



Course Code:	1502ENG
Course Name:	Engineering Materials
Semester:	Trimester 3, 2017
Program:	Diploma of Engineering
Credit Points:	10
Course Coordinator:	Dr Lucija Boskovic
Document modified:	

### Teaching Team

Your lecturer/tutor can be contacted via the email system on the portal.

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### Staff Consultation

Your lecturer/tutor is available each week for consultation outside of normal class times. Times that your lecturer/tutor will be available for consultation will be given in the first week of lectures. A list of times and rooms will be published on the Griffith College Portal under the “myTimetable” link.

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## Prerequisites

There are no prerequisites for this course

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## Brief Course Description

The course is designed for first year students enrolled on engineering programs. It considers the fundamental properties of metals and non-metallic materials. Students are introduced to the atomic and microstructure of materials and their relationship to mechanical and electrical properties. The course explores the mechanical concepts of stress, strain, elongation and material failure (including testing) and the phenomenon of electrical conduction.

Engineering Materials is a 10 credit point course within the Diploma of Engineering. The course is situated within the first semester of the program. The Diploma of Engineering is designed to provide students with a pathway to:

- further university studies in Engineering and related degrees; or
  - direct employment.
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## Rationale

"Historically, the development and advancement of societies have been intimately tied to the members' ability to produce and manipulate materials to fill their needs" (Callister and Rethwisch, 8e). An understanding of the characteristics and properties of materials is essential for the design and development of new technologies and structures.

This course introduces the fundamental of materials science and engineering. It introduces students to a range of engineering materials including metals, ceramics, polymers and composites. The course investigates the relationships that exist between the structure and properties of materials. It also considers the need to 'engineer' the structure of materials to produce predetermined characteristics. An appreciation of the physical, mechanical and electrical properties of materials is fundamental to studies of material behaviour. These studies are a cornerstone of engineering design and practice. Thus, the behaviour of materials under a mechanical load and an applied electric field are considered. The course explores the mechanical concepts of stress, strain, elongation and material failure and the phenomenon of electrical conduction.

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## Aims

Engineering Materials aims to give students an understanding of the fundamental properties of both metals and non-metallic materials, and their applications in the 'real' world of engineering. The course is supported by lectures, tutorial and laboratory-practicals. Problem solving exercises elaborating the lecture material are introduced during the lecture and tutorial time. Laboratory activities are set-up to provide students with the opportunity to

clarify their own ideas on the content material, to develop teamwork and necessary problem solving skills, and to develop written communication skills. In addition the laboratory sessions aim to develop students\' competency in laboratory skills and the interpretation of the results of system measurements.

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## **Learning Outcomes**

After successfully completing this course you should be able to:

1. Group materials into four basic classifications (metal, ceramics, polymers and composites).
  2. Describe and/or perform standard material property tests - tensile, hardness, and/or non-destructive testing;
  3. Calculate and analyze mechanical and elastic properties of materials.
  4. Describe environmental and sustainability issues relevant to the use of metals, ceramics, polymers and composites.
  5. Work independently, or as a team member, to manage materials science and engineering research activities and projects.
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## **Texts and Supporting Materials**

### **Required Resources**

Callister, WD and Rethwisch, DG. (2014) Materials Science and Engineering: An Introduction 9e, Wiley.

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## **Organisation and Teaching Strategies**

The weekly class contact consists of 4 contact hours per week and 3 x 2 hours laboratory sessions. The 4 hours will be made up of 2 hour lecture, 2 hour tutorial/ workshop.

The lectures will enable the students to understand the theoretical and practical aspects of the course matter. The tutorial/ workshops will provide students with the opportunity to discuss and clarify their own ideas on the course material, as well as to ascertain their numerical and analytical skills. Laboratory activities will reinforce the theoretical content.

Attendance at lectures, tutorials and workshops is EXPECTED. In independent study time you are expected to read the prescribed text, complete weekly exercises in your workbook and prepare for summative assessment.

## **Class Contact Summary**

Your attendance in class will be marked twice during a four hour class. To receive full attendance, you must be present in the classroom on both occasions. Therefore, you are encouraged to attend and participate in all classes throughout the semester.

### Participation in Class

You are expected to read the relevant chapter/s and complete all work stated in the content schedule before the required class. Peer study groups can be useful in assisting with your weekly preparation.

### Consultation Times

Attendance during consultation times is optional but you are encouraged to use this extra help to improve your learning outcomes.

### Course Materials

Lecture notes will be made available to you on the Griffith College/MYSTUDY/Course Notes & Results site on the student portal and you are advised to print these out and bring them to each class so that extra notes can be added.

### Independent Learning

You are expected to reinforce your learning from class time by undertaking sufficient independent study {approximately 6 hours per week outside of class time} so that you can achieve the learning outcomes of the course.

### Program Progression

You are reminded that satisfactory Program Progression requires that attendance in classes is maintained at equal to or greater than 80%, and that GPA is maintained at equal to or greater than 3.5 [please see Griffith College Policy Library - Program Progression Policy - for more information].

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## Content Schedule

1502ENG Labs will be held in the room G09\_1.43 (Gold Coast campus students only) and in the room N44\_0.14 (Mt Gravatt campus students only).

Please note that you must attend the labs as per your timetable. Failure to attend a laboratory session will result in losing the mark for that assessment item. Please note that only in exceptional circumstances the second chance to do the lab/s will be given. Any unavoidable laboratory absence must be discussed with the Course Coordinator and suitable arrangements made to complete any missed laboratory sessions. You cannot submit a laboratory report if you do not attend and participate in the practical session.

## Weekly Teaching Schedule

Week	Topic	Activity	Readings
	Topic 1: Introduction to Materials Readings; Learning Outcomes: 1, 4	Lecture	Ch 1,
	Topic 1: Introduction to Materials Readings	Tutorial	Ch1
	Topic 2: Atomic Structure and Interatomic Bonding Learning Outcomes: 1	Lecture	Ch 2
	Topic 2: Atomic Structure and Interatomic Bonding	Tutorial	Ch 2
	Topic 3: Structure of Crystalline Solids and Imperfections in Solids  Learning Outcomes: 1	Lecture	Ch 3, 4
	Topic 3: Structure of Crystalline Solids and Imperfections in Solids  Project 1: Materials Classification and Selection (Laboratory) Learning Outcomes: 1, 4 and 5.  [Topics 1, 2 and 3]  REFER TO PROJECT GUIDELINES	Tutorial	Ch 3, 4
4	Topic 4: Mechanical Properties of Metals: Learning Outcomes: 1, 3	Lecture	Ch 6
4	Topic 4: Mechanical Properties of Metals:  Project 2: Mechanical Properties of Materials (Laboratory). Learning Outcomes: 1, 2, 3 and 5.  Recommended: Week 6 Investigate metals Week 7 Investigate ceramics, polymers	Tutorial	Ch 6

	and/or composites  REFER TO PROJECT GUIDELINES		
	Topic 5: Failure of Engineering Materials; Learning Outcomes: 1, 3	Lecture	Ch 8
	Topic 5: Failure of Engineering Materials	Tutorial	Ch 8
	Topic 6: Phase Diagrams; Learning Outcomes: 1, 3	Lecture	Ch 9
	Topic 6: Phase Diagrams	Tutorial	Ch 9
	Topic 7: Ceramics;  Learning Outcomes: 1, 3	Lecture	Ch 12, 13
	Topic 7: Ceramics	Tutorial	Ch 12, 13
	Topic 8: Polymers; Learning Outcomes: 1, 3	Lecture	Ch 14, 15
	Topic 8: Polymers	Tutorial	Ch 14,15
	Topic 9: Composites; Learning Outcomes: 1, 3	Lecture	Ch 16
	Topic 9: Composites	Tutorial	Ch 16
	Topic 10: Degradation and Corrosion of Materials; Learning Outcomes: 1, 3	Lecture	Ch 17
	Topic 10: Degradation and Corrosion of Materials	Tutorial	Ch 17
	Topic 11: Electrical Properties; Learning Outcomes: 1, 3	Lecture	Ch 18
	Topic 11: Electrical Properties  Project 3: Research Based Activity Learning Outcomes: 5 (Project): Due: Friday week 12  REFER TO PROJECT GUIDELINES	Tutorial	Ch 18
	Revision	Lecture	All Materials
	Revision	Tutorial	All Materials

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## Assessment

This section sets out the assessment requirements for this course.

### Summary of Assessment

Item	Assessment Task	Weighting	Relevant Learning Outcomes	Due Date
1	PROJECT 1: Materials Characterization & Selection	10%	1,5	Week 5
2	<i>Test or quiz</i> On-line Concept/Problem Examination	20%	1, 3, 4	Weeks 6 and 11
3	<i>Assignment - Laboratory/Laboratory Report</i> PROJECT 2: Mechanical Properties of Material	30%	1,2, 3 and 5	Week 8
5	<i>Assignment - Research-based Assignment</i> PROJECT 3: Research on Properties of Materials	10%	5	Week 12
6	Final Examination	30%	1 and 3	TBA

### Assessment Details

**Title:** PROJECT 1: Materials Characterisation & Selection

'Guided laboratory' activity and movie presentation on atomic structure, composition and, bonding and material properties of common engineering materials are components of this project, which you will be required to complete.

**Title: On-line Concept/Problem Examination**

You will be required to complete two online assignments in weeks 6 and 11 worth 10% each. The On-line Concept/Problem Examination will help you to prepare better for summative final assessment and to practice more through the self-study time. On-line Concept/Problem Examinations are a combination of multiple choice, short/long answer, and calculation questions.

**Title: PROJECT 2: Mechanical Properties of Materials**

You will be required to produce a Mechanical Properties of Materials Project Report investigating various types of material (metals, ceramics, polymers and composite materials) and characterizing their properties by means of supervised tensile tests and to develop the results in the form of a laboratory report.

**Title: PROJECT 3: Research on Properties of Materials**

As a part of this group project you will be required to conduct literature review on properties and applications of an engineering material (or a group of materials) on one topic chosen from a set list. The report should cover the specific aspects and applications of the materials as appropriate to the selected topic.

**Title: Final Examination**

The final examination will be 120 minutes in duration, plus 10 minute perusal, and closed book. The final examination will assess the student's knowledge and understanding of the topics covered in the course and the ability to apply that understanding to the solution of practical problems. The examination paper is devised also to test the student's computational skills, as well as the ability to apply that knowledge to engineering design problems. Marks will be awarded according to correctness of the procedure, accuracy of the solution and clarity of the presentation.

**Submission and Return of Assessment Items**

Normally you will be able to collect your assignments in class within fourteen [14] days of the due date for submission of the assignment if required to submit a hard copy of your work in conjunction with the electronic submission through TurnItIn

**Retention of Originals**



You must be able to produce a copy of all work submitted if so requested. Copies should be retained until after the release of final results for the course.

## **Extensions**

To apply for an extension of time for an assignment, you must submit an Application for Extension of Assignment form to your teacher at least 24 hours before the date the assignment is due. Grounds for extensions are usually: serious illness, accident, disability, bereavement or other compassionate circumstances and must be able to be substantiated with relevant documentation [e.g. Griffith College Medical Certificate]. Please refer to the Griffith College website - Policy Library - for guidelines regarding extensions and deferred assessment.

## **Assessment Feedback**

Marks awarded for assessment items will also be available on the on-line grades system on the Student Website within fourteen [14] days of the due date.

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## **Generic Skills**

Griffith College aims to develop graduates who have an open and critical approach to learning and a capacity for lifelong learning. Through engagement in their studies, students are provided with opportunities to begin the development of these and other generic skills.

Studies in this course will give you opportunities to begin to develop the following skills:

Generic Skills	Taught	Practised	Assessed
Written Communication		Yes	Yes
Oral Communication		Yes	Yes
Information Literacy	Yes	Yes	Yes
Secondary Research			
Critical and Innovative Thinking	Yes	Yes	Yes
Academic Integrity		Yes	Yes
Self Directed Learning		Yes	Yes
Team Work	Yes	Yes	Yes
Cultural Intelligence			

## **Additional Course Generic Skills**

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## **Additional Course Information**

Your feedback is respected and valued by your lecturers and tutors. You are encouraged to provide your thoughts on the course and teaching, both positive and critical, directly to your lecturer and tutor or by completing course and lecturer evaluations via Griffith Colleges online evaluation tool whenever these are available.

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## **Academic Integrity**

Griffith College is committed to maintaining high academic standards to protect the value of its qualifications. Academic integrity means acting with the values of honesty, trust, fairness, respect and responsibility in learning, teaching and research. It is important for students, teachers, researchers and all staff to act in an honest way, be responsible for their actions, and show fairness in every part of their work. Academic integrity is important for an individual's and the College's reputation.

All staff and students of the College are responsible for academic integrity. As a student, you are expected to conduct your studies honestly, ethically and in accordance with accepted standards of academic conduct. Any form of academic conduct that is contrary to these standards is considered a breach of academic integrity and is unacceptable.

Some students deliberately breach academic integrity standards with intent to deceive. This conscious, pre-meditated form of cheating is considered to be one of the most serious forms of fraudulent academic behaviour, for which the College has zero tolerance and for which penalties, including exclusion from the College, will be applied.

However, Griffith College also recognises many students breach academic integrity standards without intent to deceive. In these cases, students may be required to undertake additional educational activities to remediate their behaviour and may also be provided appropriate advice by academic staff.

As you undertake your studies at Griffith College, your lecturers, tutors and academic advisors will provide you with guidance to understand and maintain academic integrity; however, it is also your responsibility to seek out guidance if and when you are unsure about appropriate academic conduct.

In the case of a breach of academic integrity made against a student he or she may request the guidance and support of a Griffith College Student Learning Advisor or Student Counsellor.

Please ensure that you are familiar with the [Griffith College Academic Integrity Policy](#); this policy provides an overview of some of the behaviours that are considered breaches of academic integrity, as well as the penalties and processes involved when a breach is identified.

For further information please refer to the Academic Integrity Policy on the Griffith College website – Policy Library.

### **Risk Assessment Statement**

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