Module Specification

Materials and Structures for Special Applications

Version: 2023-24, v3.0, 31 Jan 2023

Contents

Part 1: Information

Module title: Materials and Structures for Special Applications

Module code: UFMF7K-15-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

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: Design, Materials and Manufacturing 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module provides an opportunity for engineering students to extend their materials science knowledge beyond the introductory (level 1) materials science. Students will encounter the use of advanced materials in variety of engineering applications and related design challenges. The module also Students will also learn about new and future frontiers in materials science and their potential contributions towards sustainability and environmental impact.

Features: Not applicable

Educational aims: This module provides specialist knowledge on the properties of advanced materials and their current and potential use in engineering applications

Outline syllabus: Structure-property relations in materials: The atomic model of materials; Application of basic quantum mechanics principles to bonding theory; Levels of structure in materials; Examples of structure-property relations; Principles and processes for the manipulation and control of structure in materials; Failure processes and failure mechanisms in materials

Sandwich structures: Stiffness-limited design; Theory, design, manufacture and application of sandwich structures in motor vehicle and aerospace engineering

Smart materials and smart structures: Definition; Science and principles of smart materials; Smart materials in different materials systems; Current and future applications of smart materials and smart structures

Engineering ceramics: Fabrication, properties and applications; Designing with ceramics; Weibull statistics; Principles of material selection for ultra high temperature and hypersonic applications

Metallurgy of nickel-base superalloys, titanium alloys and intermetallic compounds: Processing, phase transformations, microstructural control and properties; titanium alloy compressor blades; diffusion bonding and superplastic forming; turbine blades; control of creep failure

New frontiers in materials science: Carbon science and technology; Graphene; Nano science and nano technology; Material science frontiers in medicine and biomedical engineering

Part 3: Teaching and learning methods

Teaching and learning methods: Concepts and theory will delivered by a lecture to the entire cohort of students supported by small group tutorial sessions. The tutorial

sessions will consist of practical materials science activities such as mechanical testing and optical microscopy. Some tutorial sessions will be used for solving tutorial questions, consolidation of theoretical principles using experimental data and for topical materials science discussions.

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

MO1 Apply scientific principles and methods to identify specific material and structural properties for a range of engineering applications

MO2 Design and analyse sandwich structures using relevant mathematical and engineering principles

MO3 Describe and explain the future potential of smart materials within engineering with special reference to environmental impact and sustainability

MO4 Apply Webull statistics to the analysis of the inter-relationship between manufacturing process, properties and application of engineering ceramics

MO5 Appraise the properties and role of special materials in novel applications and processes

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufmf7k-15-3.html

Part 4: Assessment

Assessment strategy: Strategy:
The assessment questions will be designed to enable demonstration of learning

outcomes by asking questions that will test candidates' understanding of relevant scientific and engineering principles. Candidates' understanding will be further tested by questions that involve the application of basic principles in solving both hypothetical and practical problems.

The assessment:
The module will be assessed by an end-of-semester written examination which will account for 100% of the module. The examination questions will be chosen to cover a broad range of the syllabus.

Assessment tasks:

Examination (Online) (First Sit)
Description: Online Written examination
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Examination (Online) (Resit)
Description: Online written examination
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Engineering {Top-Up} [Frenchay] BSc (Hons) 2023-24

Engineering {Top-Up} [Frenchay] BSc (Hons) 2023-24

Engineering {Top-Up} [Frenchay] BSc (Hons) 2023-24

Engineering {Top-Up} [Frenchay] BSc (Hons) 2023-24

Mechanical Engineering {Apprenticeship-GlosColl} {Top-Up} [Frenchay] BEng (Hons) 2023-24

Mechanical Engineering {Apprenticeship-UCS} {Top-Up} [Frenchay] BEng (Hons) 2023-24

Mechanical Engineering {Apprenticeship-UCW} {Top-Up} [Frenchay] BEng (Hons) 2023-24

Mechanical Engineering (Nuclear) {Apprenticeship-UCW} {Top-Up} [Sep][FT][MOD][2yrs] BEng (Hons) 2023-24

Mechanical Engineering {Apprenticeship-UCS} {Top-Up} [Sep][FT][Frenchay][2yrs] - Not Running BEng (Hons) 2022-23

Mechanical Engineering {Apprenticeship-UCS} {Top-Up} [Frenchay] - Withdrawn BEng (Hons) 2022-23

Mechanical Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2021-22

Automotive Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2021-22

Automotive Engineering [Sep][FT][Frenchay][4yrs] MEng 2021-22

Mechanical Engineering [Sep][FT][Frenchay][4yrs] MEng 2021-22

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][UCW][4yrs] BEng (Hons) 2021-22

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][COBC][4yrs] BEng (Hons) 2021-22

Mechanical Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Mechanical Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2020-21

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Mechanical Engineering {Foundation}[Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21

Automotive Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2020-21

Automotive Engineering {Foundation}[Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21

Automotive Engineering {Foundation} [Sep][FT][Frenchay][5yrs] - Not Running MEng 2020-21

Automotive Engineering [Sep][SW][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Automotive Engineering {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][UCW][4yrs] - Not Running BEng (Hons) 2020-21

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][COBC][4yrs] - Not Running BEng (Hons) 2020-21

Mechanical Engineering and Vehicle Technology {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2020-21

Mechanical Engineering and Vehicle Technology {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2020-21

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Automotive Engineering {Foundation} [Sep][SW][Frenchay][6yrs] MEng 2019-20

Automotive Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20