Module Definition Form (MDF)

Module code: MOD009728	**Version:** 1 **Date Amended:** 27/Feb/2024

1. Module Title
Computer Aided Engineering

2a. Module Leader
Jennifer Martay

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
6

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions			
Type	**Module Code**	**Module Name**	**Condition**
Pre-requisite:	MOD007035	Applied Engineering Mathematics	Compulsory
Pre-requisite:	MOD009721	Introduction to Biology and Biomedical Engineering	Compulsory
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:			

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

This module introduces you to Computer Aided Engineering (Finite Element Analysis FEA) as applied in the industry, with emphasis on the design, manufacture, analysis, and testing of a simple component. The module is predominantly 'hands on' and employs industry-standard software mainly in design and structural analysis.

You will analyse a component in three ways. You will analyse a component using hand calculations for stress analysis. You will then analyse the same component using FEA. Finally, the component will be manufactured and experimentally tested. The hand calculations, FEA results, and physical sample test results will then be compared in a validation study.

The overall strategy is to build a bridge between theory, use of computer modelling, and actual experiment, and for you to experience the advantages and disadvantages of each method and relevant error and uncertainty sources. You will also learn about how FEA can be used to improve the environmental impact of engineering designs and meet a variety of different needs. You will practice writing a company report.

6b. Outline Content

- Introduction to the FEA method & software

- Creating FE model geometry: Using FEA to minimize environmental impact of designs; meeting user, business, and customer needs

- Constructing the FE model: Element types, boundary conditions, meshing, load conditions, material properties, contact locations, etc

- Running the analysis and interpreting the results: Experimentally validating FE model

- Programming requirements for CNC milling: Tool tables, cutting speeds and feed rates etc

- Writing a company report of by-hand calculations, FEA results, and experimental testing results

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources
CAD software FEA software CNC workshop Materials laboratory

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Explain how to create and analyse a Finite Element Model.
2	Knowledge and Understanding	Discuss the uses, limitations, and environmental and societal impacts of Finite Element Models.
3	Intellectual, practical, affective and transferrable skills	Design, analyse, manufacture and test a simple component subjected to static mechanical loading. The design will take into account societal, user, business, and customer needs, health and safety, diversity, inclusion, cultural, societal, environmental, and commercial matters, codes of practice and industry standards.
4	Intellectual, practical, affective and transferrable skills	Create, solve, and validate Finite Element Models against hand calculations. Write up information as a company report.

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2025/6	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	12	1-2	First hour of weekly class
Other teacher managed learning	24	3-4	Remaining two hours of weekly class: Workshops, Seminars, Project Work
Student managed learning	114	1-4	Project Work
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Coursework	1-2	20 (%)	Fine Grade	30 (%)
1 hour in-class test (maps to C2, C3)					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Coursework	3-4	80 (%)	Fine Grade	30 (%)
2000 word coursework (maps to C5, C7, C13, C17)					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]