

Lesson Plan

Course Name- THERMAL ENGG.-I (TH-5)

Semester- 3rd, Mechanical

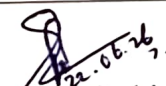
Academic Session- 2026-27 (W)

Course Outcomes (Cos):

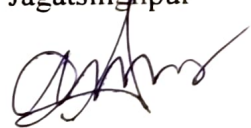
COs	Statement:
	After completion of the course students will be able to:
CO-1	Describe various sources of Energy and their applications.
CO-2	Analyze and compare different I.C. engines with their working, features and performance.
CO-3	Explain the working of air compressors, refrigeration, and air-conditioning systems and calculate their performance for different engineering uses.

Discipline – Mechanical Engg.	Semester – 3 rd	Name of the Faculty – Kalia Sethi
Subject – THERMAL ENGG.-I (TH-5)	No. of days/week class allotted- 3 Total- 45 Hours	AY 2026-27(W) Semester w.e.f.:01/07/2026
Week	Class Day	Theory/Practical Topics
1st	1st	UNIT-I-Introduction to Thermodynamics; Thermodynamic Systems (Open, Closed and Isolated Systems)
	2 nd	Thermodynamic Properties: Pressure, Volume, Temperature, Internal Energy, Enthalpy, Entropy and Units of Measurement
	3 rd	Intensive and Extensive Properties; State and Thermodynamic Equilibrium
2nd	1 st	Thermodynamic Process, Path, Cycle, Point Function and Path Function
	2 nd	Quasi-static Process, Zeroth, First, Second and Third Laws of Thermodynamics
	3 rd	Sources of Energy- Classification of Energy Sources: Renewable and Non-Renewable, Fossil Fuels (CNG & LPG)
3rd	1 st	Solar Energy; Flat Plate Collector and Concentrating Collector, Applications of Solar Energy
	2 nd	Working Principles of Solar Water Heater, Photovoltaic Cell and Solar Distillation
	3 rd	Wind Energy, Tidal Energy, Ocean Thermal Energy Conversion (OTEC) and Geothermal Energy
4th	1 st	Biomass, Biogas, Biodiesel, Hydraulic Energy, Nuclear Energy and Fuel Cell.
	2 nd	Summarize of Unit and Assignment work. UNIT-II-Introduction to Internal Combustion Engines: Internal and External Combustion Engines, Advantages of I.C. Engines over External Combustion Engines, Classification of I.C. Engines
	3 rd	Carnot Cycle P-V and T-S Diagrams.
5th	1 st	Otto Cycle and Diesel Cycle Working Principle with P-V and T-S Diagrams
	2 nd	Construction of I.C. Engine and Identification of Main Components
	3 rd	Components of I.C. Engines: Cylinder, Crankcase, Crank Pin, Crank, Crankshaft, Connecting Rod and Wrist Pin – Functions and Materials
6 th	1 st	Components of I.C. Engines-Piston, Cooling Fins, Cylinder Head, Inlet Valve and Exhaust Valve with Functions and Materials.
	2 nd	Working of Four-Stroke Petrol Engine and Four-Stroke Diesel Engine Valve Timing Diagram of Four-Stroke Engine
	3 rd	Working of Two-Stroke Petrol Engine and Two-Stroke Diesel Engine Port Timing Diagram of Two-Stroke Engine
7 th	1 st	Comparison of Two-Stroke and Four-Stroke Engines; Comparison of C.I. and S.I. Engines.

		Summarize of Unit and Assignment work.
	2 nd	UNIT-III- Fuel System of Petrol Engines and Its Components
	3 rd	Carburetion: Principle and Operation of Simple Carburettor and Zenith Carburettor
8 th	1 st	Fuel System of Diesel Engines with Components and Working Principle
	2 nd	Fuel Injection Systems: Types of Fuel Pumps and Fuel Injectors and Applications
	3 rd	Cooling Systems of I.C. Engines: Air Cooling and Water Cooling by Thermo-Siphon Method
9 th	1 st	Water Cooling System with Radiator and Forced Circulation, Comparison of Air Cooling and Water Cooling Systems
	2 nd	Ignition Systems: Battery Coil Ignition and Magneto Ignition Construction, Working and Comparison.
	3 rd	Lubrication Systems of I.C. Engines: Types of Lubricating Systems with Line Diagrams.
10 th	1 th	Governing of I.C. Engines: Hit-and-Miss, Quantitative, Qualitative and Combination Methods; Applications and Objective of Supercharging. Summarize of Unit and Assignment work.
	2 nd	UNIT-IV-Introduction to Performance Parameters of I.C. Engines::Brake Power (B.P.), Indicated Power (I.P.) and Frictional Power (F.P.)
	3 rd	Methods of Determination of Brake Power (B.P.), Dynamometers and Calculations
11 th	1 st	Determination of Indicated Power (I.P.) and Frictional Power (F.P.)
	2 nd	Mean Effective Pressure: Indicated Mean Effective Pressure (IMEP) and Brake Mean Effective Pressure (BMEP)
	3 rd	Thermal Efficiencies: Brake Thermal Efficiency and Indicated Thermal Efficiency
12 th	1 st	Mechanical Efficiency and Relative Efficiency; Significance and Applications
	2 nd	Performance Test and Morse Test: Objectives, Procedure and Calculations
	3 rd	Heat Balance Sheet: Concept, Preparation and Interpretation
13 th	1 st	Numerical Problems on B.P., I.P., F.P., Efficiencies, Mean Effective Pressure, Morse Test and Heat Balance Sheet. Summarize of Unit and Assignment work.
	2 nd	UNIT-V-Introduction to Air Compressors: Functions, Uses of Compressed Air and Classification of Air Compressors
	3 rd	Single-Stage Reciprocating Air Compressor, Construction, Working and P-V Diagram
14 th	1 st	Multi-Stage Air Compressors: Constructional Features and Advantages over Single-Stage Compressors
	2 nd	Rotary Compressors: Centrifugal Compressor, Axial Flow Compressor and Vane Compressor – Construction and Working Principles
	3 rd	Fundamentals of Refrigeration: Refrigeration, Refrigerant, Coefficient of Performance (COP); Air Refrigeration System – Components, Working and Applications
15 th	1 st	Vapour Compression Refrigeration System (VCRS): Components, Working Cycle and Applications
	2 nd	Air Conditioning: Definition, Classification, Comfort and Industrial Air Conditioning; Window Air Conditioner – Construction and Working
	3 rd	Summer Air Conditioning, Winter Air Conditioning and Year-Round Air Conditioning Systems. Summarize of Unit and Assignment work.


Kalia Sethi

Lecturer S-II, Mechanical Engineering
Govt. Polytechnic, Jagatsinghpur



Lesson Plan

Course Name- Metrology & Measurement (TH-1)

Semester- 5th Mechanical

Academic Session- 2026-27 (W)

Course Outcomes (Cos):

COs	Statement:
	After completion of the course students will be able to:
CO-1	Explain the fundamental concepts of metrology, including accuracy, precision, calibration, sensitivity, repeatability, and different types of measurement errors.
CO-2	Select appropriate measuring instruments for specific engineering applications based on their operating principles and calibration requirements.
CO-3	Analyze, interpret, and present measurement data using graphical and statistical methods for effective engineering decision-making.

Discipline – Mechanical Engg.	Semester – 5 th	Name of the Faculty – Kalia Sethi
Subject-Metrology & Measurement (TH-1)	No. of days/week class allotted- 3 Total- 45 Hours	AY 2026-27(W) Semester w.e.f.:01/07/2026
Week	Class Day	Theory/Practical Topics
1st	1 st	UNIT-I-Introduction to Measurements: Definition, Significance, Methods of Measurement (Direct & Indirect), Generalized Measuring System
	2 nd	Standards of Measurement (Primary & Secondary), Factors Influencing Selection of Measuring Instruments
	3 rd	Characteristics of Measuring Instruments: Accuracy, Precision, Sensitivity, Repeatability, Range, Threshold, Hysteresis, Calibration
2nd	1 st	Errors in Measurements: Classification of Errors, Systematic Errors, Random Errors
	2 nd	Measuring Instruments: Introduction, Thread Measurements – Thread Gauge, Thread Micrometer
	3 rd	Angle Measurements – Bevel Protractor, Sine Bar
3rd	1 st	Gauges – Plain Plug Gauge, Ring Gauge, Snap Gauge, Limit Gauge
	2 nd	Comparators – Characteristics and Types of Comparators
	3 rd	Surface Finish – Definition, Terminology, Talysurf Surface Roughness Tester
4th	1 st	Coordinate Measuring Machine (CMM). Summarize of Unit and Assignment work.
	2 nd	UNIT-II-Introduction to Transducers: Definition, Characteristics, Classification of Transducers
	3 rd	Inductive Transducers: Two-Coil Self-Inductance Transducer – Construction, Working and Applications
5th	1 st	Piezoelectric Transducer – Principle, Construction, Working and Applications
	2 nd	Strain Measurement: Introduction, Strain Gauge, Classification of Strain Gauges
	3 rd	Mounting of Strain Gauges and Strain Gauge Rosettes (Two-element and Three-element)
6 th	1 st	Force Measurement: Introduction, Spring Balance, Proving Ring
	2 nd	Force Measurement-Load Cell – Construction, Working and Applications
	3 rd	Torque Measurement: Prony Brake, Eddy Current Dynamometer
7 th	1 st	Torque Measurement: Hydraulic Dynamometer; Pressure Measurement: McLeod Gauge
	2 nd	Summarize of Unit and Assignment work.

	3 rd	UNIT-III- Applied Mechanical Measurements: Introduction. Speed Measurement – Classification of Tachometers and Revolution Counters
8 th	1 st	Speed Measurement – Eddy Current Tachometer; Displacement Measurement – Linear Variable Differential Transformer (LVDT)
	2 nd	Flow Measurement – Rotameter: Construction, Working and Applications
	3 rd	Flow Measurement – Turbine Meter; Temperature Measurement – Resistance Thermometer
9 th	1 st	Temperature Measurement – Optical Pyrometer and Comparison with Resistance Thermometer
	2 nd	Miscellaneous Measurements – Humidity Measurement (Hair Hygrometer) and Density Measurement (Hydrometer)
	3 rd	Liquid Level Measurement – Sight Glass and Float Gauge
10 th	1 th	Biomedical Measurement – Sphygmomanometer. Summarize of Unit and Assignment work.
	2 nd	UNIT-IV- Limits, Fits & Tolerances – Concepts of Limits, Fits, Tolerances, Selective Assembly and Interchangeability
	3 rd	Hole Basis and Shaft Basis Systems; Taylor's Principle
11 th	1 st	Design of Plug Gauge and Ring Gauge; IS 919:1993, IS 3477:1973; Concept of Multi-gauging and Inspection
	2 nd	Angular Measurement – Concept and Instruments for Angular Measurement
	3 rd	Universal Bevel Protractor, Sine Bar and Spirit Level – Construction, Working and Applications
12 th	1 st	Clinometers – Principle of Working; Angle Gauges and Numerical Problems on Setting of Angle Gauges
	2 nd	Screw Thread Measurement – ISO Grades and Fits of Threads; Errors in Threads and Pitch Errors
	3 rd	Measurement of Thread Elements – Major Diameter, Minor Diameter, Effective Diameter and Pitch
13 th	1 st	Two-Wire Method and Thread Gauge Micrometer – Construction, Working and Applications
	2 nd	Floating Carriage Dial Micrometer Working Principle. Summarize of Unit and Assignment work.
	3 rd	UNIT-V- Gear Measurement and Testing – Introduction, Analytical and Functional Inspection
14 th	1 st	Rolling Test; Measurement of Tooth Thickness by Constant Chord Method
	2 nd	Gear Tooth Vernier; Gear Errors – Backlash, Runout and Composite Errors
	3 rd	Machine Tool Testing – Introduction; Parallelism and Straightness Tests
15 th	1 st	Machine Tool Testing – Squareness, Coaxiality and Roundness Tests
	2 nd	Machine Tool Testing – Runout and Alignment Testing of Machine Tools
	3 rd	Summarize of Unit and Assignment work.


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Lesson Plan

Course Name- Power Plant Engineering (TH-4)

Semester- 5th Mechanical

Academic Session- 2026-27 (W)

Course Outcomes (Cos):

COs	Statement:
	After completion of the course students will be able to:
CO-1	Analyze the Indian energy scenario, power plant layouts, and economic parameters to evaluate methods for meeting fluctuating electrical loads.
CO-2	Compare the layouts, working principles, and site requirements of hydro, diesel, gas turbine, and nuclear power plants to evaluate their operational suitability for varying generation demands.
CO-3	Assess the environmental impacts and pollution from power plants to apply standard safety practices to different plants.

Discipline – Mechanical Engg.	Semester – 5 th	Name of the Faculty – Kalia Sethi
Subject-Power Plant Engineering (TH-4)	No. of days/week class allotted- 3 Total- 45 Hours	AY 2026-27(W) Semester w.e.f.:01/07/2026
Week	Class Day	Theory/Practical Topics
1st	1st	UNIT-I-Introduction to Power Plants: Definition, Need and Role of Power Generation in Industrial Development
	2 nd	Energy Scenario in India: Energy Resources, Demand and Supply Pattern, Present Status of Power Generation
	3 rd	Location of Power Plants: Factors Affecting Site Selection of Thermal, Hydro and Nuclear Power Plants
2nd	1 st	Choice of Power Plant: Factors Influencing Selection of Power Plants
	2 nd	Classification of Power Plants: Thermal, Hydroelectric, Nuclear, Gas Turbine, Diesel, Solar, Wind and Other Renewable Power Plants
	3 rd	Layout of Thermal Power Plant with Components and Working Flow Diagram. Summarize of Unit and Assignment work.
3rd	1 st	UNIT-II-Introduction to Power Plant Economics; Terminology: Connected Load, Maximum Demand, Peak Load and Base Load
	2 nd	Load Curve, Types and Significance; Daily, Monthly and Annual Load Curves
	3 rd	Load Factor, Capacity Factor, Plant Use Factor and Demand Factor; Importance in Power Plant Operation
4th	1 st	Factors Affecting the Operation of Power Plants
	2 nd	Methods of Meeting Fluctuating Load: Peak Load Plants, Base Load Plants and Load Management Techniques
	3 rd	Load Sharing Between Power Stations; Interconnected Power System and Its Advantages
5th	1 st	Cost of Power Generation and Tariff Methods: Flat Rate, Block Rate, Two-Part Tariff and Three-Part Tariff
	2 nd	Performance and Operating Characteristics of Power Plants. Summarize of Unit and Assignment work.
	3 rd	UNIT-III-Introduction to Hydroelectric Power Plant: Principle of Hydropower Generation, Importance and Applications
6 th	1 st	Rainfall and Runoff: Concepts, Factors Affecting Runoff and Methods of Measurement
	2 nd	Hydrograph: Definition, Components, Construction and Significance in Hydropower Planning

	3 rd	Flow Duration Curve: Definition, Construction and Applications in Hydroelectric Power Plant Design
7 th	1 st	Selection of Sites for Hydroelectric Power Plants: Technical, Economic and Environmental Factors
	2 nd	General Layout of Hydroelectric Power Plant: Components and Working Principle with Schematic Diagram
	3 rd	Classification of Hydroelectric Power Plants: Run-of-River Plant, Storage Plant and Pumped Storage Plant
8 th	1 st	Advantages and Disadvantages of Hydroelectric Power Plants. Summarize of Unit and Assignment work.
	2 nd	UNIT-IV- Introduction to Diesel Power Plant; Layout and Major Components of Diesel Power Plant
	3 rd	Working Principle of Diesel Power Plant and Functions of Various Components
9 th	1 st	Advantages and Disadvantages of Diesel Power Plant; Applications of Diesel Power Plants
	2 nd	Introduction to Gas Turbine Power Plant; Schematic Diagram and Major Components
	3 rd	Working Principle of Gas Turbine Power Plant and Brayton Cycle Concept
10 th	1 th	Advantages, Disadvantages and Applications of Gas Turbine Power Plants
	2 nd	Combined Cycle Power Generation: Combined Gas and Steam Turbine Power Plant (Flow Diagram and Operation)
	3 rd	Introduction to Nuclear Power Plant; Nuclear Energy, Radioactivity and Radioactive Decay
11 th	1 st	Nuclear Reactions: Fission and Fusion; Types of Nuclear Reactions and Chain Reaction
	2 nd	Layout and Working of Nuclear Power Plant; Major Components and Functions
	3 rd	Thermal Fission Reactors: Pressurized Water Reactor (PWR), Boiling Water Reactor (BWR) and Gas-Cooled Reactor
12 th	1 st	Advantages and Disadvantages of Nuclear Power Plants. Summarize of Unit and Assignment work.
	2 nd	UNIT-V- Introduction to Environmental Impact of Power Plants; Social and Economic Issues Associated with Power Generation
	3 rd	Greenhouse Effect: Causes, Mechanism, Consequences and Control Measures
13 th	1 st	Acid Precipitation: Acid Rain, Acid Snow, Dry Deposition and Acid Fog
	2 nd	Air Pollution from Power Plants: Sources, Effects and Control Measures
	3 rd	Water Pollution and Thermal Pollution from Power Plants: Causes, Effects and Prevention
14 th	1 st	Radiation Hazards from Nuclear Power Plant Effluents; Environmental Protection Measures
	2 nd	Introduction to Power Plant Safety; Plant Safety Concept and Importance of Safety Management
	3 rd	Safety Policy and Safety Practices in Power Plants; Personal Protective Equipment (PPE) and Safe Work Procedures
15 th	1 st	Safety Practices in Boiler Operation; Boiler Hazards and Preventive Measures
	2 nd	Safety in Oil Handling Systems and Chemical Handling Systems; Storage, Transportation and Emergency Response Procedures
	3 rd	Statutory Provisions Related to Boiler Operation. Summarize of Unit and Assignment work.



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