



Module Specification

Composite Engineering

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Contents

Module Specification	1
Part 1: Information	2
Part 2: Description	2
Part 3: Teaching and learning methods	4
Part 4: Assessment.....	5
Part 5: Contributes towards	7

Part 1: Information

Module title: Composite Engineering

Module code: UFMFU6-15-3

Level: Level 6

For implementation from: 2022-23

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: Frenchay Campus, Global College of Engineering and Technology (GCET)

Field: Engineering, Design and Mathematics

Module type: Standard

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module assesses the individuals core knowledge of composite materials through a series of e-assessments. This is supported by a group assignment that allows students to develop a deep understanding of the structure and performance of composite materials. They will manufacture samples and then test them to measure their mechanical properties. The students use theoretical

approaches to predict the performance of these materials and then compare their theoretical and actual test results to enable them to understand and evaluate the difficulties with predicting the performance of composite materials. The students will also explore design solutions using composite materials to critically analyse their performance developing their own analysis tools. They will then appraise the performance of their designs and discuss key conflicts with regard to sustainability and manufacturing.

Features: Not applicable

Educational aims: The module aims to provide a rounded understanding of composite engineering (design, manufacture and performance) relevant to industry practice and requirements.

Outline syllabus: Classification and structure of composite materials, composition and structural relationships.

Matrix materials, reinforcing materials, fabrics & core materials.

Joining of composite materials: bonded and bolted joints.

Manufacturing processes: main methods, influence on material properties, quality, volumes and cost.

Design for manufacture and assembly.

Calculation of physical and mechanical properties: rule of mixtures, Hart-Smith, simplified classical laminate analysis method and classical laminate analysis using software.

Design of composite structures: fundamental principles, design guidelines, balance, symmetry, thickness law.

Testing of composite materials: reasons for importance, destructive and nondestructive methods.

Performance of composite structures: tension, compression, bending, shear, impact toughness, fatigue, failure criterion.

Sustainability and recycling of composites: natural fibres and matrices, reduced weight, conflicts.

Part 3: Teaching and learning methods

Teaching and learning methods: Lecture style sessions support laboratory work-based learning where students are able to explore the structural properties of composite materials and to compare test results to theoretical predictions and appreciate the inherent link between manufacturing process and structural performance.

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

MO1 Appraise the inherent characteristics of composite materials that influence the design and performance of composite structures (D4)

MO2 Calculate the mechanical properties of composite materials demonstrating the limitations of and uncertainties with the different techniques (D3m)

MO3 Design optimum solutions with composite materials (D3m & D4)

MO4 Critically analyse the inter-relationship between manufacturing process, material properties, quality and cost (P2m)

MO5 Appraise the performance and discuss the key conflicts with composite materials with regard to sustainability and recyclability (EL4)

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](https://uwe.rl.talis.com/modules/ufmfu6-15-3.html) via the following link <https://uwe.rl.talis.com/modules/ufmfu6-15-3.html>

Part 4: Assessment

Assessment strategy: The coursework is both summative and formative.

Component A is computer based tests assess competency and breadth of understanding of composite materials. This is split into two:

1. Pass/Fail e-tests on composite fundamentals
2. E-tests on composite calculations

Component B is a group assignment that provides the students with the opportunity to apply composite design theory, develop a hands-on understanding of the materials and manufacturing process and test their understanding of the course material through an applied learning cycle.

The resit assessment strategy is the same as the first sit assessment

Assessment components:

Online Assignment - Component A (First Sit)

Description: E-quizzes assessing fundamental composite knowledge (pass/fail).

Weighting:

Final assessment: No

Group work: No

Learning outcomes tested: MO1

Online Assignment - Component A (First Sit)

Description: E-learning assessment on composite materials calculations

Weighting: 25 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2

Group work - Component B (First Sit)

Description: Assignment on design, manufacture and test of composites (groups of 4-6)

Peer review to analyse individual contributions.

Weighting: 75 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO3, MO4, MO5

Online Assignment - Component A (Resit)

Description: E-quizzes assessing fundamental composite knowledge.

Weighting:

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1

Online Assignment - Component A (Resit)

Description: E-learning assessment on composite materials calculations

Weighting: 25 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2

Group work - Component B (Resit)

Description: Assignment on design, manufacture and test of composites (groups of 4-6). Peer review to analyse individual contributions.

Weighting: 75 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO3, MO4, MO5

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Aerospace Engineering {Apprenticeship-UCW} [Sep][FT][UCW][4yrs] BEng (Hons) 2020-21

Aerospace Engineering {Apprenticeship-UWE} [Sep][FT][UCW][4yrs] BEng (Hons) 2020-21

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

Aerospace Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2020-21

Aerospace Engineering [Sep][FT][Frenchay][4yrs] MEng 2020-21

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][3yrs] BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][4yrs] MEng 2020-21

Mechanical Engineering [Sep][FT][Frenchay][4yrs] MEng 2020-21

Automotive Engineering [Sep][FT][Frenchay][4yrs] MEng 2020-21

Mechanical Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2020-21

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][UCW][4yrs] BEng (Hons) 2020-21

Automotive Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2020-21

Mechanical Engineering with Manufacturing {Apprenticeship-UWE} [Sep][FT][COBC][4yrs] BEng (Hons) 2020-21

Automotive Engineering [Sep][FT][Frenchay][4yrs] - Not Running MEng 2020-21

Automotive Engineering [Sep][FT][Frenchay][3yrs] - 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

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2019-20

Automotive Engineering {Foundation} [Sep][FT][Frenchay][5yrs] MEng 2019-20

Automotive Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2019-20

Automotive Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2019-20

Mechanical Engineering and Vehicle Technology {Foundation}

[Feb][FT][GCET][4yrs] BEng (Hons) 2019-20

Mechanical Engineering and Vehicle Technology {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2019-20

Automotive Engineering {Foundation} [Sep][SW][Frenchay][6yrs] MEng 2018-19

Automotive Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19

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

Mechanical Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19

Mechanical Engineering {Foundation} [Sep][SW][Frenchay][6yrs] MEng 2018-19

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

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