Module Definition Form (MDF)

Module code: MOD009180	**Version:** 2 **Date Amended:** 22/May/2024

1. Module Title
Engineering Thermodynamics

2a. Module Leader
Ahad Ramezanpour

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
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

Thermodynamics is about the analysis of real-world systems in terms of mass, energy, and entropy exchange. The thermodynamic analysis will enable you to calculate and optimise the efficiency of various products such as car engines, jet engines, power plants, compressors, gas and steam turbines, boilers, condensers, and refrigerators. Engineering thermodynamics helps to save energy and therefore plays a critical role in energy sustainability and net-zero engineering. The engineering thermodynamics module covers an understanding of mechanical work and heat energy used in conjunction with the first and second laws of thermodynamics and applied for products and systems that include ideal gases such as gas turbines or include multi-phase water and vapour such as condensers and steam turbines. You will also be learning about different thermodynamic cycles such as the reciprocating air standard cycle used in an internal combustion engine. The module includes an introduction to combustion that enables you to establish the analysis of exhaust gases from combustion phenomena.
In this module, you will develop your learning, using applied and real-world problems complemented by laboratory activities to ensure consistent and deep learning.

6b. Outline Content

- Basic concepts in Thermodynamics such as cycle, process, properties, and reversibility
- Heat energy and mechanical work calculation
- Understanding and distinguishing the methods applied to a certain thermodynamics problem and use of thermodynamic tables
- The first law of thermodynamics
- Properties of saturated/superheated water and vapour
- Properties of gases, ideal gas laws
- The second law of thermodynamics, entropy
- Air standard cycle for internal combustion engines
- Introduction to combustion
- Applying all the concepts to a real-world problem

6c. Key Texts/Literature

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

6d. Specialist Learning Resources

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	Distinguish different concepts of complex thermodynamic problems and recognise the scope and limitations of thermodynamics
2	Knowledge and Understanding	Demonstrate understanding of thermodynamic laws, thermodynamic cycles, the concept of efficiency, and basic combustion analysis
3	Intellectual, practical, affective and transferrable skills	Apply knowledge of mathematics and engineering principles to solve complex thermodynamic
4	Intellectual, practical, affective and transferrable skills	Select and evaluate technical literature to investigate a thermodynamic problem, with some of the knowledge expected to be in forefront of the topic, and present the research

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	36	1-4	Three hours per week for twelve weeks
Other teacher managed learning	0	None	None
Student managed learning	114	1-4	Self-managed study, engage with formative assessment, and preparing lab report
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Examination Chelmsford	2-3	60 (%)	Fine Grade	30 (%)
Examination 1.5 hours (maps to Engineering Council Learning Outcomes C1, C3)					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Practical	1, 4	40 (%)	Fine Grade	30 (%)
Oral Group Presentation, equivalent of 20 minutes presentation and Q&A per group of three students, equivalent to 2000 words (maps to Engineering Council Learning Outcomes C1, C4)					

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]