

## Liverpool John Moores University

Title: Materials  
Status: Definitive  
Code: **4551SAM** (122670)  
Version Start Date: 01-08-2020

Owning School/Faculty: Engineering  
Teaching School/Faculty: Springdale Academy Of Maritime Education (SAMET)

Team	Leader
Geraint Phylip-Jones	Y

**Academic Level:** FHEQ4  
**Credit Value:** 20  
**Total Delivered Hours:** 76  
**Total Learning Hours:** 200  
**Private Study:** 124

### Delivery Options

Course typically offered: Runs Twice - S1 & S2

Component	Contact Hours
Lecture	44
Practical	8
Tutorial	22

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS2	Examination	60	2
Report	AS1	Laboratory log book and report.	40	

### Aims

*The module will introduce the essential principles of material science.*

### Learning Outcomes

After completing the module the student should be able to:

- 1 Review the range of available materials, their applications, processing methods and demonstrate knowledge of the basic structures of different groups of materials.
- 2 Discuss the properties of engineering materials and factors affecting materials properties and selection.
- 3 Apply different materials testing and analysis data methods for design and product development
- 4 Review the range of metal casting processes and know the techniques for preventing defects.
- 5 Demonstrate knowledge of primary metal forming and removal processes including appropriate selection.
- 6 Discuss polymer and composite processing methods and their applications

### Learning Outcomes of Assessments

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

Examination	1	2	3	4	5	6
Laboratories	1	2	3	4	5	6

### 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 affect 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**

A combination of lectures, tutorials and practicals.

## **Notes**

This module covers the essential elements of materials science and manufacturing technology required by engineers studying mechanical, marine, design disciplines. The students will develop a good understanding on the structures, properties and processing methods of different groups of materials and be able to apply basic techniques for materials testing and selection. The laboratory assessment will include a comprehensive log book of each experiment, one of which will be written as a formal report.