

MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

16155 Engineering Materials

Module Registrar: Prof Margaret Stack margaret.stack@strath.ac.uk	Taught To (Course): Cohorts for whom class is compulsory / elective		
Other Lecturers Involved: Prof Peter Cormack, Dr Ghulam Rasool	Credit Weighting: 10 (ECTS 5)	Semester: 1 and 2	
Assumed Prerequisites: None, but it is assumed that students will have Physics to Higher and Chemistry to Standard Grade level or equivalent.	Compulsory / elective class	Academic Level: 1	Suitable for Exchange: N

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Group work	External	Online	Project	Assignments	Private Study	Total
22		3	36					39	100

Educational Aim

This module is important to those who may be concerned with the selection and use of engineering materials to give an understanding of, and feeling for, the properties of the materials and wider aspects such as abundance and cost, which are relevant in the selection process. The aim of the module is to facilitate such an appreciation.

Learning Outcomes

The objectives are to bring the student to a realisation of the importance of materials selection in the success of engineering products, and to an appreciation as to the factors that affect the choice, including the chemistry and physics behind the variation of properties – in particular the mechanical properties – from one material to another.

LO1 Review of polymers

LO2 Understanding properties of metallic materials

LO3 Knowledge of structure of ceramics

LO4 Understanding of composites and applications

Syllabus

1st Semester

Students will learn about the different material types. The class treats metals, polymers, ceramics and composites.

Polymers:-

Thermoplastics, thermosets and rubber, chemical and physical structures, molecular weight, and factors influencing properties. Glass transition temperature concept. Copolymers, effect of heat on plastics, fabrication processes of plastics such as extrusion, injection moulding, vacuum forming, bottle and film blowing.

2nd Semester

Students will learn about the structure and constitution of different material types and consider how these factors influence their properties and uses in engineering.

Metals:-

Atomic arrangements, yielding, slip, defects, stress concentration and fracture. The tensile test:- important mechanical and physical properties that may be measured, strengthening methods, phase diagrams.

Composites:-

Particle/fibre reinforced, laminates. Stiffness, strength, toughness and the influence of fibre length and volume fraction.

Materials in design:- Sources of materials, supply/demand, cost, energy content, recycling.

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1 Students must be able to demonstrate an understanding of polymers, including:

C1 Thermoplastics, thermosets and rubber. Copolymers, effect of heat on plastics, fabrication of plastics – extrusion, injection moulding, vacuum forming, bottle and film blowing.

C2 Chemical and physical structures, molecular weight, and factors influencing properties.

C3 Glass transition temperature concept.

LO2 Students must be able to demonstrate an understanding of metallic materials, including:

C1 The structure and constitution of different material types.

C2 How these factors influence their properties and uses in engineering applications.

C3 Atomic bonding in solids and its influence on properties such as stiffness, strength and melting point.

LO3 Students must be able to demonstrate an understanding of ceramics, including:

C1 Fracture mechanisms of ceramics.

C2 Applications of ceramics.

C3 Use of ceramics at high temperature.

LO4 Students must be able to demonstrate an understanding of composites and their applications, including:

C1 Particle/fibre reinforced laminates.

C2 Stiffness, strength, toughness.

C3 Influence of fibre length and volume fraction.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback

The 1st semester learning outcomes will be assessed by the group case study. Students will work in groups of around four to prepare a report on selected polymeric materials for a specific application. A practical laboratory session on polymeric materials will be run in the 2nd semester in which students will work in groups of two to three. Written feedback will be given on the group case study and laboratory reports (the latter are written and submitted in lab).

The 2nd semester learning outcomes will be assessed by a multiple-choice examination in April/May. Online multiple-choice tutorials will be set at approximately two-week intervals throughout the second semester. Students are encouraged to complete the tutorials as preparation for the final exam. Following each tutorial deadline, feedback will be given online through Myplace.

During the 2nd semester, each student will attend a 3-hour laboratory class. Written feedback will be given following this class. Attendance will be compulsory for the laboratory work. The lab schedule will be made available through Myplace by the end of 1st semester.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

Examination				Coursework		Practical Laboratory		Project	
Number	Month(s)	Duration	Weighting	Number	Weighting	Number	Weighting	Number	Weighting
1	Apr/May	1hr	50%	1 (sem1)	40%	1 (sem2)	10%		
* LO2,3,4				* LO1		* LO1		*	

* **L/Os:** Indicate which Learning Outcomes (LO1, LO2, etc) are to be assessed by exam/coursework/practical/project as required.

Coursework / Submissions deadlines (*academic weeks*):

Coursework submission deadline (Polymer Assignment) Monday 27 January 2020 (week 2, semester 2).

Laboratory report deadline – Lab Reports will be written-up and submitted during the laboratory sessions

Resit Assessment Procedures:

Based on the coursework component, with submission of alternate coursework prior to commencement of the August exam diet.

PLEASE NOTE:

Students must gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-assessed during the August diet. This re-assessment will consist entirely of coursework. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

*****Purchase recommended **Highly recommended reading *For reference (do NOT purchase)**

*** Materials Science and Engineering: An Introduction, Enhanced eText, 10th Edition
William D. Callister Jr., David G. Rethwisch, ISBN: 978-1-119-40549-8,
Jan 2018
** "The New Science of Strong Materials" by J. E. Gordon, Pelican, ISBN-0-1402-09204
** "The Science of Structures and Materials" by J. E. Gordon, Scientific American

Additional Student Feedback

(Please specify details of when additional feedback will be provided)

Date	Time	Room No
Will be informed through Myplace		Check timetable webpages for details

Session: 2019/20

Feedback will be provided based on the performance in project work.

Approved:

Course Director Signature: Dr Stuart Grey

Date of Last Modifications: 13/09/19

(Updated July 2019)

MODULE TIMETABLE

Module Code:

16155

Module Title:

Engineering Materials

Brief Description of Assessment:

Polymer Assignment.
 Polymer laboratory report on practical work (Lab Report).
 Multi choice examination.

Assessment Timing:-

Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment using the dropdowns provided. Dropdowns can be left blank. Add extra notes below the dropdowns.

Please note: Timings can and will change, this should only be used as a guide.

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Lab Report Submission	Lab Report Submission Polymer Assignment Submission	Lab Report Submission Lab	Lab Report Submission Lab	Lab Report Submission Lab	Lab Report Submission Lab	Lab Report Submission Lab	Lab Report Submission Lab	Lab Report Submission Lab	Lab Report Submission Lab	None Lab Report Submission	None Lab Report Submission