COURSE OUTLINE

MEC225 Engineering Materials

School: School of Science, Technology and Engineering

2026 | Semester 1

UniSC Sunshine Coast
UniSC Moreton Bay

BLENDED LEARNING

Most of your course is on campus but you may be able to do some components of this course online.

Please go to unisc.edu.au for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

The use of smart engineered materials is the bedrock of innovations in engineering structures and devices. In this course, you will learn that microstructure controls properties and processing controls microstructure, and, through processing, the properties of materials can be engineered for different applications. You will apply this knowledge to solve simple problems by conducting tests, interpreting results, and selecting materials based on performance indices to suit design specifications.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – 2 X 30 mins narrated audio presentation of concepts	1hr	Week 1	12 times
Tutorial/Workshop 1 – Weekly on campus: Tutorials/workshop on applications of concepts in Materials Engineering	2hrs	Week 2	12 times
Tutorial/Workshop 2 – Online workshops- course overview in Week 1,Overview in week 6 and week 12	2hrs	Week 1	3 times
Laboratory 1 – Students attend laboratory sessions over two weeks for materials testing.	2hrs	Week 4	2 times
Information session – Zoom meeting: Information session on preparing for the exam	1hr	Week 13	Once Only

1.3. Course Topics

General and Functional Classification of Materials
Atomic structure, crystalline structure and microstructure
Mechanical characterisation of materials
Deformation and strengthening
Phase diagrams and microstructures in metallic materials
Metals and alloys processing
Ceramics, glasses, polymers, composites
Construction materials

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES On successful completion of this course, you should be able to...	GRADUATE QUALITIES MAPPING Completing these tasks successfully will contribute to you becoming...	PROFESSIONAL STANDARD MAPPING * Engineers Australia Stage 1 Professional Engineer Competency Standards
1 Demonstrate and apply theoretical knowledge of materials (metals, ceramics & polymers): atomic and crystalline structures to predict their mechanical properties, equilibrium phase diagrams to determine the processing sequence to manipulate their microstructure, failure and degradation process	Knowledgeable	1.1, 1.3, 2.1, 2.2
2 Solve simple materials problems by: conducting stress and strain tests and calculating the main mechanical indices from the data, interpreting and analysing test results to derive performance indices, selecting materials based on mechanical properties and performance indices (e.g. mechanical, physical, cost, sustainability) to suit design specifications, evaluate the effect of the environment on materials performance	Knowledgeable Engaged Sustainability-focussed	1.1, 2.1, 2.2
3 Communicate in writing to specialist audiences	Empowered	1.1, 2.3, 3.1, 3.2

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1.1	Knowledge and Skill Base: Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
1.3	Knowledge and Skill Base: In-depth understanding of specialist bodies of knowledge within the engineering discipline.
2.1	Engineering Application Ability: Application of established engineering methods to complex engineering problem solving.
2.2	Engineering Application Ability: Fluent application of engineering techniques, tools and resources.
2.3	Engineering Application Ability: Application of systematic engineering synthesis and design processes.
3.1	Professional and Personal Attributes: Ethical conduct and professional accountability.
3.2	Professional and Personal Attributes: Effective oral and written communication in professional and lay domains.

5. Am I eligible to enrol in this course?

Refer to the UniSC Glossary of terms for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

MTH102 or MTH103

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

ENG225 or MEC1201

5.4. Specific assumed prior knowledge and skills (where applicable)

Graphing, solving equations, basic calculus

5.5. Microcredential Information

Not applicable

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

A formative assessment is given in week 2 and feedback provided as submitted in tutorial groups or as an individual during tutorials. Tutorial exercises every week from week 2 to 10.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Written Piece	Individual	0%	2 weeks to respond	Week 4	To be Negotiated
All	2	Quiz/zes	Group	0%	10 exercises - 200 words equivalent	Throughout teaching period (refer to Format)	To Supervisor
All	3	Examination - not Centrally Scheduled	Individual	30%	2 hours	Week 7	In Class
All	4	Report	Individual	20%	1500 words (equivalent)	Week 9	Online Submission
All	5	Examination - Centrally Scheduled	Individual	50%	4 hours online	Exam Period	Exam Venue

All - Assessment Task 1: Open book take home test

GOAL:	The purpose of this formative task is to ensure you understand the theoretical knowledge of atomic and crystalline structures to solve problems and explain the origin of the properties of engineering materials. This knowledge is critical for your success in this course, and therefore you will be given feedback to support your learning with this content. This exercise will prepare you for the mid-term exam.
PRODUCT:	Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	A number of multiple choices and short answer questions will be set to cover learning materials from the first three weeks. Questions include diagrams and tables. You respond using a given template. Solutions will be provided online Friday week 5.
CRITERIA:	**No.** — **Learning Outcome assessed** 1 Formative feedback will be given — 1 2 3
GENERIC SKILLS:	Communication, Problem solving, Applying technologies

All - Assessment Task 2: Tutorial exercises

GOAL:	It is critical for Engineers to develop their application skills for specific problem sets. These exercises will test your knowledge of materials (metals, ceramics & polymers) to solve simple real-life problems and communicate these solutions. These practice questions will assist you for the mid-term, lab report and final exam.
PRODUCT:	Quiz/zes
AUTHORSHIP STATEMENT:	
FORMAT:	In groups, you work on the exercises to develop solutions by discussing with each other and with guidance from the tutor. You submit the group solutions to the tutor on the day. The tutor will give feedback. Submit at end of each tutorial - weekly, except weeks 1 and 13.
CRITERIA:	**No.** — **Learning Outcome assessed** 1 Formative feedback given — 1 2
GENERIC SKILLS:	Collaboration, Problem solving

All - Assessment Task 3: Mid-semester exam

GOAL:	You will demonstrate and apply theoretical knowledge of the fundamental properties of engineering materials from an atomistic view. You will provide explanations to how materials can be classified into families and solve problems relating to the behaviours of materials in service.
PRODUCT:	Examination - not Centrally Scheduled
AUTHORSHIP STATEMENT:	
FORMAT:	Multiple-choice and short answer questions will be set to cover learning materials from the first six weeks. Questions include diagrams and tables. You respond using a given template. It will be held during the scheduled tutorial times in week 7.
CRITERIA:	

No.		Learning Outcome assessed
1	Application of knowledge of materials (metals, ceramics & polymers) to: - predict microstructures from equilibrium phase diagrams - determine the processing sequence to manipulate microstructure - explain types of failures and reasons for degradation	1 2
2	Solving simple materials problems by: - interpreting and analysing test results to derive performance indices - selecting materials based on mechanical properties and performance indices (e.g. mechanical, physical, cost, sustainability) to suit desi	2

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

All - Assessment Task 4: Laboratory Report

GOAL:	Testing and working with materials is a core part of the work of engineers. For this report, you will work in a team to solve simple material problems by conducting tests, interpreting and analysing the data to determine materials' mechanical properties, and reporting results.
PRODUCT:	Report
AUTHORSHIP STATEMENT:	
FORMAT:	In groups, you conduct a series of mechanical tests in the laboratory and collect the raw data posted on Canvas for every group. You prepare an individual report by responding to questions on a template. This involves processing the raw data and then graphing the processed data. You then interpret and analyse the results to derive materials performance indices and compare mechanical properties. You write one report about the testing conducted in two laboratory sessions.
CRITERIA:	

No.		Learning Outcome assessed
1	conducting stress and strain tests, processing the raw data and calculating the main mechanical indices from the data	1
2	interpreting and analysing test results to derive performance indices	1 2
3	comparing mechanical properties of different materials including elastic behaviour	2
4	adhere to prescribed report structure and word count	2 3
5	English expression and conventions	3
6	terminology, nomenclature and units	3

GENERIC SKILLS:	Communication, Organisation, Applying technologies, Information literacy

All - Assessment Task 5: Final Exam

GOAL:	You will demonstrate and apply theoretical knowledge of the properties of engineering materials. You will demonstrate how to solve problems relating to making an informed and reasoned choice for making material selection decisions in engineering practice.
PRODUCT:	Examination - Centrally Scheduled
AUTHORSHIP STATEMENT:	
FORMAT:	The exam consists of multiple-choice questions covering all learning materials during the semester; and short answer questions, including diagrams and tables.
CRITERIA:	

No.		Learning Outcome assessed
1	atomic and crystalline structures to predict their mechanical properties	1 2
2	equilibrium phase diagrams to determine the processing sequence to manipulate their microstructure	2
3	failure and degradation	1 2
4	calculating the main mechanical indices from the data	2
5	selecting materials based on mechanical properties and performance indices (e.g. mechanical, physical, cost, sustainability) to suit design specifications	1 2 3

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Canvas site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

You need regular access to the resource(s) below. Many texts are available as ebooks through the Library at no additional cost.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Recommended	William D. Callister,David G. Rethwisch	2021	Materials Science and Engineering	1st Australian & New Zealand Edition	Wiley
Recommended	Donald R. Askeland,Wendelin J. Wright	2020	The Science and Engineering of Materials, Enhanced, Si Edition	SI Edition	Cengage

8.2. Specific requirements

You must wear protective covered shoes and safety glasses in the laboratory. The glasses are provided.

9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the online induction training for students, and following the instructions of the University staff.

10. What administrative information is relevant to this course?

10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment Your eligibility for supplementary assessment in a course is dependent on the following conditions applying: The final mark is in the percentage range 47% to 49.4% The course is graded using the Standard Grading scale You have not failed an assessment task in the course due to academic misconduct

10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate: - 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task. - 10% (of the assessment task's identified value) for the third day - 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task. - A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task. Weekdays and weekends are included in the calculation of days late. To request an extension you must contact your course coordinator to negotiate an outcome.

10.4. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.5. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The Student Charter sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.6. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

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