Lesson Plan

Name of the Faculty : Sh. Laxman Ram

Discipline : Mechanical Engineering

Semester : 3rd

Subject : Thermodynamics-I

Lesson Plan duration : 15 weeks (01.09.2023 to 15.12.2023)

Work load per week : Lecture – 03, Practical – 02

Week	Theory		EXECUTION	
	Lecture Day	Topic (Including assessment/test)	Date	Sign.
1st	1st	Introduction about the subject & brief overview.		
	2nd	**Unit I:** **1. Fundamental Concepts:** Thermodynamic state and system, boundary, surrounding, universe,		
	3rd	thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic		
2nd	4th	Properties of system – intensive and extensive, thermodynamic equilibrium, Quasi – static process, reversible and irreversible processes,		
	5th	Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy and internal energy.		
	6th	**2. Laws of Perfect Gases:** Definition of gases, explanation of perfect gas laws – Boyle's law, Charle's law,		
3rd	7th	Avagadro's law, Regnault's law, Universal gas constant, Characteristic gas constants and its derivation.		
	8th	Specific heat at constant pressure, specific heat at constant volume of a gas,		
	9th	derivation of an expression for specific heats with characteristics,		
4th	10th	simple numerical problems on gas eqn.		
	11th	**Unit II:** **3. Thermodynamic Processes:** Types of thermodynamic processes – Isochoric process, equation representing the process. Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above process.		
	12th	Isobaric process, equation representing the process. Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above process.		
5th	13th	Isothermal process, equation representing the process.		

		Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above process.		
	14th	Adiabatic, isentropic processes, equations representing the processes. Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes.		
	15th	Polytropic and throttling processes, equations representing the processes. Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes.		
6th	16th	**1st sessional test (Tentative)**		
	17th	**Assessment**		
	18th	**Unit III** **4. Laws of Thermodynamics** Laws of conservation of energy, first law of thermodynamics (Joule's experiment) and its limitations,		
7th	19th	Steady flow energy equation, Application of steady flow energy equation for turbines, pump, boilers, compressors, nozzles, and evaporators.		
	20th	Heat source and sink, statements of second laws of thermodynamics: Kelvin Planck's statement, Classius statement,		
	21st	Equivalency of statements, Perpetual motion Machine of first kind, second kind, Carnot engine,		
8th	22nd	Introduction of third law of thermodynamics, concept of irreversibility and concept of entropy.		
	23rd	**Unit IV** **5. Steam Generators:** Uses of steam, classification of boilers, Comparison of fire tube and water tube boilers.		
	24th	Construction and working of Nestler boiler, Babcock & Wilcox Boiler.		
9th	25th	Function of various boiler mounting and accessories. Introduction to modern boilers Benson boiler.		
	26th	**6. Properties of Steam:** Formation of steam and related terms. Thermodynamic properties of steam,		
	27th	Steam tables, sensible heat, latent heat, internal energy of steam,		
10th	28th	entropy of water, entropy of steam, T- S diagrams,		
	29th	**2nd sessional test (Tentative)**		
	30th	**Assessment**		
11th	31st	Mollier diagram (H – S Chart), Expansion of steam,		
	32nd	Hyperbolic, reversible adiabatic and throttling processes, Determination of quality of steam (dryness fraction),		
	33rd	**Unit V** 7. **Ideal and Real Gases** Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas,		
12th	34th	P – V – T surface of an ideal gas, triple point, real gases, Vander-Wall's equation.		

	35th	**8. Air Compressors** Functions of air compressor – uses of compressed air, type of air compressors		
	36th	Single stage reciprocating air compressor, its construction and working, Representation of processes involved on P – V diagram, calculation of work done.		
13th	37th	Multistage compressors – advantages over single stage compressors, use of air cooler,		
	38th	condition of minimum work in two stage compressor (without proof),		
	39th	Rotary compressors – types, working and construction of centrifugal compressor,		
14th	40th	axial flow compressor, vane type compressor		
	41st	**3rd sessional test (Tentative)**		
	42nd	**Assessment**		
15th	43rd	Revision		
	44th	Revision		
	45th	Revision		

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Week	PRACTICAL		EXECUTION		
	Practical Day	Topic	G1	G2	Sign.
1st	1st	Introduction about the Lab and brief discussion over the practical work to be conducted.			
2nd	2nd	1.1 Determination of temperature by Thermocouple			
3rd	3rd	1.2 Determination of temperature by Pyrometer			
4th	4th	1.3 Determination of temperature by Infrared thermometer			
5th	5th	2. Study the working of Nestler boiler.			
6th	6th	Checking of Practical file/ **1st sessional test (Tentative)**			
7th	7th	3. Study of working of high pressure boiler.			
8th	8th	4.1 Demonstration of mountings on a boiler,			
9th	9th	4.2 Demonstration of accessories on a boiler			
10th	10th	Checking of Practical file/ **2nd sessional test (Tentative)**			

11th	11th	5. Determination of Dryness fraction of steam using calorimeter.			
12th	12th	6. Demonstrate the working of air compressor.			
13th	13th	Checking of Practical file/ Evaluation			
14th	14th	**3rd sessional test (Tentative)**			
15th	15th	7. Study of boilers (Through industrial visit)			