Module Specification

Materials and Structures for Special Applications

Version: 2021-22, v2.0, 10 Feb 2022

Contents

Part 1: Information

Module title: Materials and Structures for Special Applications

Module code: UFMF7K-15-3

Level: Level 6

For implementation from: 2021-22

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Delivery locations: Auston Institute of Management Singapore, British Institute of Engineering and Technology Sri Lanka, City of Bristol College, Frenchay Campus, Global College of Engineering and Technology (GCET), University Centre Weston

Field: Engineering, Design and Mathematics

Module type: Standard

Pre-requisites: Design, Materials and Manufacturing 2021-22

Excluded combinations: None

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: 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: Large group teaching session supported by small group tutorial sessions. Study time outside of contact hours will be spent on going through new material, exercises and example problems.

Scheduled learning includes teaching sessions and tutorials.

Independent learning includes hours engaged with essential reading and assessment preparation. These sessions constitute an average time per level as indicated in the table below. Scheduled sessions may vary slightly depending on the module choices you make.

Student contact time: 36 hours
Directed learning: 24 hours
Self-directed learning: 45 hours
Exam preparation: 45 hours
TOTAL: 150 Hours

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

MO1 Demonstrate knowledge of scientific principles and methods necessary to underpin their understanding of the role of materials science in their engineering education

MO2 Demonstrate knowledge and understanding of the scientific basis of structure property relationships in materials

MO3 Understand the importance and relevance of sandwich structures in the design of stiffness-limited structures

MO4 Apply relevant mathematical and engineering principles in the design and analysis of sandwich structures

MO5 Demonstrate knowledge and understanding of the scientific principles, applications and future potentials of smart materials

MO6 Critically analyse the inter-relationship between manufacturing process, properties and application of engineering ceramics

MO7 Demonstrate knowledge and understanding of microstructural manipulations and applications of nickel-base superalloys, titanium alloys and intermetallic compounds

MO8 Demonstrate an understanding of the principles underlying advancements in the applications of materials science in such areas as nanotechnology and biomedicine

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 components:

Examination (Online) - Component A (First Sit)
Description: Online written examination: 5 hours
Weighting: 100 %
Final assessment: Yes

Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5, MO6, MO7, MO8

Examination (Online) - Component A (Resit)
Description: Online written examination: 5 hours
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering (Manufacturing) [May][FT][BIET][12months] BEng (Hons) 2021-22

Mechanical Engineering (Manufacturing) [Sep][FT][AustonSingapore][12months] BEng (Hons) 2021-22

Mechanical Engineering (Manufacturing) [Feb][FT][BIET][12months] BEng (Hons) 2021-22

Mechanical Engineering (Manufacturing) [Feb][FT][AustonSingapore][12months] BEng (Hons) 2021-22

Mechanical Engineering (Manufacturing) [May][FT][AustonSingapore][12months] BEng (Hons) 2021-22

Automotive Engineering [Sep][FT][Frenchay][4yrs] MEng 2019-20

Automotive Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2019-20

Mechanical Engineering [Sep][PT][COBC][6yrs] BEng (Hons) 2018-19

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2018-19

Mechanical Engineering [Sep][SW][Frenchay][5yrs] MEng 2018-19

Mechanical Engineering and Vehicle Technology {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2018-19

Mechanical Engineering and Vehicle Technology {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2018-19

Mechanical Engineering {Foundation} [Sep][FT][Frenchay][5yrs] MEng 2018-19

Mechanical Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19

Mechanical Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19

Automotive Engineering {Foundation} [Sep][FT][Frenchay][5yrs] MEng 2018-19

Automotive Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19

Automotive Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19

Mechanical Engineering [Sep][PT][Frenchay][7yrs] MEng 2018-19

Mechanical Engineering [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][UCW][4yrs] BEng (Hons) 2018-19

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][COBC][4yrs] BEng (Hons) 2018-19