Module Definition Form (MDF)

Module code: MOD007119	**Version:** 5 **Date Amended:** 13/Jun/2024

1. Module Title
Engineering Simulation and Optimisation Project

2a. Module Leader
Ahad Ramezanpour

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
60

4b. Study Hours
600

5. Restrictions			
Type	**Module Code**	**Module Name**	**Condition**
Pre-requisite:	MOD007035	Applied Engineering Mathematics	Compulsory
Pre-requisite:	MOD007109	Materials and Mechanical Structures	Compulsory
Pre-requisite:	MOD007114	Product Development and Quality Engineering Project	Compulsory
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

This project-based module will help you to prepare for real scale industrial projects involving practical activities with wide versatility. In groups of 3-5 people, you will be expected to perform a teamwork study looking at feasibility, create/source the required CAD files, perform FE and CFD analysis to design a scaled-down product that works under specified and realistic specifications, and finally, use MATLAB & Simulink to create an up-to-date digital twin of the asset for simulations under different conditions. The product will need to be optimised by consistent iterations within FEA and CFD and the finalised proposal will be prototyped. You'll also learn how to manage your projects by means of critical path analysis (CPA) and change management. Once the product is manufactured, you'll need to perform experiments and use the test data compare to the ones from the numerical analysis, giving a report to demonstrate your achievements.

6b. Outline Content

- Understanding the importance of the team work and collaboration
- Definition of individual projects (for each team)
- Feasibility study and evaluation of individual projects
- Geometry creation amendment (if external source is used)
- Application of CFD on the model
- Final amendments to the CFD model and extraction of the loads
- Creation of the FE model and application of the BCs and mesh optimisation
- Application of CFD on the model - Data extraction for FE
- Creation of a simulation with MATLAB & Simulink
- Project planning and stages of project management
- Engineering standards, ethics and code of conduct
- Manufacturing the parts and testing
- Data calibration and preparing the final report

6c. Key Texts/Literature

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

6d. Specialist Learning Resources
None

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	Demonstrate the capacity to select and apply appropriate computational and analytical techniques to analyse and model a complex engineering problem, recognizing its scope, constraints, and limitations.
2	Knowledge and Understanding	Apply an integrated or systems approach to the solution of a complex problem.
3	Intellectual, practical, affective and transferrable skills	Use a risk management process to identify, evaluate and mitigate risks associated with a particular project or activity; adopt a holistic and proportionate approach for the mitigation of any security risks.
4	Intellectual, practical, affective and transferrable skills	Effectively function as an individual and as a member of a team; establish the proficiency to communicate effectively on complex engineering subjects orally and in writing, with technical and non-technical audiences.
5	Intellectual, practical, affective and transferrable skills	Discuss the role of quality management systems and continuous improvement in the context of complex problems.
6	Intellectual, practical, affective and transferrable skills	Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters.

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	18	1-5	Introduction to the projects lectures/tutoral WK 1-2 SEM1 0.5 hr a session WK3-12 SEM1 and SEM2
Other teacher managed learning	70	1-5	Workshops and supervised activities
Student managed learning	512	1-5	Self Directed Learning
TOTAL:	600		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Practical	1,4	40 (%)	Fine Grade	30 (%)
One oral presentation (010/1), equivalent to 1000 words; this assessment is associated with the requirements of Engineering Council learning outcomes LO4 (C16, C17) One report on CFD/FEA (010/2), with a maximum of 2500 words; this assessment is associated with the requirements of Engineering Council learning outcomes LO1 (C3)					

Assessment components for Element 010				
Component No.	**Assessment Title**	**Submission Method**	**Weighting (%)**	**Components needed for Mark Calculation?**
010/1	One oral presentation	Canvas	25 (%)	All
010/2	One report on CFD/FEA	Canvas	75 (%)	

Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Coursework	2 6	30 (%)	Fine Grade	30 (%)
One report (011/1) on MATLAB and Simulink and Modal Analysis, with a maximum of 2500 words; this assessment is associated with the requirements of Engineering Council learning outcomes LO2 (C6). One report (011/2) on product manufacturing, with a maximum of 2500 words; this assessment is associated with the requirements of Engineering Council learning outcomes LO6 (C15).					

Assessment components for Element 011				
Component No.	**Assessment Title**	**Submission Method**	**Weighting (%)**	**Components needed for Mark Calculation?**
011/1	One report on MATLAB and Simulink and Modal Analysis	Canvas	50 (%)	All
011/2	One report on product manufacturing	Canvas	50 (%)	

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
012	Practical	3 5	30 (%)	Fine Grade	30 (%)

One online assessment (012/1) on Engineering Standards and Code of Conduct and the mitigation of security risks, equivalent to 1000 words; this assessment is associated with the requirements of Engineering Council learning outcomes LO3 (C9, C10). An in-class Group oral presentation & a Poster (012/2), equivalent to 1000 words; this assessment is associated with the requirements of Engineering Council learning outcomes LO5 (C14).

Assessment components for Element 012				
Component No.	**Assessment Title**	**Submission Method**	**Weighting (%)**	**Components needed for Mark Calculation?**
012/1	One online assessment on Engineering Standards and Codes of Conduct and the mitigation of security risks	Scheduled Activity: Timetabled assessment task	30 (%)	All
012/2	An in-class group oral presentation & a poster	Scheduled Activity: Timetabled assessment task	70 (%)	

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]