Module Definition Form (MDF)

Module code: MOD003415	**Version:** 4 **Date Amended:** 07/Feb/2023

1. Module Title
Advanced Computer Aided Engineering

2a. Module Leader
Sarinova Simanjuntak

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
7

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:			

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

This module is designed to advance your knowledge and skill level on the FEM-based CAE, and its advanced applications in the fields of solid mechanics, heat transfer as well as in product design and development. The module aims to provide you with the experience and exploit relevant FEMbased CAE tools and technologies which can assist innovative engineering design whilst solving complex problems in engineering for industrial applications. You will be introduced to the concept of prototyping, digital twinning of a design for manufacture, and design sustainability through a case study that is based on current and real-life industrial problems or challenges. Adopting a consultancy approach, you will analyse the performance of a product that includes the integrity and life estimation of such product.

6b. Outline Content

• Applying FEM-based CAE to perform design iteration and analysis of complex components or assemblies taking into account sustainability in design and materials, environmental conditions, and processing method.

• Determining the expected life of components, assemblies and tooling using approaches of applied plasticity and FE analysis.

• Introduction to the concept of digital twinning for design and production engineering.

• Developing a digital twin model of a part or component/assembly design through the utilisation of data generated from the iterative design process and FE performance anlysis as well as from literature.

• Formulating sound solutions for design and performance (life) optimisation.

6c. Key Texts/Literature

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

6d. Specialist Learning Resources

Computer Lab with appropriate FEA software for example ANSYS and LS-Dyna. Suitable CAD software to create the graphics for FEA. CNC machining centre. Rapid prototype machine. Tensile test machine.

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	Select and critically evaluate design optimization ideas through iteration, taking into consideration of sustainability in design and materials, environmental conditions, and processing methods.
2	Knowledge and Understanding	Formulate and analyse complex components or assemblies using linear statics, non-linear FEA method, thermal, and coupled thermal-stress solutions for typical industrial components or assemblies for performance analysis and life prediction.
3	Intellectual, practical, affective and transferrable skills	Constructing a digital twin model of a part or component/assembly design.
4	Intellectual, practical, affective and transferrable skills	Communicating effectively the model of digital twin to technical and non-technical audiences, highlighting the advantages and disadvantages of the digital twinning technology in design and production engineering.

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	1-4	Short lectures in the supervised computer laboratory.
Other teacher managed learning	24	1-4	Structure FEA exercises.
Student managed learning	114	1-4	Private study.
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	70 (%)	Fine Grade	40 (%)
Course work. A case study-based assignment of max 2000 words (maps to Engineering Council Learning Outcomes M3, M4, M7)					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Practical	3 4	30 (%)	Fine Grade	40 (%)
Oral presentation. 15 minutes oral presentation including Q&A (maps to Engineering Council Learning Outcomes M3, M17)					

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]