

Liverpool John Moores University

Title: MATERIALS AND PROCESSES
Status: Definitive
Code: **5500ENGSBC** (113898)
Version Start Date: 01-08-2016

Owning School/Faculty: Maritime and Mechanical Engineering
Teaching School/Faculty: The Sino-British College

Team	Leader
Andy Pettit	Y

Academic Level: FHEQ5
Credit Value: 12
Total Delivered Hours: 37
Total Learning Hours: 120
Private Study: 83

Delivery Options

Course typically offered: Semester 2

Component	Contact Hours
Lecture	20
Practical	5
Tutorial	10

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	60	2
Report	AS2	Processing assignment	40	

Aims

To understand the dependence of macroscopic properties on the atomic and molecular arrangements within real materials. Also, to provide an understanding of how the behaviour of different materials influence the design of processing methods and to establish the relationship between component requirements and processing conditions.

Learning Outcomes

After completing the module the student should be able to:

- 1 Demonstrate knowledge that real materials contain structural imperfections that influence mechanical and physical properties.
- 2 Analyse deformation behaviour in plastic materials, demonstrate knowledge of plastics processing methods and be able to select as appropriate
- 3 Overview and be able to select the range of processing and joining methods for engineering materials.
- 4 Demonstrate knowledge of 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
Processing assignment	3	4

Outline Syllabus

Imperfections in crystalline solids:-point, line and plane defects.

Effect of imperfections on properties:-diffusion, deformation and recrystallisation related to common materials processes.

Binary equilibrium diagrams. Detailed treatment of iron-iron carbide phase diagram. Structure and properties of heat treated plain carbon steels. Common non-ferrous alloys.

Non-metallic materials:-molecular structure of polymers and factors affecting properties. Visco-elastic behaviour in polymers.

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

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.

Formability:-influence of strain hardening, strain rate sensitivity and anisotropy.

Forming limit diagrams.

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

Learning Activities

A combination of lectures, tutorials and laboratories.

Notes

This module describes how the mechanical and physical properties of materials are dependent on the atomic and molecular structures of engineering materials. Current plastics processing methods are reviewed and criteria for their selection described. The module allows the student to study modern manufacturing processes to a depth which provides an understanding of the process and its controlling variables.