



Course Outline

MATS1110

Introduction to Materials for Engineering
Applications

Materials Science and Engineering

Science

T3, 2022

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor & Group Project	Dr Ben Pace	b.pace@unsw.edu.au	School of Materials Science and Engineering (Building E10), by appointment	Phone: 9385 4837
Lecturer	Dr Bernd Gludovatz	b.gludovatz@unsw.edu.au	Ainsworth Building (Building J17), by appointment	Phone: 9385 4006
Laboratory Administrator	Dr Caitlin Healy	caitlin.healy@unsw.edu.au	School of Materials Science and Engineering (Building E10), by appointment	Phone: 9385 6038
Assistant Lecturer	A/Prof John Daniels	j.daniels@unsw.edu.au	School of Materials Science and Engineering (Building E10), by appointment	Phone: 9385 5607

2. Course information

Units of credit: 6

Pre-requisite(s): N/A

Teaching times and locations:

	Lecture			Tutorial
Location	QUADG034	LAW THEATRE G23	OLD MAIN BUILDING G31	MICHAEL HINZE THEATRE
Time	Mon 9-10	Tue 3-4	Thu 2-3	Thu 3-4
Weeks	1-5, 7-10			2-5, 7-10

Online timetable site: <http://timetable.unsw.edu.au/2022/MATS1110.html>

2.1 Course summary

This course introduces Engineering students to the field of Materials Science and Engineering. Throughout society, different materials are chosen in very applications how and why materials are selected, is a key step in the Engineering process. In this course, you will learn about the different classifications of materials, how their atomic structure and processing leads to the desirable properties needed for industry. Laboratory work will be used to examine the testing techniques employed by materials engineers to determine the properties and which processes are best suited for a given material. Students will learn how to select the correct material for a real-world problem through their understanding of mechanical, chemical and structural properties of materials.

2.2 Course aims

To provide an understanding of fundamental structure-processing-property relationships of materials. Use this knowledge to conduct materials selection tasks.

2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Describe the relationships between material structures and processing to the final properties
2. Select appropriate materials for engineering design applications
3. Apply materials testing methods to investigate and quantify material properties

2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	Program Learning Outcome (PLO)	Related Tasks & Assessment
CLO 1	8, 12	Online tutorials, Lab reports and Final exam
CLO 2	3, 16	Group assessment and Final exam
CLO 3	8, 12	Lab reports

3. Strategies and approaches to learning

3.1 Learning and teaching activities

Key teaching/learning activities in the course include lectures, tutorials, online quizzes and labs. Lectures will cover core concepts, theories and approaches, which will then be contextualised and consolidated through laboratories and tutorials. A group project will be provided to give students the opportunity to explore the real-world process of materials selection. Online quizzes will be performed to provide students with a regular feedback to understand their progressing on understanding of the course content.

Lectures: The core concepts will be taught in lectures; students will have access to the lectures notes before class for annotation during the lecture. Students will be engaged in the learning process through class discussions and problem-solving questions independently and working together with partners and groups.

Labs: Experimental techniques and procedures will be taught through laboratories classes and laboratory reports following the class. Students will actively complete the experiments gaining experience of important materials testing and characterisation techniques. Students will be able to reflect on the experiments and learn to process data through the lab reports after class.

3.2 Expectations of students

- Students should read through lecture notes and lab sheets/tutorials prior to class
- During class, students are expected to engage actively in class discussions
- Students should work through lecture, tutorial and textbook questions and work through the online tutorials
- To ensure you achieve the maximum grade possible students should complete all assessment tasks and submit them on time.
- Students are expected to participate in online discussions through the Moodle page

4. Course schedule and structure

This course consists of 41 hours of class contact hours. You are expected to take an additional 109 hours of non-class contact hours to complete assessments, readings and exam preparation.

		Main Lecture and Tutorial Schedule		Lecturer	Other tasks	Labs	Group Project	
Teaching period T3A	Week 1	Mon (9-10)	12/09	Lecture 1: Course Information and 'What is Materials Science and Engineering?'	BP	Quizzes		Group Project
		Tue (3-4)	13/09	Lecture 2: Introduction to bonding between atoms	BP			
		Thu (2-3)	15/09	Lecture 3: Packing of atoms				
		Thu (3-4)	15/09	Lecture 4: Phase diagrams	BP			
	Week 2	Mon (9-10)	19/09	Lecture 5: Diffusion, Kinetics of structural change	BP	Formative Quiz - Atomic Bonding Open		
		Tue (3-4)	20/09	Lecture 6: The Elastic Modulus	BP	Release Tutorial		
		Thu (2-3)	22/09	NO LECTURE - PUBLIC HOLIDAY	BP			
		Thu (3-4)	22/09	NO LECTURE - PUBLIC HOLIDAY	BP			
	Week 3			RECORD LECTUR		Tutorial 2: Phase Equilibria	Quiz 1: Phase diagrams	
		Mon (9-10)	28/09	Lecture 7: Yielding and Dislocations	BP	Release Tutorial		
		Tue (3-4)	27/09	Lecture 8: Strengthening methods in metals	BP			
		Thu (2-3)	29/09	Lecture 9: Fracture, toughness, micro-mechanisms of fast fracture + LAUNCH GROUP PROJEC	BP			
		Thu (3-4)	29/09	Tutorial 3: Elastic Modulus and Yielding - Follow up questions on Group Project	BP			
		Fri	30/09					
	Week 4	Mon (9-10)	03/10	LABOUR DAY - NO Lecture		Release Tutorial		
				RECORD LECTUR		Lecture 10: Fatigue mechanisms, creep		
		Wed	05/10				Tensile Testing	
		Thu (2-3)	06/10	Lecture 11: Creep fracture and mechanisms, creep resistance	BP		Tensile Testing	
		Thu (3-4)	06/10	Tutorial 4: Strengthening	BP			
		Fri	07/10				Quiz 2: Basic Mechanical Properties	
	Week 5	Mon (9-10)	10/10	Lecture 12: Oxidation	BP	Release Tutorial		
		Tue (3-4)	11/10	Lecture 13: Wet corrosion	BP		Fracture	
		Wed	12/10				Fracture	
		Thu (2-3)	13/10	GROUP PROJECT PART 1 - Follow Up Session	BP			
		Thu (3-4)	13/10	Tutorial 5: Fracture and Fatigue	BP			
	Fri	14/10				Quiz 3: Fracture, Fatigue and Creep		
	Week 6	No classes						
Teaching period T3B	Week 7	Mon (9-10)	24/10	Information Session: LAUNCH OF GROUP PROJECT PART 2	BP	Release Tutorial		Group Project Part 1 Due
		Tue (3-4)	25/10	Lecture 14: Battery and Electronic Materials	BP		Batteries	
		Wed	26/10				Batteries	
		Thu (2-3)	27/10	Lecture 15: Semi-conductors in electronics and photovoltaics	BP			
		Thu (3-4)	27/10	Tutorial 6: Corrosion, Batteries and Semiconductors Tutorial	BP			
	Fri	28/10				Quiz 4: Corrosion, Batteries & Semiconductors		
	Week 8	Mon (9-10)	31/10	GROUP PROJECT PART 2 - Follow Up Session	BP	Release Tutorial		
		Tue (3-4)	01/11	Lecture 16: Materials processing case studies in Steels and Light Alloys	BG			
		Thu (2-3)	03/11	Lecture 17: Materials processing case studies in Steels and Light Alloys	BG			
		Thu (3-4)	03/11	Tutorial Case Study 1: Steel & Alloys (Phase Diagram)	BP			
	Fri	04/11						
	Week 9	Mon (9-10)	07/11	Lecture 18: Materials processing case studies in Polymers	BG	Release Tutorial		
		Tue (3-4)	08/11	Lecture 19: Materials processing case studies in Polymers	BG		Microstructures of Steels	
		Wed	09/11				Microstructures of Steels	
		Thu (2-3)	10/11	Lecture 20: Materials processing case studies in Ceramics and Glasses	BG			
		Thu (3-4)	10/11	Tutorial Case Study 2: Steels & Alloys (Phase Transformation) & Polymers	BG			
	Fri	11/11					Group Project Part 2 Due	
Week 10	Mon (9-10)	14/11	Lecture 21: Materials processing case studies in Ceramics and Glasses	BG	Release Tutorial			
	Tue (3-4)	15/11	Lecture 22: Materials processing case studies in Composites	BG				
	Thu (2-3)	17/11	Lecture 23: Materials processing case studies in Composites	BG				
	Thu (3-4)	17/11	Tutorial Case Study 3: Ceramics & Composites	BG				
	Fri	18/11				Quiz 5: Engineering Materials		

5. Assessment

5.1 Assessment tasks

Assessment task	Description	Weight	Due date
Online tutorials:	5 Online quizzes.	Total: 10%, 2% each quiz	See Moodle for details
Laboratory reports:	<p>There will be 4 laboratories throughout the course on:</p> <ul style="list-style-type: none"> • Tensile testing • Microstructures of Materials • Fracture • Batteries <p>To complete the assessment task students will be required to complete a lab report for each lab. Note: It is intended that the labs run in-person. For cases where students provide information to the course coordinator as to why they cannot attend labs, an online option is available.</p>	Total: 25 %, 6.25 % for each lab	1 week after the students have completed the lab, see Moodle for details
Group Project on Materials Selection:	<p>This is a team task in which you are to perform the job of a Materials Engineer when faced with a product design in which the selection of the materials is not yet made.</p> <p>You will be randomly allocated into groups during week 2-3. We'll let you know as soon as they are formed so you can contact your group member via Moodle. Select lecture times during term are reserved for you and your group to meet and get a start on the project work.</p> <p>The group project has two submissions. Submission 1 is a report on your materials selection process within the group. Submission 2 will be a peer-assessment of another groups work, providing critical review of their materials section strategy. After both assessments, you will peer assess your group member's contributions to the work, which will be used to weight individual marks relative to the group marks.</p>	<p>Total 25%</p> <p>15% Submission 1,</p> <p>10% Submission 2</p>	See Moodle for Details
Final Exam:	The exam will be 2 hrs in length and cover the topics taught throughout the course. The exam will consist of a mix of multiple choice, short answer and calculation style questions.	40 %	Final Exam period

Further information

UNSW grading system: <https://student.unsw.edu.au/grades>

UNSW assessment policy: <https://student.unsw.edu.au/assessment>

5.2 Assessment criteria and standards

Note: Students who fail to achieve a score of at least 40% for the final exam but achieve a final mark >50% for the course, may still be awarded a UF (Unsatisfactory Fail) for the course. Please refer to the UNSW guide to grades: <https://student.unsw.edu.au/grades>

Assessment criteria and standards for each assessment task are available on the course Moodle page.

Working in groups can be both challenging and rewarding, for a general guide of what you can expect and how you are expected to behave see here, <https://student.unsw.edu.au/groupwork>

5.3 Submission of assessment tasks

- Assignments/lab reports submitted after the due date for submission will receive a **5% of maximum grade penalty for every day late, or part thereof. This is up to a maximum of 5 days, after which the assessment cannot be accepted.**
- UNSW operates under a Fit to Sit/ Submit rule for all assessments. If a student wishes to submit an application for special consideration for an exam or assessment, the application must be submitted prior to the start of the exam or before an assessment is submitted. If a student sits the exam/ submits an assignment, they are declaring themselves well enough to do so. Information on this process can be found here: <https://student.unsw.edu.au/special-consideration>. Medical certificates or other appropriate documents must be included. Students should also advise the lecturer of the situation.
- Unless otherwise specified in the task criteria, all assignments must be uploaded via Moodle prior to the due date for submission.
- Students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course coordinator prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit: <https://student.unsw.edu.au/disability>. Early notification is essential to enable any necessary adjustments to be made.
- Rules governing conduct during exams are given at <https://student.unsw.edu.au/exam-rules>

5.4. Feedback on assessment

Laboratory reports: Students will receive their mark for lab reports 1-2 weeks after submission with a comment detailing the areas that require further understanding by the student

Final exam: Students will receive their final grade during official results release.

6. Academic integrity, referencing 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.¹ At UNSW, this means that your work must be your own, and others'

¹ International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

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

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* site <https://student.unsw.edu.au/plagiarism>, and
- The *ELISE* training site <http://subjectguides.library.unsw.edu.au/elise/presenting>

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

7. Readings and resources

- Engineering Materials, Volumes 1 & 2, Ashby & Jones, Butterworth Heinemann, 2005

8. Administrative matters

School Office: Room 137, Building E10 School of Materials Science and Engineering

School Website: <http://www.materials.unsw.edu.au/>

Faculty Office: Robert Webster Building, Room 128

Faculty Website: <http://www.science.unsw.edu.au/>

9. Additional support for students

- The Current Students Gateway: <https://student.unsw.edu.au/>
- Academic Skills and Support: <https://student.unsw.edu.au/academic-skills>
- Student Wellbeing, Health and Safety: <https://student.unsw.edu.au/wellbeing>
- Disability Support Services: <https://student.unsw.edu.au/disability-services>
- UNSW IT Service Centre: <https://www.it.unsw.edu.au/students/index.html>