

## Faculty of Engineering & Technology

### Thermal Power Systems

**Information :**

**Course Code :** MPR 355

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Mechatronics Engineering

**Instructor Information :**

| Title              | Name                              | Office hours |
|--------------------|-----------------------------------|--------------|
| Lecturer           | Anas Mohamed Abdelrahman Ali      |              |
| Assistant Lecturer | Zakaria Mostafa Abdo Salim Marouf | 10           |

**Area Of Study :**

This course aims to:

- Enrich the student Understanding about fundamentals of Thermal Power Systems
- Prepare the student to apply the fundamental principles of Thermodynamics and Fluid Mechanics
- Train the student to Explore the fundamental principles of Heat Engines through analysis and experimentation
- Develop the student skills for analyzing engines data and working in teams
- Train the student to share ideas and work in a team.

**Description :**

Basic characteristics, analysis and performance of different types of engines and thermal power systems, including: steam power, combined cycles, petrol engines, diesel engines, gas turbines and jet engines. Latest developments in automotive engines technology.

**Course outcomes :**

**a. Knowledge and Understanding: :**

|     |  |
|-----|--|
| 1 - | Identify principles in the field of design of fluid flow, thermodynamics, gas dynamics, turbo- machinery, heat transfer engineering and fundamentals of thermal and fluid processes. |
| 2 - | Describe conceptual and detailed design of fluid power systems.  |
| 3 - | Explain the constraints which mechanical power engineers have to judge to reach at an optimum solution for thermal power systems.  |
| 4 - | Describe basic types of internal combustion engines and vapor power plants.  |

**b. Intellectual Skills: :**

|     |   |
|-----|---|
| 1 - | Derive different solution alternatives for the engineering problems in thermal power systems.     |
| 2 - | Evaluate different power losses.  |
| 3 - | Analyze the performance of the basic types of internal combustion engines and vapor power plants. |

**c. Professional and Practical Skills: :**

|     |  |
|-----|--|
| 1 - | Classify different types of internal combustion engines based on different criteria. |
| 2 - | Connect engine performance to design parameters, fuels and environmental conditions. |

**d.General and Transferable Skills: :**

|     |  |
|-----|--|
| 1 - | Write reports in accordance with the standard scientific guidelines.                     |
| 2 - | Use digital libraries and/or Learning systems and demonstrate efficient IT capabilities. |

**Course Topic And Contents :**

| Topic   | No. of hours | Lecture | Tutorial / Practical |
|---|--------------|---------|----------------------|
| Ideal Air and Gas Power Cycles(Otto Cycle . Petrol Engine)  | 4            | 2       | 2                    |
| Ideal Air and Gas Power Cycles(Diesel Engine, Brayton Cycles-Gas Turbine)   | 8            | 4       | 4                    |
| Vapor Power Cycles (Basic Rankine and Superheat Cycles) + Midterm Examination 1   | 8            | 4       | 4                    |
| Improving Efficiency of Vapor Power Cycles (Reheat, Regeneration and Co-generation)   | 4            | 2       | 2                    |
| Improving Efficiency of Vapor Power Cycles (Combined and Binary Cycles)   | 4            | 2       | 2                    |
| Actual Cycles, Reheat, Regeneration   | 8            | 4       | 4                    |
| Gas Turbines and Jet Propulsion Systems (Jet Propulsion, Modifications to Turbojet Engines, Ramjets) + Mid-term Examination 2 | 8            | 4       | 4                    |
| Revision of Basic Principles of Thermodynamics (Definitions, Concepts, Fluid Properties Fundamental Laws)                     | 8            | 4       | 4                    |
| Operating Characteristics of Reciprocating Engines(Engine Parameters, Efficiencies, Emissions and Noise)                      | 8            | 4       | 4                    |

**Teaching And Learning Methodologies :**

|                        |
|------------------------|
| Interactive Lecture    |
| Problem based learning |
| Discussion             |
| Experimental learning  |
| Project based learning |
| Research               |

**Course Assessment :**

| Methods of assessment | Relative weight % | Week No | Assess What |
|-----------------------|-------------------|---------|-------------|
| Assignment            | 10.00             | 11      |             |
| Final Exam            | 40.00             | 16      |             |
| Mid- Exam 1I          | 15.00             | 11      |             |
| Mid- Exam I           | 15.00             | 6       |             |
| Participation         | 10.00             | 16      |             |
| Research              | 5.00              | 9       |             |

**Recommended books :**

"Thermodynamics an Engineering Approach", Seventh Edition, 2011, By: Yunus Cengel and Michael A. Boles, Mc Graw Hill