Module Specification

Stress Analysis, Materials and Finite Element Analysis

Version: 2023-24, v3.0, 11 May 2023

Contents

Part 1: Information

Module title: Stress Analysis, Materials and Finite Element Analysis

Module code: UFMF9Q-30-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

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: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: The Stress Analysis, Materials, and Finite Element Analysis module focusses on advanced stress concepts, such as curved beams, deflections and un-symmetric bending and material stress and fatigue. Key areas for study are understanding stress theory and how to apply FEA theory to practical modelling techniques.

Features: Not applicable

Educational aims: Learners will develop the theoretical understanding of advanced stress concepts and material stress, alongside Finite Element Analysis (FEA) to enable the learner to apply stress concepts to carry out modelling, which would be used in industry.

Outline syllabus: The topics covered in this unit are:

Stress:
Stress Concentration
Un-symmetric bending
Curved beams
Elementary elastic plastic analysis
Buckling of struts
Beams deflections
Mohr's Circle for stress and strain
Rosette analysis
Failure criteria for ductile and brittle materials

Materials:
Introduction to Design Codes and Standards
Energy Methods in Structural Analysis
Impact
Fatigue Analysis
Fracture Mechanics
Introduction to Creep and Plastic Stress Analysis

Finite Element Analysis:
Introduction to FEA theory, technique and applications
Practical modelling techniques
Elementary elastic plastic analysis.

Part 3: Teaching and learning methods

Teaching and learning methods: See Outline Syllabus and Assessment.

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

MO1 Conduct stress and dynamics analysis calculations

MO2 Analyse stress in real engineering scenarios

MO3 Evaluate the design and properties of materials under load

MO4 Design and create stress models using FEA

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

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/index.html

Part 4: Assessment

Assessment strategy: Data Interpretation: Examination – The learner will be given a set of stress data as a case study and will be asked to perform stress analysis calculations.
FEA Model Design – The learners will design an FEA model of stress in a section of nuclear plant and present their results, along with material stress analysis results and material properties evaluation in presentation slides.

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

Assessment tasks:

Examination (First Sit)
Description: Examination - Data interpretation using a case study

Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1

Set Exercise (First Sit)
Description: FEA model design and presentation
Weighting: 75 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3, MO4

Examination (Resit)
Description: Examination - Data interpretation using a case study
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Set Exercise (Resit)
Description: FEA design and presentation
Weighting: 75 %
Final assessment: No
Group work: No
Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering with Nuclear {Apprenticeship-UCS} [Sep][FT][UCS][4yrs] BEng (Hons) 2021-22

Mechanical Engineering with Nuclear [Sep][PT][UCS][4yrs] BEng (Hons) 2021-22

Mechanical Engineering with Nuclear {Apprenticeship-UCS} [Sep][FT][UCS][5yrs] BEng (Hons) 2020-21