

Liverpool John Moores University

Title: Materials and Processes
Status: Definitive
Code: **5103MAN** (121979)
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering
Teaching School/Faculty: Engineering

| Team | Leader |
|---------------------|--------|
| Lisa Li | Y |
| Sam Tammas-Williams | |

Academic Level: FHEQ5 **Credit Value:** 10 **Total Delivered Hours:** 24
Total Learning Hours: 100 **Private Study:** 76

Delivery Options

Course typically offered: Semester 1

| Component | Contact Hours |
|-----------|---------------|
| Lecture | 16.5 |
| Tutorial | 5.5 |

Grading Basis: 40 %

Assessment Details

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|-----------|-------------------|-------------|---------------|---------------|
| Exam | AS1 | Examination | 60 | 2 |
| Portfolio | AS2 | Portfolio | 40 | |

Aims

To have a thorough understanding of the properties and applications of a range of structural engineering materials and their associated manufacturing processes.

Learning Outcomes

After completing the module the student should be able to:

- 1 Explain the microstructural and macrostructural properties of metallic, ceramic, composite and polymeric structural engineering materials
- 2 Critically evaluate the typical mechanical properties of metallic, ceramic, composite and polymeric structural engineering materials
- 3 Make an informed choice with regards to the selection of appropriate structural engineering materials for particular applications
- 4 Select suitable methods from a range of manufacturing processes
- 5 Calculate processing parameters from processing data
- 6 Plan manufacturing strategies for a range of technologies

Learning Outcomes of Assessments

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

| | | | | | | |
|-------------|---|---|---|---|---|---|
| Examination | 1 | 2 | 3 | 4 | 5 | 6 |
| Port | 1 | 2 | 3 | 4 | 5 | 6 |

Outline Syllabus

List of possible topics

Materials

Microstructure and strengthening mechanisms in steels and ferrous materials : thermal treatments, alloying elements, high performance steels.

Mechanical properties of advanced metallic materials (including light weight –high strength alloys and super alloys).

Engineering ceramics: structures-property relationships, applications

Polymeric and composite materials: structure and property relationships, applications and selections

Structure, properties and applications of advanced materials, including CMCs and MMCs.

Factors affecting materials properties and performance; Materials developments.

Manufacturing

Moulding processes for polymers:-injection moulding and extrusion processes. Blow moulding/blown film extrusion. Design considerations when processing polymers

Powder metallurgy techniques applied to metals and ceramics.

Modern developments in metal cutting processes:-grinding theory and practice.CNC machining processes.

Hard turning versus grinding

Deformation processes:-evaluation of forming loads based on principal stresses and yield criteria.Extrusion and drawing. Sheet metal working processes, an investigation of bending and shearing

Learning Activities

Lectures, tutorial and practicals

Notes

This module builds on the knowledge gained from the level 4 materials and manufacture module and will deliver engineering students who have a good understanding of the main engineering materials and manufacturing processes. They will be able to make informed choices with regards to material and process selection.