

Lesson Plan

Name of the Faculty : Sh. Munish Kumar Jain

Discipline : Mechanical Engineering

Semester : 3rd

Subject : Thermodynamics-I

Lesson Plan duration : 17 weeks (15.09.2022 to 16.01.2023)

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

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

	12 th	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.		
5 th	13 th	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.		
	14 th	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.		
	15 th	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.		
6 th	16 th	Unit 4: Laws of Thermodynamics Laws of conservation of energy, first law of thermodynamics (Joule's experiment) and its limitations,		
	17 th	Application of first law of thermodynamics to Non-flow systems – Constant volume, Constant pressure, Adiabatic and polytropic processes,		
	18 th	Steady flow energy equation, Application of steady flow energy equation for turbines, pump, boilers, compressors, nozzles, and evaporators.		
7 th	19 th	1st sessional test (Tentative)		
	20 th	Assessment		
	21 st	Heat source and sink, statements of second laws of thermodynamics: Kelvin Planck's statement, Classius statement,		
8 th	22 nd	Equivalency of statements, Perpetual motion Machine of first kind, second kind, Carnot engine,		
	23 rd	Introduction of third law of thermodynamics, concept of irreversibility and concept of entropy.		
	24 th	Unit 5: Ideal and Real Gases Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas,		
9 th	25 th	P – V – T surface of an ideal gas, triple point, real gases, Vander-Wall's equation.		
	26 th	Unit 6: Properties of Steam: Formation of steam and related terms, thermodynamic properties of steam,		
	27 th	Steam tables, sensible heat, latent heat, internal energy of steam,		
10 th	28 th	entropy of water, entropy of steam, T- S diagrams,		
	29 th	Mollier diagram (H – S Chart), Expansion of steam, Hyperbolic, reversible adiabatic and throttling processes,		

	30 th	Determination of quality of steam (dryness fraction),		
11 th	31 st	Unit 7: Steam Generators: Uses of steam, classification of boilers, Function of various boiler mounting and accessories,		
	32 nd	Comparison of fire tube and water tube boilers. Construction and working of Lancashire boiler,		
	33 rd	Nestler boiler, Babcock & Wilcox Boiler. Introduction to modern boilers		
12 th	34 th	2nd sessional test (Tentative)		
	35 th	Assessment		
	36 th	Unit 8: Air Standard Cycles Meaning of air standard cycle – its use, condition of reversibility of a cycle, Description of Carnot cycle,		
13 th	37 th	Description of Otto cycle, Diesel cycle,		
	38 th	simple problems on efficiency for different cycles.		
	39 th	Comparison of Otto, Diesel cycles for same compression ratio, same peak pressure developed and same heat input. Reasons for highest efficiency of Carnot cycle and all other cycles working between same temperature limits.		
14 th	40 th	Unit 9: Air Compressors Functions of air compressor – uses of compressed air, type of air compressors		
	41 st	Single stage reciprocating air compressor, its construction and working, representation of processes involved on P – V diagram, calculation of work done.		
	42 nd	Multistage compressors – advantages over single stage compressors, use of air cooler,		
15 th	43 rd	condition of minimum work in two stage compressor (without proof), simple problems		
	44 th	Rotary compressors – types, working and construction of centrifugal compressor,		
	45 th	axial flow compressor, vane type compressor		
16 th	46 th	3rd sessional test (Tentative)		
	47 th	Assessment		
	48 th	Revision		
17 th	49 th	Revision		
	50 th	Revision		
	51 st	Revision		

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

10 th	10 th	4. Study of working of high pressure boiler.			
11 th	11 th	5. Study of boilers (Through industrial visit)			
12 th	12 th	Checking of Practical file/ 2nd sessional test (Tentative)			
13 th	13 th	6. Determination of Dryness fraction of steam using calorimeter.			
14 th	14 th	7. Demonstrate the working of air compressor.			
15 th	15 th	7. Demonstrate the working of air compressor.			
16 th	16 th	Checking of Practical file/ 3rd sessional test (Tentative)			
17 th	17 th	Checking of practical file/ Evaluation			