

## Liverpool John Moores University

Title: Materials and Manufacture  
Status: Definitive  
Code: **4112ENG** (120013)  
Version Start Date: 01-08-2016

Owning School/Faculty: Maritime and Mechanical Engineering  
Teaching School/Faculty: Maritime and Mechanical Engineering

Team	Leader
James Ren	Y
Rob Darlington	
Lisa Li	
Andy Pettit	

**Academic Level:** FHEQ4      **Credit Value:** 20      **Total Delivered Hours:** 74  
**Total Learning Hours:** 200      **Private Study:** 126

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	48
Tutorial	24

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS2	Examination	70	2
Test	AS1	Test with a V.L.E. Based Test	30	

### Aims

*The module will introduce the essential principles of material science, applications and processing methods of different material groups.*

## Learning Outcomes

After completing the module the student should be able to:

- 1 Review the range of available materials, their applications, processing methods and demonstrate knowledge of the basic structures of different groups of materials.
- 2 Understand the properties of engineering materials and factors affecting materials properties and selection.
- 3 Apply different materials testing and analysis data methods for design and product development
- 4 Review the range of metal casting processes and know the techniques for preventing defects.
- 5 Demonstrate knowledge of primary metal forming and removal processes including appropriate selection.
- 6 Understand polymer and composite processing methods and their applications

## Learning Outcomes of Assessments

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

Examination	1	2	3	4	5	6
VLE Based Test	1	2	3	4	5	6

## Outline Syllabus

### *Materials*

#### *Materials Structures and Applications*

*Structure of atoms, Bohr theory. primary and secondary bondings and their relationships with material properties.*

*Classification of engineering materials: metals, ceramics, polymers and composites and typical applications.*

*Ideal crystalline solids: basic crystallography;*

*Microstructure of metals and ceramics: grains, grain size, defects and their influence on mechanical and physical properties.*

*Structure of polymers: molecule chains, curing, thermoplastic and thermosets*

#### *Properties, testing and selection*

*Materials properties and design: stiffness. strength and toughness; stress strain curves, Young's modulus, yield strength, toughness, fracture toughness.*

*Factors affect the behaviour and properties of materials.*

*Destructive and non-destructive tests; tensile, hardness, ductile and brittle failure.*

*Analysis and interpretation of materials testing data.*

*Material selection: Introduction to computer-based techniques for material selection.*

### *Manufacturing*

*Metal materials and processing*

*Classification of materials processing methods: forming, shaping, and processing.  
Casting processes: Fluid flow and solidification; casting mould design; prevention of casting defects.*

*Metal cutting processes: Milling, turning and grinding theory, preparation of data and tool selection.*

*Overview of cold working process of metals.*

*Processing of plastics and composites*

*Fundamentals of moulding processes of plastics and composites.*

*Injection moulding, compression moulding, blow moulding, vacuum forming*

*Rapid prototyping and 3D printing methods*

*Mould design*

## **Learning Activities**

Lectures, tutorial and practicals

## **Notes**

This module covers the essential elements of materials science and manufacturing technology required by engineers studying mechanical, marine, design disciplines. The students will develop a good understanding on the structures, properties and processing methods of different groups of materials and be able to apply basic techniques for materials testing and selection.