

Program : Diploma in Mechanical Engineering/ Manufacturing Technology	
Course Code : 4027	Course Title: Thermal Engineering Lab
Semester : 4	Credits: 1.5
Course Category: Program Core	
Periods per week: 3 (L:0, T:0, P:3)	Periods per semester: 45

Course Objectives:

- To identify different parts and systems of IC engines
- To perform different performance test on IC engines, draw various characteristic curves and obtain economic speed & power.
- To determine viscosity, calorific value, flash and fire point of the given solid and liquid fuels.
- To achieve the proficiency to test the performance of heat exchangers and Air compressors.

Course Prerequisites:

Topic	Course Code	Course Name	Semester
Basic Mathematics		Mathematics I&II	1&2
Basic physics		Applied Physics I&II	1& 2
Basic concepts in Thermodynamics		Thermal Engineering	5

Course Outcomes:

On completion of the course, the student will be able to:

CO _n	Description	Duration (Hours)	Cognitive Level
CO1	Apply theoretical knowledge in evaluating the performance of IC engines	20	Applying
CO2	Determination of viscosity, calorific value, flash point and fire point of fuels.	9	Applying
CO3	Demonstrate performance test on Heat exchangers	6	Applying

CO4	Conduct performance test on air compressors	4	Applying
	Lab Exam	6	

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3			3			2
CO2	3			3			
CO3	3			3			
CO4	3			3			

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	Apply theoretical knowledge in evaluating the performance of IC engines		
M1.01	Study the parts and functions of the petrol engine. Identify the various systems in IC Engines - intake system, exhaust system, lubricating system, cooling system, electrical system, fuel system & loading system	5	Understanding
M1.02	Conduct different tests on petrol engine – load test, heat balance test, valve timing diagram, Morse test. Compare the values, draw various characteristic curves and obtain economic speed & power.	5	Applying
M1.03	Study the parts and functions of diesel engine. Identify the various systems in Diesel Engines - intake system, exhaust system, lubricating system, fuel system, and cooling system.	5	Understanding
M1.04	Conducting different tests on diesel engine – load test, heat balance test, valve timing diagram. Compare the values, draw various characteristic curves and obtain economic speed & power.	5	Applying
Contents: Study of petrol and Diesel engines. Components and systems of IC engines-Valve timing			

diagrams -Load test on petrol and diesel engines.

CO2	Determination of viscosity, calorific value, flash point and fire point of fuels.		
M 2.01	Perform the test on lubricating oils. Determine the viscosity of the given oil.	3	Applying
M 2.02	Determine the flash and fire point of the given oil.	3	Applying
M 2.03	Determine the calorific value of given solid fuels. Determine the calorific value of the given liquid fuel.	3	Applying
	Lab Exam I	3	

Contents:

Properties of fuels, Redwood Viscometer. Flash and fire point apparatus. Bomb Calorimeters, Junker's calorimeter.

CO3	Demonstrate performance test on Heat exchangers		
M 3.01	Identify the function and working of heat exchangers Explain the classification of heat exchangers	2	Understanding
M 3.02	Find the effectiveness of parallel flow and counter flow heat exchangers.	2	Applying
M 3.03	Find the effectiveness and overall heat transfer co efficient of a shell and tube heat exchanger.	2	Applying

Contents:

Heat exchanger-function-classification- parallel flow- counter flow- shell and tube-effectiveness- overall heat transfer co efficient.

CO4	Conduct performance test on air compressors		
M4.01	Study the components and working of Reciprocating and Rotary air compressors	2	Understanding
M4.02	Conduct a performance test on air compressor and determine volumetric efficiency, isothermal efficiency& adiabatic efficiency	2	Applying
	Lab Exam II	3	

Contents:

Air compressor –Components-working-Reciprocating and Rotary air compressors- Performance test, volumetric efficiency, adiabatic efficiency.

Text / Reference

T/R	Book Title/Author
T1	Mechanical Workshop & Laboratory Manual by K. C. John
R1	Thermal engineering by R S Khurmi
R2	Internal combustion engines by V Ganesan
R3	Heat and Mass transfer by R K Rajput
R4	Thermal engineering (Heat power) by A.R. Basu
R6	Internal Combustion Engines by Domkundwar&Domkundwar
R7	Heat and mass transfer data book by Domkundwar

Online Resources

Sl.No	Website Link
1	https://www.thermal-engineering.org/
2	https://www.ignou.ac.in/upload/unit-7.pdf
3	https://nptel.ac.in/courses/112/103/112103262/
4	https://en.wikipedia.org/wiki/NTU_method
5	https://www.youtube.com/watch?v=OyQ3SaU4KKU
6	https://en.wikipedia.org/wiki/Air_compressor
7	https://www.youtube.com/watch?v=bJluUxA7aaY
8	https://www.youtube.com/watch?v=rtrOcFq6QSs