



## MODULE SPECIFICATION

Part 1: Information			
Module Title	Design, Materials and Manufacturing		
Module Code	UFMFN3-30-1	Level	Level 4
For implementation from	2018-19		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Contributes towards	<p>Mechanical Engineering with Manufacturing {Apprenticeship} [Sep][PT][Frenchay][4yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering (Design) [Sep][FT][Frenchay][4yrs] MEng 2018-19</p> <p>Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][5yrs] MEng 2018-19</p> <p>Aerospace Engineering [Sep][SW][Frenchay][5yrs] MEng 2018-19</p> <p>Mechanical Engineering [Sep][SW][Frenchay][5yrs] MEng 2018-19</p> <p>Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2018-19</p> <p>Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19</p> <p>Mechanical Engineering [Sep][PT][Frenchay][7yrs] MEng 2018-19</p> <p>Mechanical Engineering [Sep][FT][Frenchay][4yrs] MEng 2018-19</p> <p>Mechanical Engineering [Sep][FT][Frenchay][3yrs] BEng 2018-19</p> <p>Mechanical Engineering {Apprenticeship} [Sep][PT][Frenchay][6yrs] BEng 2018-19</p> <p>Mechanical Engineering [Sep][PT][Frenchay][6yrs] BEng 2018-19</p> <p>Mechanical Engineering [Sep][PT][COBC][6yrs] BEng 2018-19</p> <p>Mechanical Engineering [Sep][SW][Frenchay][4yrs] BEng 2018-19</p> <p>Aerospace Engineering (Design) [Sep][SW][Frenchay][5yrs] MEng 2018-19</p> <p>Aerospace Engineering (Systems) [Sep][FT][Frenchay][4yrs] MEng 2018-19</p> <p>Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering with Pilot Studies (Design) [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering with Pilot Studies (Design) [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19</p>		

## STUDENT AND ACADEMIC SERVICES

Aerospace Engineering with Pilot Studies (Design) [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][4yrs] MEng 2018-19  
 Automotive Engineering [Sep][FT][Frenchay][4yrs] MEng 2018-19  
 Automotive Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Automotive Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies (Design) [Sep][SW][Frenchay][5yrs] MEng 2018-19  
 Aerospace Engineering [Sep][PT][UCW][8yrs] MEng 2018-19  
 Aerospace Engineering with Pilot Studies (Manufacturing) [Sep][SW][Frenchay][5yrs] MEng 2018-19  
 Aerospace Engineering with Pilot Studies (Systems) [Sep][SW][Frenchay][5yrs] MEng 2018-19  
 Aerospace Engineering with Pilot Studies (Systems) [Sep][FT][Frenchay][4yrs] MEng 2018-19  
 Aerospace Engineering with Pilot Studies (Manufacturing) [Sep][FT][Frenchay][4yrs] MEng 2018-19  
 Aerospace Engineering with Pilot Studies (Design) [Sep][FT][Frenchay][4yrs] MEng 2018-19  
 Aerospace Engineering with Pilot Studies (Manufacturing) [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies (Systems) [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies (Manufacturing) [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies (Systems) [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies (Manufacturing) [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Aerospace Engineering with Pilot Studies (Systems) [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Manufacturing) [Sep][FT][Frenchay][4yrs] MEng 2018-19  
 Aerospace Engineering [Sep][FT][Frenchay][4yrs] MEng 2018-19  
 Aerospace Engineering [Sep][PT][Frenchay][8yrs] MEng 2018-19  
 Aerospace Engineering (Manufacturing) [Sep][SW][Frenchay][5yrs] MEng 2018-19  
 Aerospace Engineering (Systems) [Sep][SW][Frenchay][5yrs] MEng 2018-19  
 Aerospace Engineering (Design) [Sep][PT][Frenchay][8yrs] MEng 2018-19  
 Aerospace Engineering (Manufacturing) [Sep][PT][Frenchay][8yrs] MEng 2018-19  
 Aerospace Engineering (Systems) [Sep][PT][Frenchay][8yrs] MEng 2018-19  
 Aerospace Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Design) [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Design) [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Manufacturing) [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Manufacturing) [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Systems) [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Systems) [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19  
 Aerospace Engineering (Design) {Apprenticeship} [Sep][PT][COBC][4yrs] BEng (Hons) 2018-19

## STUDENT AND ACADEMIC SERVICES

	<p>Mechanical Engineering with Manufacturing [Sep][PT][Frenchay][4yrs] BEng (Hons) 2018-19</p> <p>Mechanical Engineering with Manufacturing {Apprenticeship} [Sep][PT][UCW][4yrs] BEng (Hons) 2018-19</p> <p>Mechanical Engineering with Manufacturing {Apprenticeship} [Sep][PT][COBC][4yrs] BEng (Hons) 2018-19</p> <p>Mechanical Engineering with Manufacturing {Apprenticeship} [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering (Manufacturing) {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering (Systems) {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering (Systems) {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering with Pilot Studies {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19</p> <p>Aerospace Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19</p>
Module type:	Standard
Pre-requisites	None
Excluded Combinations	Materials and Processes 2018-19
Co- requisites	None
Module Entry requirements	None

### Part 2: Description

**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.

## STUDENT AND ACADEMIC SERVICES

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.

**Teaching and Learning Methods:** See Learning Outcomes

### Part 3: Assessment

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 (Component A) will be assessed through formal presentations and individual questioning. The Design project (Component B) will be assessed through a group coursework where they submit a portfolio of their design work. More detail below:

Component A: 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.

Component B: 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: Component A will be an individual presentation followed by questioning of the PBL activity. Component B 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.

First Sit Components	Final Assessment	Element weighting	Description
Presentation - Component A		50 %	Group presentation and individual questioning
Group work - Component B	✓	50 %	Group coursework (Design and CAD Report) – 20 page report, technical drawings and CAD files
Resit Components	Final Assessment	Element weighting	Description
Project - Component B	✓	50 %	Individual coursework (Design and CAD Report) – 10 page report, technical drawings and CAD files.

STUDENT AND ACADEMIC SERVICES

Presentation - Component A		50 %	Presentation and individual questioning
----------------------------	--	------	---

<b>Part 4: Teaching and Learning Methods</b>		
Learning Outcomes	On successful completion of this module students will be able to:	
	<b>Module Learning Outcomes</b>	
	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
Contact Hours	<b>Contact Hours</b>	
	<b>Independent Study Hours:</b>	
	Independent study/self-guided study	216
	<b>Total Independent Study Hours:</b>	216
	<b>Scheduled Learning and Teaching Hours:</b>	
	Face-to-face learning	84
	<b>Total Scheduled Learning and Teaching Hours:</b>	84
	<b>Hours to be allocated</b>	300
	<b>Allocated Hours</b>	300
Reading List	<p><i>The reading list for this module can be accessed via the following link:</i></p> <p><a href="https://uwe.rl.talis.com/modules/ufmfn3-30-1.html">https://uwe.rl.talis.com/modules/ufmfn3-30-1.html</a></p>	