

UNIVERSITY OF PLYMOUTH MODULE RECORD

Module Code: MATS 116

Credits: 20

Level : 1

Module Title : Manufacturing and Materials

Pre-Requisites : None

Co – Requisites : None

If Linked, Module linked to : N/A

Short Module Descriptor - (Maximum four lines 9pt print):

This module introduces students to the range of engineering materials available and covers concepts such as the relationship between structure, manufacture and properties. Some balancing studies on atomic structure and bonding are covered for those students with little experience of this topic. The need for and standard methods of testing are also covered, and practical applications are considered wherever appropriate.

An introduction to traditional manufacturing processes and techniques, covering both primary and secondary forming processes.

Elements of Assessment

COURSEWORK	50 %	EXAMINATION	50%	EoM TEST	N/A	%
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Module Aims :

1. To provide an awareness of the wide range of engineering materials and their distinguishing properties.
2. To provide an understanding of the important engineering properties, how these are measured, and the factors, such as structure and processing route, that affect them.
3. To introduce basic concepts concerned with alloying, heat treatment, working and strengthening of materials.
4. To impart an appreciation of factors involved in materials selection for specific applications.
5. To develop the students' understanding and knowledge of basic manufacturing technology.

Skills Elements :

1. Generic cognitive, e.g. ability to apply concepts and models in relation to materials structure/property relationships.
2. Communication skills, e.g. ability to describe by use of sketches and written work materials structures and properties.
3. Numeracy, e.g. ability to calculate materials properties from data generated in tests.
4. IT/Own learning/Professional skills, e.g. ability to import microstructures into reports, use of library and world wide web information sources and an appreciation of the practical applications of materials.
5. The selection and analysis of suitable processes for component manufacture.

Objectives / Learning Outcomes :

Students should be able to:

1. Demonstrate an understanding of basic materials properties and their measurement.
2. Process raw data generated by materials testing.
3. Show an appreciation of materials structures and be able to use optical microscopes to reveal them.
4. Discuss the relationship between structure and properties of metals and non-metals.
5. Show an understanding of how structure is modified by manufacturing process, alloying and heat treatment.
6. Select generic materials for specific applications.
7. Demonstrate an understanding of the basic processes available.
8. Identify a suitable process for the manufacture of a particular engineering component.
9. Discuss the reasons for a particular choice and describe its advantages and disadvantages when compared to alternative processes.

Indicative Syllabus Content :

The menu of materials. Properties, costs, selection for metals, alloys, polymers, ceramics and composites.

Methods of testing materials.

Properties, including modulus, yield stress, tensile strength, ductility, hardness etc., with typical values.

Interpretation of stress-strain curves. True stress and strain.

Review of atomic structure and bonding. Periodic table. Isotopes.

Relation between materials properties and structure and bonding.

Structure in crystalline and amorphous materials. Glass transition temperature.

Metal crystal structures. Defects in crystals and their effects. Yielding and plastic deformation.

Elastic behaviour, strain energy, thermal stresses, elastic anisotropy. Time dependent elasticity.

Polymerisation. Classes and types of polymers. Polymer structures, tacticity and crystallinity.

Visco-elasticity and plasticity in polymers, drawing and effect of strain rate.

Phases, nucleation and growth. Grain structures of engineering castings and macroscopic defects.

Introduction to phase equilibrium diagrams.

Two phase alloys and precipitation hardening alloys. Steels and their heat treatment. Non-equilibrium phases.

Hot and Cold working, effects on structure and properties. Annealing, recovery, recrystallisation and grain growth in metals.

Types of manufacturing organisation and the design of facilities.

Primary forming processes such as casting, rolling, forging and plastic moulding.
 Secondary forming techniques such as milling and turning, to include tool life and cutting forces.
 Joining and fabrication techniques such as welding, adhesive bonding and mechanical fasteners.
 Basic metrology including standards of length, limits and fits and surface texture assessment.

Please complete the information below

Faculty: Technology	Dept: DMME	Partner Institution: N/A
Module Leader: D C Plane	Subject Group: DMM	Term: All year

Registry Use Only

VALIDATION- DATE OF APPROVAL: _____ DATE OF IMPLEMENTATION : _____
 DATES(S) OF APPROVED CHANGES: _____

ASC:	FEEBAND :	RESOURCE UNITS :
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