Materials

Module Information

2022.01, Approved

Summary Information

Module Code	4305MECH
Formal Module Title	Materials
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 4
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

Learning Methods

Learning Method Type	Hours
Lecture	11
Online	11
Tutorial	22

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
SEP-CTY	CTY	September	12 Weeks

Aims and Outcomes

Aims	The module aims to introduce the essential principles of material science and engineering with reference to an essential element in mechanical design and materials selection. This module will also provide technical insight into various manufacturing processes. The overall module aim is to enable students to gain knowledge and skills for further studies or employment.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Review the range of available materials, their applications, processing methods and demonstrate knowledge of the basic structures of different groups of materials.
MLO2	2	Understand the properties of engineering materials and factors affecting materials properties and selection.
MLO3	3	Apply different materials testing and analysis data methods for design and product development.
MLO4	4	Review the range of metal casting processes and know the techniques for preventing defects.
MLO5	5	Demonstrate knowledge of primary metal forming and removal processes including appropriate selection.
MLO6	6	Understand polymer, composite and additive manufacturing processing methods and their applications.

Module Content

Outline Syllabus	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. Materials properties and design: - Factors that affect the behaviour and properties of materials. - Destructive and non-destructive tests; analysis and interpretation of materials testing data. - Material selection: Introduction to computer-based techniques for material selection. 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. - Hand lay-up, open moulding, resin infusion processes, pultrusion processes. Rapid prototyping and 3D printing methods: - Principles of various rapid prototyping techniques. - Fused deposition modelling, stereo-lithography, selective laser melting.
Module Overview	
Additional Information	This module is designed to be linked with the level 4 module 4106MECH- Engineering Practices and the level 5 module - 5103MECH Materials and processes. It provides students with fundamental knowledge on materials science and manufacturing technologies that needed by other modules.This module includes content which relates to the following UN Sustainable Development GoalsSDG8 – This module will consider how to provide students with skills that match the labour market in the manufacturing field and allow them to attain productive employment.SDG12 – This module will consider the issues of materials waste and recycling in manufacturing processes when designing engineering solutions.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping

Centralised Exam	Examination	60	2	MLO1, MLO2, MLO3, MLO4, MLO5, MLO6
Test	Online Tests	40	0	MLO1, MLO2, MLO3, MLO4, MLO5, MLO6

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Xiaoxiao Liu	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings