

Liverpool John Moores University

Title: Materials and Manufacture
Status: Definitive
Code: **4505MTC** (125777)
Version Start Date: 01-08-2019

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

Team	Leader
James Ren	Y

Academic Level: FHEQ4 **Credit Value:** 20 **Total Delivered Hours:** 41
Total Learning Hours: 200 **Private Study:** 159

Delivery Options

Course typically offered: Summer

Component	Contact Hours
Online	24
Tutorial	15

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS2	Examination	50	2
Report	AS1	Report based on work based learning - eg materials selection project	50	

Aims

The module will introduce the essential principles of material science and manufacturing processing methods which will then be developed further by application to a work based learning project.

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 Apply a knowledge of the properties of engineering materials, materials testing methods and factors affecting materials properties to select a material for design and product development.
- 3 Apply a knowledge of metal casting, forming and removal processes to the manufacture of a component.
- 4 Apply a knowledge of polymer and composite processing methods to the manufacture of a component.

Learning Outcomes of Assessments

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

Examination	1	2	3	4
Report	1	2	3	4

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 forging, cold working of metals, additive manufacturing, and multi-stage process chain.

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

Online lectures, campus based tutorials, work based learning

Notes

This module covers the essential elements of materials science and manufacturing technology. The students will develop a good understanding on the structures, properties and processing methods of different groups of materials and have knowledge of the basic techniques for materials testing and selection. This knowledge will then be developed further by application to a work based learning project.