



The University of Southern Queensland

Course Specification

Description: Engineering Materials

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
MEC	1201	14573	2, 2002	EXT	1.00	TWMBBA

Academic Group:	FOENS
Academic Org:	FOES02
HECS Band:	2
ASCED Code:	030305

STAFFING

Examiner: Mick Morgan

Moderator: Douglas Baddeley

SYNOPSIS

Materials science and engineering has come into its own as a field of endeavour during the past 25 years. The central theme in this development is the concept that the properties and behaviour of a material are closely related to the internal structure of that material. The properties (which may be regarded as the responses of the material to its immediate environment) are functions of : (i) the kinds of atoms present and the type of bonding among them, and (ii) the geometrical arrangement of large numbers of atoms, microstructure and macrostructure. As a result, in order to modify properties, appropriate changes must be made in the internal structure. Also, if processing or service conditions alter the structure, the characteristics of the material are altered. Over the same period noticeable changes have taken place in the teaching of engineering materials to the engineering student. Previously, elementary courses emphasised the mechanical properties of materials with long dull lists of chemical specifications and descriptions of processing. More recently, elementary courses seek to provide a thorough grasp of the structures encountered in the principal families of materials - metals, ceramics and polymers - and then to show how the properties of important engineering materials depend on these structures. This course seeks to provide a background knowledge of the more commonly used engineering materials. This will be achieved by promoting an understanding of the interrelation of structure and properties in the principal families of materials and the mechanisms by which the structural changes may be accomplished.

OBJECTIVES

On completion of this course, students should be able to:

- explain the basic atomic structures of metals, ceramics and polymers;

- outline the influence of both atomic structure and microstructure on the mechanical properties of the materials listed in objective 1;
- describe the principal forms of mechanical tests and calculate the mechanical properties of engineering materials;
- interpret the principal mechanisms by which structural change may be accomplished in engineering materials in order to enhance their mechanical properties;
- analyse the effects of stress state, temperature and corrosion on the more commonly used engineering materials;
- identify the major forms of corrosion commonly found in engineering materials;
- examine in depth a selected aspect of engineering materials studies.

TOPICS

Description	Weighting (%)
1. Introduction to Materials Science and Engineering	1.00
2. Atomic Bonding and Structures of Materials	9.00
3. Properties and Testing of Materials	15.00
4. Deformation and Annealing of Metals	10.00
5. Phase Equilibria in Metal Alloy Systems	10.00
6. Non Equilibrium Effects in Metal Alloy Systems	10.00
7. Polymeric Materials	10.00
8. Ceramic Materials	10.00
9. Corrosion of Materials	10.00
10. Selected studies	15.00
10.1. The Metallurgy of Steels	
10.2. Welding of Metals	
10.3. Electrical and Magnetic Properties of Materials	
10.4. Cement and Concrete	
10.5. Timber	

REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Askeland, D. R. 1998, *The Science and Engineering of Materials*, 3rd edition, PWS Publishing Company,

Callister Jnr, W. D. 2000, *Materials Science and Engineering, An Introduction*, 5th edition, John Wiley & Sons,

Flinn, R. A. & Trojan, P. K. 1990, *Engineering Materials and their Applications*, 4th edition, Houghton Mifflin,

Higgins, R. A. 1994, *The Properties of Engineering Materials*, 2nd edition, Edward Arnold,

John, V. B. 1992, *Introduction to Engineering Materials*, 3rd edition, MacMillan,

Schaffer, J. P. et al 1999, *The Science and Design of Engineering Materials*, 2nd edition, McGraw Hill,

Shackelford, J. F. 1992, *Introduction to Materials Science for Engineers*, 3rd edition, MacMillan,

Smith, W. F. 1996, *Foundations of Materials Science and Engineering*, 3rd edition, McGraw Hill,

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	19
Directed Study	79
Examinations	2
Private Study	55

ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
CMA 1	60.00	6.00	Y	09 Aug 2002
CMA 2	60.00	6.00	Y	23 Aug 2002
CMA 3	60.00	6.00	Y	06 Sep 2002
CMA 4	60.00	6.00	Y	20 Sep 2002
CMA 5	60.00	6.00	Y	18 Oct 2002
2 HOUR CLOSED EXAMINATION	700.00	70.00	Y	END S2 (see note 6)

NOTES:

6. Student Administration will advise students of the dates of their examinations during the semester.

OTHER REQUIREMENTS

- 1 Students must generally achieve at least 50% of the maximum possible marks in the final examination and at least 50% of the total possible marks to successfully complete the course. There is no requirement to achieve a minimum mark in any of the CMA tests.
- 2 The final grades for students will be assigned on the basis of the aggregate of the marks obtained for each of the assessments in the course.
- 3 Because model answers are released promptly after the due date, the penalty for late submission of assignment work will be the loss of all marks awarded for the assignment.
- 4 Students must retain a copy of each item submitted for assessment. This must be produced within five days if required by the Examiner.
- 5 A closed examination is an examination where the candidates are allowed to bring only writing and drawing instruments into the examination.
- 6 A minimum standard of communication skills must be demonstrated in order for a passing grade to be achieved.
- 7 The due date for an assignment is the date by which a student must submit the assignment to the USQ. The onus is on the student to provide proof of the submit date, if requested by the Examiner.
- 8 In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience.
- 9 The Faculty of Engineering and Surveying will NOT accept submission of hand written or typed assignments by facsimile, e- mail or computer diskette. Students in remote locations who do not have regular access to postal services may be given special consideration.
- 10 The Faculty of Engineering and Surveying does not offer supplementary examinations.
- 11 Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded the temporary grade: IM (Incomplete - Make up). An IM grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non directed personal study.
- 12 Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination; IDM (Incomplete Deferred Make-up; IDSM (Incomplete Deferred Examination and Make-up).