

**Summary Information**

<b>Module Code</b>	4516USST
<b>Formal Module Title</b>	Materials
<b>Owning School</b>	Engineering
<b>Career</b>	Undergraduate
<b>Credits</b>	20
<b>Academic level</b>	FHEQ Level 4
<b>Grading Schema</b>	40

**Module Contacts**

**Module Leader**

Contact Name	Applies to all offerings	Offerings
Dante Matellini	Yes	N/A

**Module Team Member**

Contact Name	Applies to all offerings	Offerings
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**Partner Module Team**

Contact Name	Applies to all offerings	Offerings
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**Teaching Responsibility**

<b>LJMU Schools involved in Delivery</b>
LJMU Partner Taught

## Partner Teaching Institution

Institution Name
University of Shanghai For Science and Technology

## Learning Methods

Learning Method Type	Hours
Lecture	22
Tutorial	22

## Module Offering(s)

Offering Code	Location	Start Month	Duration
SEP-PAR	PAR	September	12 Weeks

## Aims and Outcomes

<b>Aims</b>	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.
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## Learning Outcomes

After completing the module the student should be able to:

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

SDG8 – 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)	Learning Outcome Mapping
Test	Online Tests	40	0	MLO1, MLO2, MLO3, MLO4, MLO5, MLO6
Exam	Examination	60	2	MLO1, MLO2, MLO3, MLO4, MLO5, MLO6