MODULE SPECIFICATION

Part 1: Information			
Module Title	Mechanics of Materials		
Module Code	UFMFP9-15-3	Level	Level 6
For implementation from	2022-23		
UWE Credit Rating	15	ECTS Credit Rating	7.5
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Module type:	Standard		
Pre-requisites	Structural Mechanics 2021-22		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Overview: This modules gives students access to advanced methods of stress analysis to be used in the design of mechanical components. It builds on level 5 module "Structural mechanics" in the following ways

Students' knowledge of stress determining techniques are expanded by considering several energy methods and introducing the formalism for plasticity.

Student's knowledge of failure mechanisms are expanded by considering more realistic and complex aspects of fracture mechanics, fatigue and creep.

Finally, the module will introduce real engineering scenarios that involve design, analysis and recommendations, to holistically tie the analysis and failure aspects together.

Educational Aims: In this module, students apply their knowledge and understanding of advanced stress analysis techniques and detailed failure mechanisms to solve complex engineering problems and design mechanical components.

Outline Syllabus: Indicative Content (Syllabus) for Mechanics of Materials:

Elastic energy for axial loads, torson, bending and shear.
Energy methods: unit load (virtual work) and Castigliano's theorem for trusses, beams and combined problems, including staticaly indeterminate ones.
Impact
Introduction to plasticity for torsion and bending, calculation of residual stresses

Fracture mechanics (TBD)
Fatigue (stochastic aspects, corrections beyond Goodman's, multiaxial fatigue)
Introduction to creep

Teaching and Learning Methods: The module is organised around the structural analysis and design of typical mechanical components, including complex factors such as the effect of physical impacts, fracture, fatigue and creep.

Lectures will be used to present the problems and explore the key features and issues. Workshops will be used for more detailed discussions and actual calculations.
Typically students will work in pairs.

Part 3: Assessment

The assessment will be organised around an industrially relevant case study involving a structural element design task.
Students (typically working in pairs) will be expected to demonstrate understanding and ability to apply basic principles and taught processes through the production of a 10 page technical report.

The report will not be marked but will form the basis for the controlled assessment which will take the form of a 30 minute oral presentation by each pair on the work including a series of questions that will determine the individual mark.

In addition, in order to allow students to practice and gain rapid feedback on the use of standard calculation and analysis techniques component B will comprise a series of e-assessments (10% of the module mark).

The resit assessment strategy will involve an individual report and oral presentation for component A and a repeat of the e-assessments for component B.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Presentation - Component A	✓	90 %	Viva style presentation, based on the 10 page technical report student pairs have produced to solve an industrially relevant mechanical design problem (30 mins).
Online Assignment - Component B		10 %	Series of DEWIS based assignments, covering energy methods (trusses, beams) impact, fracture mechanics, fatigue and creep.
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Presentation - Component A	✓	90 %	Viva style presentation, based on the 6 pages technical report individual student have produced to solve an industrially relevant mechanical design problem (of reduced scope compared to the one proposed for the main assessment).
Online Assignment - Component B		10 %	Series of DEWIS based assignments, covering energy methods (trusses, beams) impact, fracture mechanics, fatigue and creep.

Part 4: Teaching and Learning Methods

Learning Outcomes

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

Module Learning Outcomes	Reference
Explain and apply and explain scientific and mathematical principles of advanced stress analysis using energy methods for mechanical components. (SM1m, SM2m, SM5m)	MO1
Determine failure mechanisms (plasticity, fracture mechanics, fatigue and creep) for mechanical components using clearly defined scientific and mathematical principles. (SM1m, SM2m, SM5m)	MO2
Analyse complex mechanical components, including hypotheses and results validation. (EA1m, EA2, EA3m, EA6m)	MO3
Design complex mechanical components using detailed analyses of stress and failure. (D3m, D7m, EL4, EL5, EL6, P8m)	MO4

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	114
Total Independent Study Hours:	114
Scheduled Learning and Teaching Hours:	
Face-to-face learning	36
Total Scheduled Learning and Teaching Hours:	36
Hours to be allocated	150
Allocated Hours	150

Reading List

The reading list for this module can be accessed via the following link:

https://uwe.rl.talis.com/modules/ufmfp9-15-3.html

Part 5: Contributes Towards

This module contributes towards the following programmes of study:

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

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

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

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

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

Mechanical Engineering {Apprenticeship} [Sep][PT][Frenchay][6yrs] BEng 2018-19