



## UNSW Course Outline

# MATS2007 Sustainable Materials Processing - 2024

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## General Course Information

Course Code : MATS2007

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

Units of Credit : 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

This course on Sustainable Design and Environmental Impact offers a comprehensive exploration of key materials sustainability challenges, principles and practical approaches. Students will learn problem-solving methodologies and analyze the environmental footprint of

processes like production, maintenance, and disposal. They will study embodied carbon and energy, pollution, life cycle analysis, energy recovery, carbon sequestration, pollution minimization, and sustainable material selection and processing technologies.

Through in-person lectures and tutorials, students will gain a deep understanding of sustainable practices. The course may incorporate innovative approaches like flipped classroom sessions and field trips.

This course equips students with expertise in evaluating environmental impacts and implementing sustainable solutions. It is relevant to engineering, environmental sciences, and related fields. By completing this course, students contribute to a more resilient future.

## **Course Aims**

The aim of this course is to instill a critical understanding of sustainability issues in materials selection, sourcing and processing, and the application of materials in energy efficiency, and environmental remediation. By studying this course and through practical examples, students will develop analysis and solving problem skills, in particular in ecological footprint analysis and minimisation, recycling of waste materials, and material selection.

# Course Learning Outcomes

Course Learning Outcomes
CLO1 : Solve problems relating to material supply chains, sustainable material selection, and lifecycle assessment using rigorous standardised approaches and critical analysis.
CLO2 : Critique and compare the distinguishing features of different types of energy sources, their conversion methods and appropriate related measures in energy recovery and efficient utilisation.
CLO3 : Assess the energy consumption of a given operation and greenhouse gas emission using lifecycle assessment, adopting an appropriate analysis scope.
CLO4 : Analyse selected underlying environmental challenges and propose and justify solutions that reduce or eliminate energy consumption, wastes and greenhouse gases in materials processing, design and application.

Course Learning Outcomes	Assessment Item
CLO1 : Solve problems relating to material supply chains, sustainable material selection, and lifecycle assessment using rigorous standardised approaches and critical analysis.	<ul style="list-style-type: none"><li>• SMaRT Centre Recycling Project</li><li>• Final exam</li><li>• Mid-term Test</li><li>• Group report and presentation</li></ul>
CLO2 : Critique and compare the distinguishing features of different types of energy sources, their conversion methods and appropriate related measures in energy recovery and efficient utilisation.	<ul style="list-style-type: none"><li>• Final exam</li><li>• Mid-term Test</li></ul>
CLO3 : Assess the energy consumption of a given operation and greenhouse gas emission using lifecycle assessment, adopting an appropriate analysis scope.	<ul style="list-style-type: none"><li>• Group report and presentation</li><li>• Final exam</li><li>• Mid-term Test</li></ul>
CLO4 : Analyse selected underlying environmental challenges and propose and justify solutions that reduce or eliminate energy consumption, wastes and greenhouse gases in materials processing, design and application.	<ul style="list-style-type: none"><li>• SMaRT Centre Recycling Project</li><li>• Group report and presentation</li><li>• Final exam</li><li>• Mid-term Test</li></ul>

## Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

## Additional Course Information

Please note that a tour to a cementworks in Week 6 is an integral part of this course. Groups will either travel all together, or nominate one or two group spokespersons to travel on the tour. The

tour will be useful in completing one of the group assignments on energy audits and life cycle assessment. The date for the tour will be finalised at the start of term.

# Assessments

## Assessment Structure

Assessment Item	Weight	Relevant Dates
SMaRT Centre Recycling Project Assessment Format: Group	10%	
Final exam Assessment Format: Individual	40%	
Mid-term Test Assessment Format: Individual	30%	
Group report and presentation Assessment Format: Group	20%	

## Assessment Details

### SMaRT Centre Recycling Project

#### Assessment Overview

This task involves a team-based interview where you will be asked to identify an environmental issue identified anywhere within the course, and then conduct a Q&A style presentation in a pre-allocated timeslot where details of the problems and their solutions will be identified. Your group will be assessed on the clarity of problem identification, proposed solutions, team presentation style and consistency /professionalism.

Your presentation will be 5 minutes in length, and will be worth 10% of your course grade. The presentations will be scheduled in week 9 or 10.

Feedback will be given two weeks after submission, including your marked assignment, report, and comments on your presentations, and overall comments on how the class performed.

#### Course Learning Outcomes

- CL01 : Solve problems relating to material supply chains, sustainable material selection, and lifecycle assessment using rigorous standardised approaches and critical analysis.
- CL04 : Analyse selected underlying environmental challenges and propose and justify solutions that reduce or eliminate energy consumption, wastes and greenhouse gases in materials processing, design and application.

#### Generative AI Permission Level

#### Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

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

## **Final exam**

### **Assessment Overview**

Your final exam will be 2hrs in duration and will assess content from week 5 onwards, and will be held in the formal examination period. You will be assessed on conceptual understanding and ability to apply theory and technology learnt throughout the course to energy, materials, and environmental sustainability challenges and problem solving-type scenarios.

Your exam will typically include a mixture of short to longer responses assessing critical interpretation of sustainability principles and approaches, and long term challenges.

Feedback is available through inquiry with the convenor.

### **Course Learning Outcomes**

- CL01 : Solve problems relating to material supply chains, sustainable material selection, and lifecycle assessment using rigorous standardised approaches and critical analysis.
- CL02 : Critique and compare the distinguishing features of different types of energy sources, their conversion methods and appropriate related measures in energy recovery and efficient utilisation.
- CL03 : Assess the energy consumption of a given operation and greenhouse gas emission using lifecycle assessment, adopting an appropriate analysis scope.
- CL04 : Analyse selected underlying environmental challenges and propose and justify solutions that reduce or eliminate energy consumption, wastes and greenhouse gases in materials processing, design and application.

### **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](#).

## Mid-term Test

### Assessment Overview

You will complete a 90 min mid-term test covering the topics presented in Weeks 1-4.

The test will typically incorporate a combination of multiple choice questions, numerical calculation questions, and short response questions.

Feedback: You will receive your marked tests indicating which questions you answered correctly and incorrectly. Additionally, overall comments and worked solutions may be provided to the entire class within two weeks of completing the test.

### Course Learning Outcomes

- CL01 : Solve problems relating to material supply chains, sustainable material selection, and lifecycle assessment using rigorous standardised approaches and critical analysis.
- CL02 : Critique and compare the distinguishing features of different types of energy sources, their conversion methods and appropriate related measures in energy recovery and efficient utilisation.
- CL03 : Assess the energy consumption of a given operation and greenhouse gas emission using lifecycle assessment, adopting an appropriate analysis scope.
- CL04 : Analyse selected underlying environmental challenges and propose and justify solutions that reduce or eliminate energy consumption, wastes and greenhouse gases in materials processing, design and application.

### Generative AI Permission Level

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## Group report and presentation

### Assessment Overview

You will form into groups and select a topic in one of the energy production industries (fossil fuel, nuclear, solar, biomass, etc.) or one of metal/materials production industries (ironmaking, steelmaking, cement, aluminium, copper, etc.). You will investigate one stage of the production

process through an energy and carbon footprint audit and propose solutions to achieve enhanced sustainability for this industry by considering the application of new materials, innovative technologies, and waste and environmental management that reduce the energy consumption or carbon footprint of the stage.

Your group will submit a group report on your investigation, calculations/modelling and findings at the end of Week 7 worth 20%. The word limit is 3000 words.

Your group must also submit a group project proposal summarising your intended investigation topic by the end of week 3, with feedback being provided in Week 4.

Final submission feedback will be given two weeks after submission of the assignment and take the form of the mark for the assignment, overall comments on how the class performed, and your group specific feedback.

### **Course Learning Outcomes**

- CL01 : Solve problems relating to material supply chains, sustainable material selection, and lifecycle assessment using rigorous standardised approaches and critical analysis.
- CL03 : Assess the energy consumption of a given operation and greenhouse gas emission using lifecycle assessment, adopting an appropriate analysis scope.
- CL04 : Analyse selected underlying environmental challenges and propose and justify solutions that reduce or eliminate energy consumption, wastes and greenhouse gases in materials processing, design and application.

### **Assignment submission Turnitin type**

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

### **Generative AI Permission Level**

#### **Simple Editing Assistance**

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

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# General Assessment Information

## 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

NOTE: Students who fail to achieve a score of at least 40% for the overall exam component (i.e., mid-session exam and final exam marks combined), but achieve a final mark >50% for the course, will be awarded a UF (Unsatisfactory Fail) for the course

# Course Schedule

## Attendance Requirements

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

## General Schedule Information

Please refer to the main Moodle course page for the course schedule, which will be updated whenever any changes arise in the course.

# Course Resources

## Prescribed Resources

Please use the below links to access the prescribed textbooks as either hard copy or online:

Print:

<https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9780128215210>

<https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9780323983617>



Digital:

<https://unswbookshop.vitalsource.com/products/-v9780128215265>

<https://unswbookshop.vitalsource.com/textbooks?sort=&term=9780123859716>+ old edition

<https://unswbookshop.vitalsource.com/products/-v9780323985468>

## Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Benjamin Pace					No	Yes
	Rakesh Joshi					No	No

## 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](https://student.unsw.edu.au/conduct).

### 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/>

**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](#)