

Liverpool John Moores University

Title: Properties and Application of Engineering Materials
Status: Definitive
Code: **5502ENGICA** (119153)
Version Start Date: 01-08-2018

Owning School/Faculty: Engineering
Teaching School/Faculty: HICOM University College Sdn,Bhd

Team	Leader
Russell English	

Academic Level: FHEQ5
Credit Value: 20
Total Delivered Hours: 40
Total Learning Hours: 200
Private Study: 160

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	20
Practical	10
Tutorial	10

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Essay	AS1	Mechanical properties of metals	40	
Essay	AS3	Materials applications based case study	40	
Essay	AS2	Properties and processing of plastics or composites	20	

Aims

To provide students with knowledge and understanding of the properties of the main structural engineering materials so they can subsequently make informed decisions with regards to their applications.

Learning Outcomes

After completing the module the student should be able to:

- 1 explain the microstructural and macrostructural properties of metallic, composite and polymeric structural engineering materials.
- 2 understand the typical mechanical properties of metallic, composite and polymeric structural engineering materials.
- 3 make informed choices with regards to the selection of appropriate structural engineering materials for particular applications.

Learning Outcomes of Assessments

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

Mechanical Properties of metal	1	2	
Mats applications case study	1	2	3
Prop & processing of plastics	1	2	

Outline Syllabus

Introduction to engineering materials - why they are important, the main properties that need to be considered when choosing a material for a specific application, cost and environmental issues.

Structure of materials – atomic structure and bonding, crystalline solids, imperfections in solids.

Metallic materials – general overview of the structure and properties of metallic materials including dislocations and strengthening mechanisms.

Steels – general properties, phase diagrams, heat treatments, overview of processing routes.

Aluminium – microstructure and macrostructure, general properties and applications, strain hardening, heat treatments, overview of processing routes.

Polymers and plastics (to include both thermoplastics and thermosetting plastics) – microstructure and macrostructure, general properties and applications, overview of processing routes.

Composite materials (to concentrate on glass reinforced plastics and carbon reinforced plastics) – macrostructure, general properties and applications, overview of processing routes.

Key Skills:

Analysis of experimental data and technical report writing,

Use of British, European and International standards,

Research and investigation skills,

Group working skills,

Presentation skills.

Learning Activities

A series of lectures, case studies, tutorials and laboratories. Four courseworks will be undertaken, three minor ones will be experimental laboratory based exercises and a major one will be a group based case study involving the critical analysis of engineering materials with respect to typical applications.

Course Material	Book
Author	Ashby, MF
Publishing Year	2010
Title	Materials Selection in Mechanical Design
Subtitle	
Edition	4th
Publisher	Elsevier
ISBN	9780080952239

Course Material	Book
Author	Polmear, I
Publishing Year	2006
Title	Light alloys – from traditional alloys to nanocrystals
Subtitle	
Edition	4th
Publisher	Elsevier
ISBN	978-0-750-66371-5

Course Material	Book
Author	Kaw, AK
Publishing Year	2006
Title	Mechanics of composite materials
Subtitle	
Edition	2nd
Publisher	Taylor & Francis
ISBN	978-0-849-31343-1

Course Material	Book
Author	Hull, D; Clyne, TW
Publishing Year	1996
Title	An introduction to composite materials
Subtitle	
Edition	2nd
Publisher	Cambridge University Press
ISBN	0521388554

Course Material	Book
Author	Crawford, RJ
Publishing Year	1998
Title	Plastics engineering

Subtitle	
Edition	3rd
Publisher	Elsevier
ISBN	978-0-75063-764-1

Course Material	Book
Author	Callister, WD; Rethwisch, DG
Publishing Year	2010
Title	Materials science and engineering
Subtitle	
Edition	8th
Publisher	Wiley
ISBN	978-0-470-50586-1

Course Material	Book
Author	Ashby, M; Shercliff, H; Cebon, D
Publishing Year	2009
Title	Materials – engineering, science, processing and design
Subtitle	
Edition	2nd
Publisher	Elsevier
ISBN	978-1-85617-7436

Course Material	Book
Author	Ashby, MF; Jones, DRH
Publishing Year	2006
Title	Engineering Materials 2 – an introduction to microstructures, processing and design
Subtitle	
Edition	3rd
Publisher	Elsevier
ISBN	978-0-7506-6381-6

Course Material	Book
Author	Ashby, MF; Jones, DRH
Publishing Year	2005
Title	Engineering Materials 1 – an introduction to properties, applications and design
Subtitle	
Edition	4th
Publisher	Elsevier
ISBN	080966656

Notes

The module covers the properties and applications of the main structural engineering

materials, metals, plastics and composites. Typical applications of the materials are discussed in relation to their properties and manufacturing routes.