Lesson Plan

Name of the Faculty : Sh. Munish Kumar Jain

Discipline : Mechanical Engineering

Semester : 3rd

Subject : Thermodynamics-I

Lesson Plan duration : 17 weeks (01.10.2021 to 28.01.2022)

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

Week	Theory	
	Lecture Day	Topic (Including assessment/test)
1st	1st	Subject introduction and overview
	2nd	**Unit 1: Fundamental Concepts:** Thermodynamic state and system, boundary, surrounding, universe,
	3rd	thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic, properties of system – intensive and extensive, thermodynamic equilibrium,
2nd	4th	Quasi – static process, reversible and irreversible processes, Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy and internal energy.
	5th	**Unit 2: Laws of Perfect Gases:** Definition of gases, explanation of perfect gas laws – Boyle's law,
	6th	Charle's law, Avagadro's law, Regnault's law,
3rd	7th	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 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	**Unit 4: Laws of Thermodynamics** Laws of conservation of energy, first law of thermodynamics (Joule's experiment) and its limitations,
	17th	Application of first law of thermodynamics to Non-flow systems – Constant volume, Constant pressure, Adiabatic and polytropic processes,
	18th	Steady flow energy equation, Application of steady flow energy equation for turbines, pump, boilers, compressors, nozzles, and evaporators.
7th	19th	**1st sessional test (Tentative)**
	20th	**Assessment**
	21st	Heat source and sink, statements of second laws of thermodynamics: Kelvin Planck's statement, Classius statement,
8th	22nd	Equivalency of statements, Perpetual motion Machine of first kind, second kind, Carnot engine,
	23rd	Introduction of third law of thermodynamics, concept of irreversibility and concept of entropy.
	24th	**Unit 5**: **Ideal and Real Gases** Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas,
9th	25th	P – V – T surface of an ideal gas, triple point, real gases, Vander-Wall's equation.
	26th	**Unit 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	Mollier diagram (H – S Chart), Expansion of steam, Hyperbolic, reversible adiabatic and throttling processes,
	30th	Determination of quality of steam (dryness fraction),
11th	31st	**2nd sessional test (Tentative)**
	32nd	**Assessment**
	33rd	**Unit 7: Steam Generators:** Uses of steam, classification of boilers, Function of various boiler mounting and accessories,
12th	34th	Comparison of fire tube and water tube boilers. Construction and working of Lancashire boiler,
	35th	Nestler boiler, Babcock & Wilcox Boiler. Introduction to modern boilers
	36th	**Unit 8: Air Standard Cycles** Meaning of air standard cycle – its use, condition of reversibility of a cycle Description of Carnot cycle,
13th	37th	Otto cycle, Diesel cycle, simple problems on efficiency for different cycles.
	38th	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
	39th	**Unit 9:Air Compressors** Functions of air compressor – uses of compressed air, type of air compressors
14th	40th	Single stage reciprocating air compressor, its construction and working, representation of processes involved on P – V diagram, calculation of work

		done.
	41st	Multistage compressors – advantages over single stage compressors, use of air cooler,
	42nd	condition of minimum work in two stage compressor (without proof), simple problems Rotary compressors – types, working and construction of centrifugal compressor,
15th	43rd	axial flow compressor, vane type compressor
	44th	**3rd sessional test (Tentative)**
	45th	**Assessment**
16th	46th	Revision
	47th	Revision
	48th	Revision
17th	49th	Revision
	50th	Revision
	51st	Revision