

Liverpool John Moores University

Title: MATERIALS PROPERTIES AND PROCESSING
Status: Definitive
Code: **5065ENG** (115885)
Version Start Date: 01-08-2011

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

Team	Leader
Gareth Bradley	Y

Academic Level: FHEQ5
Credit Value: 20.00
Total Delivered Hours: 72.00
Total Learning Hours: 200
Private Study: 128

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	42.000
Practical	6.000
Tutorial	21.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	60.0	3.00
Portfolio	AS2	Coursework - Materials Lab/Coursework portfolio	20.0	
Portfolio	AS3	Coursework - Manufacturing Lab/Coursework Portfolio	20.0	

Aims

To have a thorough understanding of the properties and applications of a range of structural engineering materials and their associated manufacturing processes.

Learning Outcomes

After completing the module the student should be able to:

- 1 Explain the microstructural and macrostructural properties of metallic, ceramic, composite and polymeric structural engineering materials.
- 2 Critically evaluate the typical mechanical properties of metallic, ceramic, composite and polymeric structural engineering materials.
- 3 Make an informed choice with regards to the selection of appropriate structural engineering materials for particular applications.
- 4 Select from a range of processing and joining methods for engineering materials.
- 5 Calculate processing parameters from processing data.
- 6 Plan CNC metal removal processes including selection of tool and machining parameters.

Learning Outcomes of Assessments

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

EXAM	1	2	3	4	5	6
Materials	1	2	3			
Lab/Coursework portf						
Manufacturing	4	5	6			
Lab/Coursework P						

Outline Syllabus

Microstructure and macrostructure of metallic, ceramic, polymeric and composite materials.

Strengthening mechanisms in metallic materials.

Mechanical properties of metallic (including steels, light alloys and nickel alloys), polymeric, ceramic and composite materials.

Applications of metallic, ceramic, polymeric and composite materials.

Properties and applications of advanced materials, including CMCs and MMCs.

Decisions to be considered in materials selection.

Fatigue - S-N curves, factors affecting endurance limit.

Moulding processes for polymers:-injection moulding and extrusion processes.

Powder metallurgy techniques applied to metals and ceramics.

Modern developments in metal cutting processes:-grinding theory and practice.CNC machining processes.

Deformation processes:-evaluation of forming loads based on principal stresses and yield criteria.

Fastening methods:-solid and liquid phase welding, diffusion bonding, adhesive joining and mechanical fastenings.

Learning Activities

A series of lectures supported by tutorials, seminars, practical work and group exercises.

References

Course Material	Book
Author	Ashby, M.F.
Publishing Year	1999
Title	Materials Selection in Mechanical Design
Subtitle	
Edition	2nd Edition
Publisher	Butterworth-Neinemann
ISBN	0-750-64357-9

Course Material	Book
Author	Ashby, M.F, Jones DRH
Publishing Year	2005
Title	Engineering Materials
Subtitle	
Edition	1st and 3rd Edition
Publisher	Butterworth-Heinemann
ISBN	978-07506-63809

Course Material	Book
Author	Ashby, M.F, Jones DRH
Publishing Year	2006
Title	Engineeirng Materials
Subtitle	
Edition	2nd and 3rd Edition
Publisher	Butterworth-Heinemann
ISBN	0-7506-6381-2

Course Material	Book
Author	Callister, W.D.
Publishing Year	2010
Title	Materials Science and Engineering
Subtitle	
Edition	8th Edition
Publisher	Wiley
ISBN	978-0470-505861

Course Material	Book
Author	Hull, D, Clyne TW
Publishing Year	1996
Title	An Introduction to Composite Materials
Subtitle	
Edition	2nd Edition
Publisher	Cambridge

ISBN	
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Course Material	Book
Author	Polmear, I.
Publishing Year	2006
Title	Light Alloys
Subtitle	
Edition	4th Edition
Publisher	Butterworth-Heinemann
ISBN	0750663715

Course Material	Book
Author	Crawford, R.J.
Publishing Year	1998
Title	Plastics Engineering
Subtitle	
Edition	3rd Edition
Publisher	Butterworth-Heinemann
ISBN	978-0-750637640

Course Material	Book
Author	Green, D.J.
Publishing Year	1998
Title	An Introduction to the Mechanical Properties of Ceramics
Subtitle	
Edition	
Publisher	Cambridge
ISBN	0-521-59913-x

Course Material	Book
Author	kalpakjian, S.
Publishing Year	2003
Title	Manufacturing Processes for Engineering Materials
Subtitle	
Edition	4th Edition
Publisher	Addison Wesley
ISBN	0-201-50806-0

Course Material	Book
Author	malkin, S.
Publishing Year	1991
Title	Grinding Technology
Subtitle	
Edition	
Publisher	Ellis Horwood
ISBN	0-853-12756-5

Course Material	Book
Author	Degarmo E.P., Black J.T. and Kohser R.A.
Publishing Year	1997
Title	Materials and Processes in Manufacturing
Subtitle	
Edition	8th Edition
Publisher	Wiley
ISBN	0-471-36679-X

Course Material	Book
Author	Shaw, M.C.
Publishing Year	1996
Title	Principles of Abrasive Processing
Subtitle	
Edition	
Publisher	Oxford University Press
ISBN	0-198-59021-0

Notes

This module builds on the knowledge gained from the level 1 materials and manufacture module and will deliver engineering students who have a good understanding of the main structural engineering materials and processes and can subsequently make informed choices with regards to material selection.