Lesson Plan

Name of Faculty : Harjit Chawla

Discipline : Mechanical Engg.

Semester : 3rd

Subject : Thermodynamics-I

Lesson Plan Duration : 15 weeks (15, sept, 2022 to 16 January, 2023)

Work Load (Lecture/Practical) per week (in hours) : Lectures-03, Practicals-02

Week	Theory		Practical
	Lecture day	Topic(including assignment/test)	Topic
1st	1st	**Fundamental Concepts :-** Thermodynamic state and system, boundary, surrounding, universe	Determination of temperature by 1.1 Thermocouple 1.2 Pyrometer 1.3 Infrared thermometer
	2nd	thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic	
	3rd	properties of system – intensive and extensive, thermodynamic equilibrium, quasi – static process, reversible and irreversible processes	
2nd	1st	Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy and internal energy	Revision.
	2nd	**Laws of Perfect Gases :-** Definition of gases, explanation of perfect gas laws – Boyle's law, Charle's law, Avagadro's law	
	3rd	Regnault's law, Universal gas constant, Characteristic gas constants and its derivation	
3rd	1st	Specific heat at constant pressure, specific heat at constant volume of a gas, derivation of an expression for specific heats with characteristics	Demonstration of mountings and accessories on a boiler.
	2nd	Simple numerical problems on gas equation.	
	3rd	**Thermodynamic Processes :-** Types of thermodynamic processes – isochoric, isobaric	
4th	1st	isothermal, adiabatic, isentropic	Revision.
	2nd	polytropic and throttling processes,	

		equations representing the processes	
	3rd	Derivation of work done, change in internal energy	
5th	1st	change in entropy, rate of heat transfer for the above processes	Study the working of Lancashire boiler and Nestler boiler.
	2nd	**Laws of Thermodynamics :-** Laws of conservation of energy, first law of thermodynamics (Joule's experiment) and its limitations	
	3rd	Application of first law of thermodynamics to Non-flow systems – Constant volume	
6th	1st	Constant pressure, Adiabatic and polytropic processes	Revision.
	2nd	steady flow energy equation, Application of steady flow energy equation for turbines, pump	
	3rd	boilers, compressors, nozzles, and evaporators	
7th	1st	Heat source and sink, statements of second laws of thermodynamics: Kelvin Planck's statement	Study of working of high pressure boiler.
	2nd	Classius statement, equivalency of statements	
	3rd	Perpetual motion Machine of first kind, second kind, Carnot engine	
8th	1st	Introduction of third law of thermodynamics, concept of irreversibility and concept of entropy	Revision
	2nd	**Ideal and Real Gases :-** Concept of ideal gas, enthalpy	
	3rd	specific heat capacities of an ideal gas	
9th	1st	P – V – T surface of an ideal gas, triple point	Study of boilers .
	2nd	real gases, Vander-Wall's equation	
	3rd	**Properties of Steam :-** Formation of steam and related terms, thermodynamic properties of steam	
10th	1st	steam tables, sensible heat, latent heat, internal energy of steam, entropy of water, entropy of steam	Revision
	2nd	T- S diagrams, Mollier diagram (H – S Chart), Expansion of steam, Hyperbolic	
	3rd	reversible adiabatic and throttling processes, determination of quality of	

		steam (dryness fraction)	
11th	**1st**	**Steam Generators :-** Uses of steam, classification of boilers	Determination of Dryness fraction of steam using calorimeter.
	2nd	function of various boiler mounting and accessories	
	3rd	comparison of fire tube and water tube boilers	
12th	**1st**	Construction and working of Lancashire boiler	Revision
	2nd	Nestler boiler, Babcock & Wilcox Boiler. Introduction to modern boilers.	
	3rd	**Air Standard Cycles :-** Meaning of air standard cycle – its use, condition of reversibility of a cycle	
13th	**1st**	Description of Carnot cycle Otto cycle,	Demonstrate the working of air compressor
	2nd	Diesel cycle, simple problems on efficiency for different cycles.	
	3rd	Comparison of Otto, Diesel cycles for same compression ratio, same peak pressure developed and same heat input	
14th	**1st**	Reasons for highest efficiency of Carnot cycle and all other cycles working between same temperature limits	Revision
	2nd	**Air Compressors :-** Functions of air compressor – uses of compressed air, type of air compressors	
	3rd	Single stage reciprocating air compressor, its construction and working, representation of processes involved on P – V diagram, calculation of work done.	
15th	**1st**	Multistage compressors – advantages over single stage compressors, use of air cooler, condition of minimum work in two stage compressor (without proof), simple problems	Revision.
	2nd	Rotary compressors – types, working and construction of centrifugal compressor	
	3rd	Axial flow compressor, vane type compressor	