

Liverpool John Moores University

Title: Materials and Processes
Status: Definitive
Code: **5503MTC** (125782)
Version Start Date: 01-08-2019

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

| Team | Leader |
|---------|--------|
| Lisa Li | Y |

Academic Level: FHEQ5 **Credit Value:** 20 **Total Delivered Hours:** 41
Total Learning Hours: 200 **Private Study:** 159

Delivery Options

Course typically offered: Semester 1

| Component | Contact Hours |
|-----------|---------------|
| Online | 24 |
| Tutorial | 15 |

Grading Basis: 40 %

Assessment Details

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|----------|-------------------|--|---------------|---------------|
| Exam | AS1 | Examination | 50 | 2 |
| Report | AS2 | Report based on work based learning activity | 50 | |

Aims

To have a thorough understanding of the properties and applications of a range of structural engineering materials and their associated manufacturing processes. To develop this understanding further by application to a work based learning project activity.

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 so as to be able to make an informed choice of material selection for a particular application.
- 3 Calculate processing parameters and select appropriate methods of manufacture for a particular application/product
- 4 Plan CNC removal processes including selection of tool and machining parameters

Learning Outcomes of Assessments

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

| | | | | |
|---------------------|---|---|---|---|
| Examination | 1 | 2 | 4 | 3 |
| Report based on WBL | 2 | 3 | | |

Outline Syllabus

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

Online lectures and tutorials, campus based tutorials, work based learning.

Notes

This module builds on the knowledge gained from the level 4 'materials and manufacture' module and will further develop understanding of the main engineering materials and manufacturing processes. Students will be able to make informed choices with regards to material and process selection. In addition, understanding will be further developed by application to a work based learning project activity.