



MODULE SPECIFICATION

Faculty of Engineering

Last Updated (25th April 2018)

1. Module Title

Advanced Engineering Thermodynamics

2. Module Code

ME5101

3. Number of credits

10

4. Level

5

5. Semester

1

6. Pre-requisites for admission to the module

Normal entry requirements

7. Module Coordinator

Dr Mohammad Nurul Islam

8. Aims

To equip the students with the relevant advanced topics on thermodynamics on the fundamental core of thermodynamic studies in order to develop an intuitive understanding of thermodynamics by emphasizing the physics and physical arguments.

9. Summary of Contents

The module covers the following topics:

- Overview of the second law of thermodynamics.
- **Entropy:** Entropy changes, Isentropic Processes, Entropy and entropy generation in daily life, The Tds relations, Isentropic efficiencies of steady-flow devices, Entropy balance.
- **Exergy:** A measure of work potential, Reversible work and irreversibility, Second-law efficiency, Exergy change of a system, The decrease of exergy principle and exergy destruction, Exergy balance.
- **Thermodynamic property relations:** The Maxwell relations, The Clapeyron equation, General relations, The Joule-Thomson coefficient, The enthalpy, entropy and internal energy changes for real gases, The concept of fugacity.
- **Reactive systems:** Combustion, Enthalpy of formation, Enthalpy of combustion, Adiabatic flame temperature, First law and second law analysis of reacting systems.
- **Chemical and phase equilibrium:** Criterion for chemical equilibrium, The equilibrium constant, phase equilibrium, The phase rule, Phase equilibrium for systems.

10. Module Intended Learning Outcomes (MILOs)

Upon successful completion of this module, students will be able to:

No.	MILOs	Weightage (%)
1	Make use of entropy concept to solve thermodynamic problems	20
2	Solve thermodynamic problems by using the exergy concept	25
3	Analyse different thermodynamic property relationships	20
4	Discuss different reactive systems taking into considerations of chemical and phase equilibrium and compressible flow.	35

11. Teaching and Learning Activities (TLAs)

MILO No.	TLAs	Functions	Hours/Week
1,2,3,4	Lecture	Present and convey critical information and theories	2
1,2,3,4	Tutorial	Interactive problem solving session used for transfer of knowledge by example through a set of instructions to complete a task	1
1,2,4	Field visit	Study of related devices, their performance study, field visit and writing up individual technical reports	1

12. Assessment Tasks/Activities

MILO No.	Type of Assessment Tasks/Activities	Weightage (%)
1,2,3,4	University Examination	60
1,2,3	Class Test	10
2,3	2 Assignment	10
1, 2,4	Field visit Report	20

Assessment Criteria:

Assessment components of the module shall be University Examination and Course-works. To achieve a pass in the module students must obtain a minimum overall marks of 50% and a minimum of 40% in each assessment component.

Resit:

Students eligible for resit shall be assessed according to the Programme Area's Examination Board recommendation.

13. Attendance Requirements

Students are expected to attend all lectures, tutorials and lab sessions/field visits.

14. Contribution to Programme Intended Learning Outcomes

PILO		MILO No.			
		1	2	3	4
1	Science & Mathematics	✓	✓	✓	✓
2	Engineering Analysis	✓	✓	✓	✓
3	Design	✓			✓
4	Advanced Design	✓	✓		
5	Engineering Practice Knowledge	✓	✓		✓
6	Engineering Practice		✓		✓
7	Ethical, Economic & Social				
8	Management, Legal & Environmental				✓
9	General Skills	✓			

15. Grading of Student Achievement

Marks (%)	Grades	Grade Definition
85-100	A+	Excellent
75-84	A	
70-74	B+	Very Good
65-69	B	
60-64	C+	Good
55-59	C	
50-54	D	Satisfactory
0-49	F	Fail

16. Resources

Primary texts

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	A. Bejan	2016	Advanced Engineering Thermodynamics	4th	Wiley Interscience	978-1-119-05209-8
2	Y. A. Cengel and M. A. Boles	2014	Thermodynamics An Engineering Approach	8th	McGraw-Hill	978-0073398174
3	P. K. Nag	2013	Engineering Thermodynamics	5th	McGraw Hill	978-1259062568

Secondary texts

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	J.P. Holman	2004	Thermodynamics	2 nd	Mc Graw Hill	0070296332
2	P.K. Nag	2006	Basic and Applied Thermodynamics	8 th Reprint	Tata Mc Graw Hill	0070473382
3	J.E. Ahern	1980	The Exergy Method of Energy Systems Analysis		John Wiley & Sons	OSTI Identifier: 6148569