Module Definition Form (MDF)

Module code: MOD010261	**Version:** 2 **Date Amended:** 13/Jun/2024

1. Module Title
Materials Science, Solid Mechanics, and Vibration Project

2a. Module Leader
Hossein Bisheh

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
5

3b. Module Type
Standard (fine graded)

4a. Credits
30

4b. Study Hours
300

5. Restrictions			
Type	**Module Code**	**Module Name**	**Condition**
Pre-requisite:	MOD009156	Engineering Dynamics	Compulsory
Pre-requisite:	MOD009161	Structural Mechanics	Compulsory
Co-requisite:	MOD007035	Applied Engineering Mathematics	Compulsory
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

This project-based module follows the theme of improving the design of an existing mechanical appliance/product using the design and analysis concepts for enhanced performance metrics. This module has been designed to give you the opportunity to work in groups in the multidisciplinary area of mechanical engineering to achieve a common goal. You'll use specialised engineering software packages, e.g., Autodesk Inventor, to design, analyse, and optimise a product and/or its components.

You'll be introduced to the concepts of structural design, solid mechanics, mechanical design, mechanical vibration, mechanical integrity, materials science, and their importance while designing a product. You'll learn about failure analysis of mechanical parts and components along with stress, strain, and vibration analysis. This module will help you to understand and apply theoretical concepts related mechanical design and materials science in design, analysis, and development of products.

6b. Outline Content

- Advanced CAD modelling and design of complex products.
- Review of basic material properties: Young's modulus and Poisson's ratio, yield stress, and ultimate strengths.
- Engineering Materials: structure, properties, manufacturing process and applications.
- Solid mechanics: review on load and stress analysis, transformation of stress, principal stresses, buckling, energy methods, etc.
- Mechanical vibration analysis of engineering structures and components.

6c. Key Texts/Literature

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

6d. Specialist Learning Resources

Computer Room and Mechanical Engineering 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	Design a complex product based on the principles of 'engineering design and analysis' techniques to improve functionality using advanced 3D CAD part and assembly modelling as well as recognising the limitations of the techniques employed.
2	Knowledge and Understanding	Understand the concept of mechanical design, structural analysis, solid mechanics, mechanical vibration, and materials science for a specific product and formulate their impact on the structural design and integrity.
3	Intellectual, practical, affective and transferrable skills	Design and create complex 3D part and assembly models using a 3D CAD package, prepare detailed design, analysis, and optimisation of a product using the knowledge of materials science, solid mechanics, and mechanical vibration.
4	Intellectual, practical, affective and transferrable skills	Demonstrate effective teamwork, communication, and decision-making procedures, as well as communicate effectively on complex engineering matters with technical and non-technical audiences.

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	72	1-4	Module lectures/tutorials WKs 1-12, Tri1, 6 hours per week
Other teacher managed learning	0	None	None
Student managed learning	228	1-4	Self-directed learning
TOTAL:	300		

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	50 (%)	Fine Grade	30 (%)
15 min in-class group presentation followed by 5 minutes of Q&A (equivalent to 2000 words)					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Examination Chelmsford	2-3	50 (%)	Fine Grade	30 (%)
Exam (2 hours)					

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]