

Liverpool John Moores University

Title: MATERIALS ENGINEERING
Status: Definitive
Code: **5028ENG** (105478)
Version Start Date: 01-08-2011

Owning School/Faculty: Engineering
Teaching School/Faculty: Engineering

Team	Leader
Gareth Bradley	Y

Academic Level: FHEQ5
Credit Value: 12.00
Total Delivered Hours: 26.00
Total Learning Hours: 120
Private Study: 94

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	18.000
Practical	3.000
Tutorial	3.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	2 Hour Examination	70.0	2.00
Essay	AS2	Coursework	30.0	

Aims

To understand the dependence of macroscopic properties on the atomic and molecular arrangements within real materials. To gain knowledge of composite materials and materials selection process based on performance.

Learning Outcomes

After completing the module the student should be able to:

- 1 explain that properties such as ductility and strength depend upon the crystallographic structure
- 2 discuss real materials' structural imperfections that influence mechanical and physical properties
- 3 explain how the deformation of materials and its properties and that deformability relies on microscopic structure
- 4 apply plastics processing methods and be able to select an appropriate process for a specific application.
- 5 discuss the application of advanced composite materials
- 6 select materials based on performance

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

EXAM	1	2	3	4	5	6
CW	4	5	6			

Outline Syllabus

Ideal crystalline solids: revision of basic crystallography and its influence on mechanical and physical properties. Imperfections in crystalline solids: point, line and plane defects. Effect of imperfections on properties: diffusion, deformation, recrystallisation; related to common materials processes.

Binary equilibrium diagrams. Detailed treatment of Fe-Fe₃C phase diagram.

Structure and properties of heat treated plain carbon steels; common non-ferrous alloys.

Non-metallic materials: molecular structure of polymers, factors affecting properties.

Visco elastic behaviour in polymers.

Structure, properties and application of modern materials, lightweight - high strength materials, composites, titanium and titanium alloys.

Material performance index and selection charts, manufacturability, materials and processes selections.

Learning Activities

Combination of lectures, laboratories and tutorials.

References

Course Material	Book
Author	John, V.
Publishing Year	2003
Title	Introduction to Engineering Materials

Subtitle	
Edition	
Publisher	Macmillan
ISBN	

Course Material	Book
Author	Askeland, D.R.
Publishing Year	2003
Title	The Science and Engineering of Materials
Subtitle	
Edition	
Publisher	Brooks/Cole
ISBN	

Course Material	Book
Author	Ashby, M. and Jones, D.R.H
Publishing Year	1996
Title	Engineering Materials. Vols. 1 and 2
Subtitle	
Edition	
Publisher	Pergamon
ISBN	

Course Material	Book
Author	Ashby, M.
Publishing Year	1999
Title	Materials Selection in Mechanical Design
Subtitle	
Edition	
Publisher	Butterworth-Heinemann
ISBN	

Notes

This module describes how the mechanical and physical properties of materials are dependant on the atomic and molecular structures of engineering materials. Recent advances in composite materials and materials selection processes based on performance are discussed.