



Module Specification

Design, Materials and Manufacturing

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Part 1: Information

Module title: Design, Materials and Manufacturing

Module code: UFMFN3-30-1

Level: Level 4

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: None

Excluded combinations: Materials and Processes 2023-24

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: See Learning Outcomes

Outline syllabus: This module will introduce you to:

Classification of Materials: Introduction to Metals, Polymers, Composites and

Ceramics. Atomic structure and bonding. Environmental impact of materials and manufacturing processes.

Classification of Manufacturing: Job, Batch and Continuous manufacture. Economies of scale. Breakeven Analysis.

Materials: Mechanical properties of materials and their measurement; e.g. tensile, hardness, impact. Introduction to primary and secondary bonding and the structure of materials.

Metals: Crystal structures and crystal defects (point defects, dislocations, grain boundaries); strengthening processes: alloying, work hardening, grain refinement and heat treatment processes; phase diagrams, simple phase transformations and microstructures; basic heat treatment; the heat treatment of steels.

Polymers: Classification, structure, properties and manufacturing of polymers.

Composites: Types, structure, properties and manufacturing of composites.

Primary Processes: Rolling, casting, extrusion and forging of metals.

Presswork and Associated Processes: Sheet metal blanking, piercing, shearing and forming. Press tools, drawing and extrusion.

Material Removal Processes: Conventional metal cutting processes. Turning, milling and grinding. CNC machining. Calculation of power required to cut and Taylor's tool life equation.

Introduction to assembly and joining techniques: Welding, adhesives and fasteners.

Design Methods: the design process, and the systematic approach to design problems: requirement analysis, problem identification, problem solving methods, problem solving tools, preparation of specifications, solution identification and design. Principles of embodiment design.

Engineering Drawing: principles of 3rd angle orthographic projection. Basic Standard conventions using BS 8888. Use of 2D and 3D CAD tools.

Practical Skills: application of manufacturing and metrology techniques within the practical environment of an engineering workshop.

Part 3: Teaching and learning methods

Teaching and learning methods: See Learning Outcomes

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Show an understanding of the design process and the ability to apply the design process and evaluate its effectiveness

MO2 Show a detailed knowledge and understanding of key principles in materials technology

MO3 Show an understanding of materials properties and the impact of the choice of material and processes on the environment

MO4 Communicate the design, material and manufacturing of products through the preparation and reading of Engineering Drawings to appropriate standards through the medium of 2D and 3D CAD tools

MO5 Understand the relationship between material properties and their structure at the atomic/molecular level using general concepts and the impact of the choice of material and processes on the environment

MO6 Demonstrate skills to allow choice of material and manufacturing processes to meet specific design criteria with relationship to manufacturing volume, mechanical properties, cost, dimensional accuracy and automation

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 216 hours

Face-to-face learning = 84 hours

Total = 300

Reading list: The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/modules/ufmfn3-30-1.html) via the following link <https://uwe.rl.talis.com/modules/ufmfn3-30-1.html>

Part 4: Assessment

Assessment strategy: The assessment strategy for this module is designed to get the students working in groups (for the first time in their degree programme) to develop their knowledge and understanding of design, materials and manufacturing through Project Based Learning (PBL) and to assess this through a combination of different mechanisms. The Materials and Manufacturing project will be assessed through formal presentations and individual questioning. The Design project will be assessed through a group coursework where they submit a portfolio of their design work. More detail below:

Assessment Task 1: A technical oral (group) presentation to assess how students implement their understanding and knowledge of the fundamentals of materials and manufacturing. They will explain their experimental results and approach to finding solutions to real-world materials and manufacturing problems (PBL). Following the presentation, there will be individual questioning where the teaching team will ask questions to evaluate fundamental knowledge of each student in the group.

Assessment Task 2: The design project includes a 3D CAD model of an engineering system, 2D component drawings to appropriate standards and qualified choices of materials and manufacturing processes to test full comprehension of the syllabus and learning outcomes. This will be assessed using the standard group assessment strategy.

Resit Assessment Strategy: Task 1 will be an individual presentation followed by questioning of the PBL activity. Task 2 will be a 10 page individual report, technical

drawings and CAD files on the design of a specific component or assembly to enable the learning outcomes to be assessed.

Assessment tasks:**Presentation (First Sit)**

Description: Individual presentation and questioning (20 mins)
(Materials and Manufacturing project)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO2, MO3, MO5, MO6

Project (First Sit)

Description: Individual coursework (Design and CAD Report) – 10 page report, technical drawings and CAD files

(Design Project)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO3, MO4, MO6

Presentation (Resit)

Description: Presentation and individual questioning (20 mins)

(Materials and Manufacturing project)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO2, MO3, MO5, MO6

Project (Resit)

Description: Individual coursework (Design and CAD Report) – 10 page report, technical drawings and CAD files.

(Design project)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO3, MO4, MO6

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering and Technology (Vehicle Technology) {Foundation} [GCET] BEng (Hons) 2022-23

Mechanical Engineering and Technology (Mechatronics) {Foundation} [GCET] BEng (Hons) 2022-23

Mechanical Engineering and Technology {Foundation} [GCET] BEng (Hons) 2022-23

Mechanical Engineering and Technology (Manufacturing) {Foundation} [GCET] BEng (Hons) 2022-23

Energy Technology and Management {Foundation} [GCET] BSc (Hons) 2022-23