

## 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 :**

- Understand fundamentals of Thermal Power Systems
- Apply the fundamental principles of Thermodynamics and Fluid Mechanics
- Explore the fundamental principles of Heat Engines through experimentation
- Develop skills for analyzing experimental data and working in teams
- Share ideas and work in a team.

The student shall attain the above mentioned objectives efficiently under controlled guidance and supervision while gaining the experience through application and analysis of realistic system data.

**Course outcomes :**

**a. Knowledge and Understanding: :**

1 -	Identify basic applied and engineering science.
2 -	Identify principles in the of design of mechanical components, different materials, and manufacturing technologies in the field of mechanical power engineering and some other engineering disciplines.
3 -	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
4 -	Develop conceptual and detailed design of construction projects and fluid power systems.

**b. Intellectual Skills: :**

1 -	Define the mechanical power engineering problems and evaluate designs, processes, and performance and propose improvements.
2 -	Derive different solution alternatives for the engineering problems, analyze, interpret data and design experiments to obtain new data, and evaluate the power losses in the fluid transmission lines and networks
3 -	Analyze the performance of the basic types of internal combustion engines, hydraulic machines, fluid power systems, subsystems and various control valves and actuators. Analyze the solution alternatives and choose the optimum one.

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

1 -	Use laboratory, workshop e4quipment and field devices competently and safely.
2 -	Analyze the record data in the laboratory.

3 -	Prepare engineering drawings, computer graphics, and write specialized technical reports.
4 -	Write computer programs pertaining to mechanical power and energy engineering to describe the basic thermal and fluid processes mathematically, and use the computer software for their simulation and analysis.

**d.General and Transferable Skills :**

1 -	Collaborate effectively within multidisciplinary team.
2 -	Share ideas, communicate effectively and work in stressful environment and within constraints.
3 -	Lead and motivate individuals and work with others according to the rules of the professional Ethics.
4 -	Use digital libraries and/or Learning systems and demonstrate efficient IT capabilities.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Revision of Basic Principles of Thermodynamics (Definitions, Concepts, Fluid Properties)			
Revision of Basic Principles of Thermodynamics(Fundamental Laws and Thermal Efficiency)			
Ideal Air and Gas Power Cycles(Otto Cycle . Petrol Engine)			
Ideal Air and Gas Power Cycles(Diesel Engine, Brayton Cycles-Gas Turbine)			
Vapor Power Cycles (Basic Rankine and Superheat Cycles)			
Improving Efficiency of Vapor Power Cycles (Reheat, Regeneration and Co-generation)			
Improving Efficiency of Vapor Power Cycles (Combined and Binary Cycles)			
Gas Turbines and Jet Propulsion Systems (Actual Gas Turbine Cycles, Reheat, Regeneration)			
Gas Turbines and Jet Propulsion Systems (Jet Propulsion, Modifications to Turbojet Engines, Ramjets)			
Operating Characteristics of Reciprocating Engines(Engine Parameters, Efficiencies, Emissions and Noise)			
Basic Engine Systems(Induction and Combustion Systems)			
Basic Engine Systems(Exhaust, Cooling and Lubrication Systems)			
Internal Combustion Engines for Aviation and Marine Power			

**Teaching And Learning Methodologies :**

Lectures
Tutorials
Presentation & Discussion
Brain storming

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
1st -Mid-term examination	25.00	6	

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2 nd -Mid-term examination	25.00	11	
Final examination	40.00	16	
General Performance	10.00	15	

**Recommended books :**

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