

Liverpool John Moores University

Title: Materials and Manufacture
Status: Definitive
Code: **4611IYO** (124223)
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering
Teaching School/Faculty: Study Group

Team	Leader
Jack Mullett	Y

Academic Level: FHEQ4 **Credit Value:** 10 **Total Delivered Hours:** 47
Total Learning Hours: 100 **Private Study:** 53

Delivery Options

Course typically offered: Semester 2 and Summer

Component	Contact Hours
Lecture	30
Tutorial	15

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Invigilated exam/test	100	2

Aims

To 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 and properties and demonstrate knowledge of the basic structures of different groups of materials.
- 2 Apply different materials testing and analysis data methods for design and product development.
- 3 Demonstrate knowledge of materials and processing methods.

Learning Outcomes of Assessments

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

Exam/test	2	3	1
-----------	---	---	---

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 affecting 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

Lecture, demonstration and practical activities

Notes

-