

MECH3400: Materials Science and Engineering 2

Singapore PSB

Trimester 1 - 2024 (Singapore)



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description Extends the competency of students in understanding engineering materials and their behaviours. The course is focused more on the mechanical and other physical, chemical behaviours of materials than is Materials Science & Engineering 1, although the importance of other properties is never ignored. There are three major elements to the course: 1. The required theoretical understanding of the properties of engineering materials, how they are manipulated, and how they may degrade in service is presented in a series of lectures; 2. This material is reinforced by tutorials; 3. A series of laboratory exercises and a related assignment encourage students to think across topic boundaries.

Academic Progress Requirements Nil

Assumed Knowledge MECH1750 Engineering Materials 1

Contact Hours

Singapore PSB Laboratory
Face to Face On Campus
2 hour(s) per week(s) for 6 week(s) starting Week 3

Lecture
Face to Face On Campus
36 hour(s) per term starting Week 1
4 hours per week for 6 weeks and 2 hours per week for 6 weeks

Tutorial
Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1

Unit Weighting 10

Workload Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator **Singapore PSB**
Associate Professor Jiabao Yi
Jiabao.Yi@newcastle.edu.au
+61 2 4926 1625
Consultation: via email.

Teaching Staff Other teaching staff will be advised on the course Canvas site.

School Office **School of Engineering (Callaghan)**
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SYLLABUS

Course Content

1. Crystallography
2. Mechanical properties of materials
3. Phase diagram/Heat treatments/Steels/Non equilibrium states1
4. Materials Experiments
5. Fundamentals of Chemistry
6. Organic Chem & Synthesis
7. Advanced materials properties-electronic, optical, thermal, and magnetic properties

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Relate the mechanical properties of a material to its atomic and crystal structure, and of the detailed assemblage of phases within it.
2. Plan how material properties can be tailored to suit a particular application using thermal, mechanical and chemical treatments.
3. Identify other forms of material failure including oxidation, corrosion, and wear.
4. Categorize different mechanical failure modes of materials.
5. Apply the fundamentals of chemistry to analyse chemical reactions and chemical synthesis.
6. Connect the physical properties of materials including electronic, optical, thermal and magnetic properties with the mechanisms behind these phenomena.

ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Laboratory Assignment	To be advised on Canvas	Individual	25%	1, 2
2	Assessment 2 - Quiz	To be advised on Canvas	Individual	20%	1, 2
3	Assessment 3 - Quiz	To be advised on Canvas	Individual	20%	3
4	Assessment 4 - Quiz	To be advised on Canvas	Individual	35%	1, 2, 3, 4, 5, 6

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Laboratory Assignment

Assessment Type	Written Assignment
Purpose	Assess knowledge gained through conduct of the labs, data analysis skills and practice technical writing skills.
Description	Written, graphical and computational answers to a set of questions.
Weighting	25%
Length	No limit - typically 10-15 pages including figures
Due Date	To be advised in Canvas
Submission Method	Online
Assessment Criteria	To be advised in Canvas
Return Method	Online
Feedback Provided	In Class – 2 weeks after due date.

Assessment 2 - Assessment 2 - Quiz

Assessment Type	Quiz
Description	Quiz for the teaching content of week 1-3
Weighting	20%
Due Date	To be advised in Canvas
Submission Method	In Class
Assessment Criteria	To be advised in Canvas
Return Method	In Class
Feedback Provided	Returned Work

Assessment 3 - Assessment 3 - Quiz

Assessment Type	Quiz
Description	Quiz for the teaching content of week 4-7.
Weighting	20%
Due Date	To be advised in Canvas
Submission Method	In Class
Assessment Criteria	To be advised in Canvas
Return Method	In Class
Feedback Provided	Returned Work

Assessment 4 - Assessment 4 - Quiz

Assessment Type	Quiz
Description	Quiz covering all course content
Weighting	35%
Due Date	To be advised in Canvas
Submission Method	In Class
Assessment Criteria	To be advised in Canvas
Return Method	In Class
Feedback Provided	Returned Work

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;

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3. you are requesting a change of placement; or
 4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

This course outline was approved by the Head of School on 29th November, 2023. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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Graduate Profile Statements

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

UON Att.	University of Newcastle Bachelor of Engineering Graduate Profile Statements/ Engineers Australia Stage 1 competency statements	Taught	Practised	Assessed	Skill Level (1-4)
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability				
12	3.2. Effective oral and written communication in professional and lay domains.	✓	✓	✓	3
13	3.3. Creative, innovative and pro-active demeanour.				
14	3.4. Professional use and management of information.	✓	✓	✓	3
15	3.5. Orderly management of self, and professional conduct.				
16	3.6. Effective team membership and team leadership.				
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.	✓	✓	✓	3
8	2.2. Fluent application of engineering techniques, tools and resources.	✓	✓	✓	3
9	2.3. Application of systematic engineering synthesis and design processes.				
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	Knowledge Base				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	✓	✓	✓	2
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	✓	✓	✓	2
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	✓	✓	✓	3
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.	✓	✓	✓	3
5	1.5. Knowledge of contextual factors impacting the engineering discipline.	✓			3
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.		✓		3