#), and
- The [Use of AI for assessments](#) site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: <https://student.unsw.edu.au/special-consideration>

Important note: UNSW has a “fit to sit/submit” rule, which means that if you sit an exam or

submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- [The Current Students Gateway](#)
- [Student Support](#)
- [Academic Skills and Support](#)
- [Student Wellbeing, Health and Safety](#)
- [Equitable Learning Services](#)
- [UNSW IT Service Centre](#)
- Science EDI Student [Initiatives](#), [Offerings](#) and [Guidelines](#)