**De Montfort University**

 **Module Specification**

**(Module template)**

**In completing this specification please refer to the relevant** [**guidance**](http://preview.dmu.ac.uk/documents/about-dmu-documents/quality-management-and-policy/academic-quality/programme-approval-management/module-specification-guidance-notes.docx)**.**

**Basic module information**

Module Title: Materials Engineering and Processing

Short Module Title (less than 40 characters):

|  |  |  |
| --- | --- | --- |
| Module Code: ENGD2105 | Credit value:15 | Credit level: 5 |

Owning Department: ESD

Semester/year-long: Term 1

(semester only for postgraduate modules, or undergraduate modules with explicit university agreement)

Details of accreditation by Professional, Statutory or Regulatory body:

Module Leader: Dr. Yong Sun

Appraiser/s (markers): Dr. Richard Bailey

Module pre-requisites: None

Maximum student numbers on module (if applicable):

DMU Global content/assessment Y/N: N

**Module description** (including outline content)

The module provides students with an opportunity to study materials science and engineering. The module focuses on materials structure and properties, materials processing, materials testing, engineering materials, and computer aided material information and selection.

The module objectives are: to develop students’ understanding of the basic principles of materials structure-processing-properties relationship; to develop students’ ability in analysing engineering problems involving materials issues; to develop students’ skills in material selection to meet functional requirements using computer aided material selection tools; and to develop students’ practical, experimental and measurement skills via a structured programme of laboratory exercises.

The module is delivered through a combination of lectures, seminars and a series of computer sessions and laboratory based experiments. Assessment of the module is via phase test and laboratory reports.

The computer sessions and laboratory exercises are designed to develop students’ skills in material selection using computer aided slection tools and give students confidence in using experimental procedures to validate theoretical results, train students to correctly use laboratory equipment and enable students to develop technical reporting skills.

***Module Syllabus*** (Outline Content):

* Material categories: metals, ceramics, polymers and composites.
* Material structure: crystal structure, amorphous structure, molecular structure
* Equilibrium phase diagram: binary phase diagrams, the lever rule, solidification sequence.
* Mechanical properties: tensile testing and hardness testing
* Defects in materials: point defects, line defects, surface defects.
* Strengthening mechanisms of metals: grain refinement hardening, precipitation hardening, strain hardening and phase transformation hardening.
* Heat treatments: annealing, normalising, quenching and tempering.
* Engineering steels: low carbon steel, medium carbon steel, high carbon steel, stainless steel.
* Other engineering materials: aluminium alloys, titanium alloys, magnesium alloys, cemramics, polymers and compsoite materials, recylability of materials.
* Material processing: metal casting, metal forming, polymer processing, ceramic powder processing.
* Material failure: fracture, fatigue failure, impact failure, creep failure
* Materials selection: computer aided material information and selection techniques using Cambridge Engineering Selector (CES).

**Learning outcomes** (please indicate in brackets at the end of each learning outcome which assessment task(s) will test the achievement of the learning outcome)

LO1 The student will have an understanding of the principles of materials science and demonstrate knowledge of various common engineering materials and processes, and apply them to the solutions of engineering problems (IET AHEP 3: SM1p, SM1m, EA1p, EA1m, EA4p, ET2p, ET2m, ET4p, ET4m); (IMechE AHEP 3: SM1b, SM1m, EA1b, EA1m, EA4b, EL2, EL4, G2). [Phase test, Report]

LO2 The student will be able to take practical measurements, analyse and critically appraise experimental data, and present the results and critical analysis of experimental work in a written format as a short scientific report. (IET AHEP3: EA4p, EA4m, EP2p, EP2m, EP3p, EP3m, EP4p, EP4m); (IMechE AHEP 3: EA4b, EA4m, P2, P2m, P3, P4, G1, G4). [Report]

LO3 The student will be able to develop skills for material selection in design and demonstrate the awareness of the impact of materials use on the global environments and sustainability. (IET AHEP3: SM1p, SM1m,SM3p, SM3m, EA4p, ET4p, ET4m, ET6p, ET6m, EP6p, EP6m, EP7p, EP7m, EP8p, EP8m, D2p, D2m); (IMechE AHEP3: SM1b, SM1m, SM3b, SM3m, EA4b, EL4, EL6b, EL6m, P6, P7, P8, D2). [Phase test, Report].

**Assessment**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Type of assessment** | **Duration or****volume** | **Assessment weighting %** | **Final assessment Y/N** | **Minimum threshold mark %** (if not 40% for UG, 50% for PGT) | **Essential component Y/N**(approval needed for UG essential components) | **Anonymously marked Y/N** (if N select the relevant exemption code from below) |
| **Phase test** | **2 hours** | **50%** | **Y** | **30% for IET accreditation** | **N** | **Y** |
| **Lab Report** | **2000 word** | **50%** | **N** | **30% for IET accreditation** | **N** | **N1** |

**Anonymous marking exemption codes**: *1: Individually distinct work, 2: Reflection on development of own work*

*3: Presentation 4: individually negotiated work 5: work placement/experience/assessment*

**Assessment Notes**

Phase test: A phase test to assess the student's comprehension of the lectured material.

Lab: The laboratory sessions include computer aided material selection sessions and practical laboratory testing sessions where students apply engineering principles to select materials for design and material testing.

**Reassessment**

By Failed Component.

Resubmission of Lab report can be done remotely.

**Expected methods of delivery**

A structured programme of lectures and seminars together with laboratory work and guest lectures where appropriate.

Lecture 20 hours
Seminar 20 hours
Practical 8 hours
Self-directed study 72 hours
Assessment 30 hours

**Sustainable Development Goals**

This module has been designed to meet the following specified goals of the United Nations (UN SDGs).

Goal 3: Good health and well-being

Goal 9: Industry, Innovation, and Infrastructure

Goal 12: Responsible consumption and production

Goal 15: Life on land