



UNSW Course Outline

MATS6002 Fundamentals of Materials Design - 2024

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General Course Information

Course Code : MATS6002

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 : Postgraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

This course is designed for postgraduate students with materials science and engineering background. The course aims to understand the basic elements of engineering materials design concepts and methodologies. The course covers a background on the relationship between

materials structure and properties and hence the application of advanced engineering materials; including the elastic moduli, yield strength, tensile strength, hardness and ductility, fast fracture, toughness and fatigue, creep deformation and fracture, oxidation and corrosion, friction, abrasion and wear of materials.

Course Aims

The overall aim of this course is to present an advanced level coverage of the engineering materials design concepts and methodologies through introducing engineering materials failure process and mechanisms. The lectures will also introduce engineering processes to enhance mechanical properties of materials through tuning of composition and microstructure.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Explain the relationship among materials composition, microstructure, mechanical properties and materials failure.
CL02 : Identify the distinguishing features of different types of materials selection criteria and economic drivers in materials design processes.
CL03 : Develop problem-solving skills for identifying and applying design methods, techniques and conditions specific to materials used for real-world applications.
CL04 : Identify and apply different approaches in the design of a specific component.

Course Learning Outcomes	Assessment Item
CL01 : Explain the relationship among materials composition, microstructure, mechanical properties and materials failure.	<ul style="list-style-type: none"> • Final exam • Mid-term Test
CL02 : Identify the distinguishing features of different types of materials selection criteria and economic drivers in materials design processes.	<ul style="list-style-type: none"> • Assignment • Final exam • Mid-term Test
CL03 : Develop problem-solving skills for identifying and applying design methods, techniques and conditions specific to materials used for real-world applications.	<ul style="list-style-type: none"> • Research project • Final exam • Mid-term Test
CL04 : Identify and apply different approaches in the design of a specific component.	<ul style="list-style-type: none"> • Assignment • Research project • Mid-term Test

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Final exam Assessment Format: Individual	45%	Start Date: Exam week Due Date: Not Applicable
Assignment Assessment Format: Individual	20%	
Mid-term Test Assessment Format: Individual	15%	
Research project Assessment Format: Individual	20%	

Assessment Details

Final exam

Assessment Overview

You will sit a final exam held during the formal examination period. The exam will be 2 hrs in duration and will cover the design of materials / devices based on the interrelationship of materials properties, behaviour, and failure including: mechanical properties, dislocations, strengthening, fracture, creep, deformation and fracture, oxidation and corrosion, friction, abrasion and wear.

Feedback is available through inquiry with the convenor after the formal UNSW release of course results.

Expected format: multiple choice questions, short answer responses, and calculations.

Course Learning Outcomes

- CL01 : Explain the relationship among materials composition, microstructure, mechanical properties and materials failure.
- CL02 : Identify the distinguishing features of different types of materials selection criteria and economic drivers in materials design processes.
- CL03 : Develop problem-solving skills for identifying and applying design methods, techniques and conditions specific to materials used for real-world applications.

Assessment Length

2h

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](#).

Assignment

Assessment Overview

You are required to submit an assignment related to activities covered in Weeks 1-5 on mechanical materials design. It will be due in week 5 and have 10 calculation questions.

You will be given feedback on submission within 2 weeks of submission.

Course Learning Outcomes

- CL02 : Identify the distinguishing features of different types of materials selection criteria and economic drivers in materials design processes.
- CL04 : Identify and apply different approaches in the design of a specific component.

Generative AI Permission Level

No Assistance

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Mid-term Test

Assessment Overview

You will sit a 1 hr test, held in class covering topics of atomic structure and bonding, structure of crystalline solids, imperfections, and mechanical properties. These topics will be examined in the context of their role/importance in the design of materials for mechanical loading applications.

Feedback: You will receive your marked exams indicating what questions were answered

correctly and incorrectly. Overall comments and worked solutions will be provided to the class.

The test will be held typically in week 7.

Expected format: multiple choice questions and calculations.

Course Learning Outcomes

- CL01 : Explain the relationship among materials composition, microstructure, mechanical properties and materials failure.
- CL02 : Identify the distinguishing features of different types of materials selection criteria and economic drivers in materials design processes.
- CL03 : Develop problem-solving skills for identifying and applying design methods, techniques and conditions specific to materials used for real-world applications.
- CL04 : Identify and apply different approaches in the design of a specific component.

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](#).

Research project

Assessment Overview

You will be required to conduct a research project on a selected device/application investigating the interrelationship between materials, properties, design parameters, performance, and/or failure.

Requirements

-A written report prepared to a professional standard (approximately < 15 pages/2000 words, worth 5%) and an oral presentation (approximately <5 minutes duration, worth 5%)

Report is due in Week 9 and presentation is given in Week 10. You will be given feedback on the content and quality of their presentation within 2 weeks of the submission of project report and presentation.

Course Learning Outcomes

- CL03 : Develop problem-solving skills for identifying and applying design methods, techniques and conditions specific to materials used for real-world applications.

- CLO4 : Identify and apply different approaches in the design of a specific component.

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](#).

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

You are required to achieve a mark of at least 35% in this final exam (and at least 45% weighted average for this final exam and the mid-term test) to pass the course otherwise an Unsatisfactory Fail (UF) grade may be awarded.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 2 : 16 September - 22 September	Assessment	Assignment 1 due
Week 4 : 30 September - 6 October	Assessment	Assignment 2 due
Week 5 : 7 October - 13 October	Assessment	Portfolio assignment due
Week 7 : 21 October - 27 October	Assessment	Mid-exam
Week 10 : 11 November - 17 November	Group Work	Project report due
Week 11 : 18 November - 24 November	Assessment	Final exam

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
Convenor	Dewei Chu				By appointment	No	Yes
Lecturer	Wenxian Li				By appointment	No	No
	Mengyao Li				By appointment	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](#).

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](#)