



## MODULE SPECIFICATION

### Faculty of Engineering

Last Updated (7<sup>th</sup> March 2018)

1. **Module Title**  
Engineering Thermodynamics 1
2. **Module Code**  
EM2101
3. **Number of credits**  
10
4. **Level**  
2
5. **Semester**  
3
6. **Pre-requisites for admission to the module**  
Normal Progression Requirements
7. **Module Coordinator**  
Dr Md Nurul Islam Gafur
8. **Aims**  
The module aims to generate and enhance student's basic understanding of thermodynamics, its properties, laws and principles and the application of the fundamental laws and principles in different engineering thermodynamic systems.
9. **Summary of Contents**  
The module covers the following topics:
  - **Introduction and Basic Concepts of Thermodynamics:** Overview of energy, thermodynamic systems, properties and state of substances, units and dimensions, processes and cycles.
  - **Energy and First Law of Thermodynamics:** Forms of energy, energy transfer, and general energy analysis, principles of energy conservation, energy balance, energy change of a system, energy conversion and efficiencies, energy and environment.
  - **Pure Substances:** Properties of pure substances, the ideal-gas equation of state and its deviation.
  - **Thermodynamic Analysis:** Analysis of closed systems, non-flow energy equation, mass and energy analysis of control volumes, the steady-flow energy equation.
  - **The Second Law of Thermodynamics:** Heat engines, refrigeration and heat pumps, Carnot cycle.
  - **Entropy:** The Increase of Entropy Principle, Entropy changes of Solids and Liquids and Ideal Gases, Isentropic efficiencies of Steady-Flow Devices, Entropy Balance.

## 10. Module Intended Learning Outcomes (MILOs)

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

| No. | MILOs  | Weightage (%) |
|-----|--|---------------|
| 1   | interpret basic thermodynamic systems, control volumes, properties and their interactions with energy transfer, processes and cycles | 20            |
| 2   | Outline the laws and principles of thermodynamics  | 20            |
| 3   | Develop the governing equation for the thermodynamic systems   | 20            |
| 4   | Apply the laws and principles in engineering devices   | 20            |
| 5   | Distinguish between ideal and real thermodynamic processes   | 20            |

## 11. Teaching and Learning Activities (TLAs)

| MILO No. | TLAs       | Functions  | Hours/Week                              |
|----------|------------|--|---|
| 1 – 5    | Lectures   | Present and convey critical information and theories   | 2                                       |
| 1 – 5    | Tutorials  | Interactive problem solving session used for transfer of knowledge by example through a set of instructions to complete a task | 1                                       |
| 2, 4, 5  | Laboratory | Study of related devices, their performance study, field visit and writing up individual technical reports                     | 3 sessions of 2 hours each per semester |

## 12. Assessment Tasks/Activities

| MILO No. | Type of Assessment Tasks/Activities | Weightage (%) |
|----------|-------------------------------------|---------------|
| 1 – 5    | University Examination              | 60            |
| 1 – 4    | Assignments (2)                     | 20            |
| 2, 4, 5  | Laboratory reports (3)              | 20            |

### Assessment Criteria:

Assessment components of the module shall be University Examination and Coursework. To achieve a pass in the module students must obtain a minimum overall marks of 40% and a minimum of 30% in each assessment component.

**Resit:** Students eligible for resit shall be assessed according to the programme area examination board recommendation.

## 13. Attendance Requirements

Students are required to attend all lectures, tutorials and laboratory sessions.

#### 14. Contribution to Programme Intended Learning Outcomes

| PILO |  | MILO No. |   |   |   |   |
|------|--|----------|---|---|---|---|
|      |  | 1        | 2 | 3 | 4 | 5 |
| 1    | Science & Mathematics                        | ✓        | ✓ | ✓ | ✓ | ✓ |
| 2    | Engineering Analysis                         | ✓        | ✓ | ✓ | ✓ | ✓ |
| 3    | Design                                       |          |   |   |   |   |
| 4    | Advanced Design                              |          |   |   |   |   |
| 5    | Economic, Legal, Social and Ethical Contexts | ✓        |   |   |   |   |
| 6    | Engineering Practice                         |          |   |   | ✓ | ✓ |
| 7    | 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     |
| 45-49     | D      |                  |
| 40-44     | E      | Marginal         |
| 0-39      | F      | Fail             |

## 16. Resources

### Primary texts

| No | Name of Author(s)                     | Year of Publication | Title of Book                                     | Edition         | Publisher's Name | ISBN          |
|----|---------------------------------------|---------------------|---|-----------------|------------------|---------------|
| 1. | Yunus A. Çengel and Michael A. Boles, | 2014                | Thermodynamics–An Engineering Approach            | 8 <sup>th</sup> | McGraw-Hill      | 9780073398174 |
| 2. | G. Rogers and Y. Mayhew               | 2013                | Engineering Thermodynamics-Work and Heat Transfer | 4 <sup>th</sup> | Longman          | 9780582045668 |

### Secondary texts

| No | Name of Author(s)  | Year of Publication | Title of Book                            | Edition | Publisher's Name   | ISBN       |
|----|--|---------------------|--|---------|--------------------|------------|
| 1. | William Z. Black and James G. Hartley,                       | 1997                | Thermodynamics                           | 3rd     | Prentice Hall      | 0673996484 |
| 2. | Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen, | 1998                | Fundamentals of Thermodynamics           | 5th     | John Wiley & Sons  | 047118361X |
| 3. | Gordon J. Van Wylen, Richard E. Sonntag and Claus Borgnakke  | 1994                | Fundamentals of Classical Thermodynamics | 4th     | John Wiley & Sons. | 9971511517 |

Note: Module specification valid for Intake 2017 onwards.