MODULE DESCRIPTION FORM

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 P Cormack, Dr Shayan Sharifi, Prof J Thomason

Credit Weighting: 10 (ECTS 5)

Assumed Prerequisites: There are no prerequisites but it is assumed students will have Physics to at least Higher level and Chemistry to at least Standard Grade or equivalent.

Compulsory / elective class

Semester: 1 and 2

Academic Level: 1

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

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Groupwork</th>
<th>External</th>
<th>Online</th>
<th>Project</th>
<th>Assignments</th>
<th>Private Study</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>22</td>
<td>3</td>
<td>75</td>
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Educational Aim

It is important to those who may be concerned with the selection and use of engineering materials to have 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 class 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 physics behind the variation of properties - in particular the mechanical properties - from one material to another.

LO1 Understanding properties of metallic materials

LO2 Knowledge of structure of ceramics

LO3 Review of polymers

LO4 Understanding of composites and applications

Syllabus

1st 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. The class treats metals, polymers, ceramics and composites.

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

Thermoplastics, thermosets and rubber: chemical and physical structure, molecular weight, and factors influencing properties. Glass transition temperature concept. Copolymers, effect of heat on plastics, fabrication of plastics – extrusion, injection moulding, vacuum forming, bottle and film blowing, fibre spinning.

2nd Semester

Metals: Atomic arrangements, yielding, slip, stress concentrations and fracture. The tensile test: important properties that may be measured, strengthening methods.

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 Understanding properties of metallic materials
C1 understand and distinguish between the structure and constitution of different material types
C2 ability to demonstrate how these factors influence their properties and uses in engineering.
C3 demonstrate understanding of atomic bonding in solids and its influence on properties such as stiffness, strength and melting point.

LO2 Knowledge of ceramics
C1 demonstrate understanding of fracture mechanisms of ceramics
C2 demonstrate understanding and appreciate the applications of ceramics
C3 Use of ceramics at high temperatures

LO3 Review of polymers
C1 understand and appreciate the properties and fabrication of polymers: Thermoplastic, thermosets and rubber. Copolymers, effect of heat on plastics, fabrication of plastics – extrusion, injection moulding, vacuum forming, bottle and film blowing, fibre spinning.
C2 demonstrate understanding of the chemical and physical structure, molecular weight, and factors influencing properties.
C3 appreciate the glass transition temperature concept

LO4 Understanding of composites and applications
C1 understand and appreciate the properties of particle/fibre reinforced, laminates.
C2 demonstrate appreciation of how stiffness, strength, toughness can be determined and how properties influence applications
C3 understand the 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.

12 Principles of Assessment and Feedback
(on Learning & Teaching web pages: www.strath.ac.uk/learnteach/teaching/staff/assessfeedback/12principles/ )

The first semester material will be assessed by a group case study project. Written feedback will be given on the performance of the students following this project. Students will work in groups of four to produce a report on the selection of a polymeric material for a specific application. A laboratory will be run in semester 2 on polymeric materials.

The second semester material will be assessed by a multiple choice examination in May/June. 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 second semester, each student will attend a 3 hour laboratory class. Written feedback will be given following this class. Attendance is compulsory. The lab schedule will be available through Myplace at the end of semester 1.

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

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
</tr>
<tr>
<td>1</td>
<td>May/June</td>
<td>1hr</td>
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<tr>
<td>LO1,2,4</td>
<td>LO1</td>
<td>LO3</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.
Coursework / Submissions deadlines:
30 January 2015 – Project deadline
02 April 2015 - Course work deadline

Resit Assessment Procedures:
Re-sit procedures will be based on a course component to be submitted prior to the commencement of the August Examination diet.

PLEASE NOTE:
Students need to gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of coursework.

Recommended Reading

****Purchase essential; ***Purchase recommended; **Highly recommended reading; *Simply for reference (do NOT purchase)


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

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<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Room No</th>
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<tbody>
<tr>
<td>Week 1 semester 2</td>
<td>10am</td>
<td>tbc</td>
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Session: 2014/15

Approved:

Course Director Signature: [Signature]

Date of Last Modifications: 3 September 2014
**MODULE TIMETABLE**

<table>
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<tr>
<th>Module Code:</th>
<th>16155</th>
<th>Module Title:</th>
<th>Engineering Materials</th>
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**Brief Description of Assessment:**
- Polymer assignment
- Polymer practical (groups of 4)

**Assessment Timing:**
Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment(s).

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<th>Semester One</th>
<th>WK1</th>
<th>WK2</th>
<th>WK3</th>
<th>WK4</th>
<th>WK5</th>
<th>WK6</th>
<th>WK7</th>
<th>WK8</th>
<th>WK9</th>
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<th>Exam Period</th>
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<th>WK10</th>
<th>WK11</th>
<th>WK12</th>
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- 30 January
- Polymer assignment
- 2 April
- Coursework assignment
- May/June
- Multiple choice exam