Course Outline

MATS1110

Introduction to Materials for Engineering Applications

Materials Science and Engineering

Science

T2, 2020

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor	A/Prof John Daniels	j.daniels@unsw.edu.au	Room 338, School of Materials Science and Engineering (Building E10), by appointment	Phone: 9385 5607
Lecturer	Dr Bernd Gludovatz	b.gludovatz@unsw.edu.au	Room 311G, Ainsworth Building (Building J17), by appointment	Phone: 9385 4006
Laboratory Administrator	Dr Pramod Koshy	koshy@unsw.edu.au	Room 220, School of Materials Science and Engineering (Building E10), by appointment	Phone: 9385 6038

2. Course information

Units of credit: 6

Pre-requisite(s): N/A

Teaching times and locations:

	Lecture	Lecture	Lecture	Tutorial
Location	Online	Online	Online	Online
Time	Mon 11-12	Tue 3-4	Wed 11-12	Tue 4-5
Weeks	1-2, 4-5, 7-10[1]	1-5, 7-10	1-3, 4, 8, 10[2]	1-5, 7-10

Online timetable site: http://timetable.unsw.edu.au/2020/MATS1110.html#S2

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.

[1] Week 3 is reserved for the start of the group project.
[2] Weeks 4, 7, 9 are reserved for completion of the group project.

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 F2F 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 must attend at least 80% of all classes
- 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.

Week	Topics
1	Introduction to bonding between atoms Packing of atoms in solids
2	Young's modulus, yield and tensile strength, dislocations Diffusion, Kinetics of structural change Phase diagrams
3	Group Project
4	Strengthening methods in metals Fracture, toughness, micro-mechanisms of fast fracture Fatigue mechanisms, creep
5	Creep fracture and mechanisms, creep resistance Oxidation Wet corrosion
6	Battery design Semi-conductors in electronics and photovoltaics
7	Materials processing case studies in Steels and Light alloys
8	Materials processing case studies in ceramics and glasses
9	Materials processing case studies in polymers
10	Materials processing case studies in composites

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:	There will be 5 laboratories throughout the course on: • Tensile testing • Microstructures of Materials • Fracture • Corrosion and batteries • Semiconductors and photovoltaic effects To complete the assessment task students will be required to work through the pre-lab online material and complete a lab report for each lab. Note: The laboratories will be held online through Moodle	Total: 25 %, 5 % for each lab	1 week after the students have completed the lab, see Moodle for details
Group Project on Materials Selection:	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. You will be randomly allocated into groups during week 2. We'll let you know as soon as they are formed so you can contact your group member via Moodle. The lecture times during Week 3 are reserved for you and your group to meet and get a start on the project work. 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, your individual group will report group members contributions to the work, which will be used to weight individual marks from the group marks.	Total 25% 15% Submission 1, 10% Submission 2	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

Assessment criteria and standards for each assessment tasks 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 **10% of maximum grade penalty for every day late, or part thereof.**
- 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 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.[3] 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 and **plagiarism** can be located at:

- The *Current Students* site https://student.unsw.edu.au/plagiarism**,** and

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

- 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