

JHARKHAND RAI UNIVERSITY
COURSE FILE
SUBJECT: MECHANICAL ENGINEERING
B.TECH IV
Prepared By Prof. Om Prakash Satyam

8ESC202	Mechanical Engineering
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Category	T	P	L	Credit
Core	0	0	30	3

Preamble

Course Learning Objective:

CLO 1: Ability to apply mathematics, science, and engineering.

CLO 2: Ability to design and conduct experiments, as well as to analyze and interpret data.

CLO 3: Ability to identify, formulate, and solve engineering problems.

CLO 4: Ability to apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations.

CLO 5: Ability to comprehend the thermodynamics and their corresponding processes that influence the behavior and response of structural components

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: Understand the basic thermodynamics systems & concept of temperature and heat.

CO 2: To identify and formulate power production based on the fundamentals laws of thermal engineering.

CO 3: Understand the various cycles and its implications in real practical applications.

CO 4: To appreciate concepts learnt in fundamentals laws of thermodynamics from which learning ideas how to sustain in energy crisis and think beyond curriculum in the field of alternative and renewable sources of

energy. To communicate effectively the concepts of internal combustion engines and try to think beyond curriculum in alternative sources of energy.

CO 5: Understand the Psychrometry and psychrometric charts, property calculations of air vapour mixtures & Psychrometric process

Prerequisite

No pre-requisites

Course Outcomes

On the successful completion of the Course, students will be able to

CO 1. Understand the basic thermodynamics systems & concept of temperature and heat.	Apply - Affective
CO 2. To identify and formulate power production based on the fundamentals laws of thermal engineering.	Apply - Affective
CO 3. Understand the various cycles and its implications in real practical applications	Understand - Cognitive
CO 4. To appreciate concepts learnt in fundamentals laws of thermodynamics from which learning ideas how to sustain in energy crisis and think beyond curriculum in the field of alternative and renewable sources of energy. To communicate effectively the concepts of internal combustion engines and try to think beyond curriculum in alternative sources of energy.	Evaluate - Affective
CO 5. Understand the Psychrometry and psychrometric charts, property calculations of air vapour mixtures & Psychrometric process.	Apply - Affective

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Mapping With Program Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO5	PO 12	PO 11	PO 10	PO 9	PO 8	PO 7	PO 6	PSO 3	PSO 2	PSO 1
CO 1	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	S	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	M	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	L	-	-	-	-	-	-	-	-	-	-	-	-	-

S- Strong; M - Medium; L - Low

Assessment Pattern

Blooms Taxonomy	Learning Domain	Continous Assessment Tests	
		Assignment 11	Assignment 2
Remember	Cognitive	2	2
Understand	Cognitive	2	3
Apply	Cognitive	2	5
Analyze	Cognitive	2	0
Evaluate	Cognitive	0	0
Create	Cognitive	0	0
Remember	Affective	0	0
Understand	Affective	2	0
Apply	Affective	0	0
Analyze	Affective	0	0
Evaluate	Affective	0	0
Create	Affective	0	0
Remember	Psychomotor	0	0

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Blooms Taxonomy	Learning Domain	Continuous Assessment Tests	
		Assignment 11	Assignment 2
Understand	Psychomotor	0	0
Apply	Psychomotor	0	0
Analyze	Psychomotor	0	0
Evaluate	Psychomotor	0	0
Create	Psychomotor	0	0

Program Level Assessment Questions

Undefined

1. Differentiate between open & closed system with suitable examples.
2. State Boyle's law & Charles' law.
3. Is Heat & Work a path function? Prove.
4. Compare between state of system & path of a system with PV diagram.
5. Define Heat. Elaborate the modes of heat transfer with suitable examples.

Syllabus

Topics Unit 1: Basic Concepts- Basic concepts - concept of continuum, macroscopic approach, Thermodynamic systems - closed, open and isolated. Property, state, path and process, quasistatic process, work, modes of work. Zeroth law of Thermodynamics, concept of temperature and heat. Concept of ideal and real gases. Unit II: First Law of Thermodynamics- Concepts of Internal Energy, Specific Heat Capacities, Enthalpy. Energy Balance for Closed and Open Systems, Energy Balance for Steady-Flow Systems. Steady-Flow Engineering Devices. Energy Balance for Unsteady-Flow. Unit III: Second Law of Thermodynamics- Thermal energy reservoirs, heat engines energy conversion, Kelvin's and Clausius statements of second law, the Carnot cycle, the Carnot Theorem, the thermodynamic temperature scale, the Carnot heat engine, efficiency, the Carnot refrigerator and heat pump, COP, perpetual-motion machines, reversible and irreversible processes. Unit IV: Power Cycles- Vapour and combined power cycles, including the Carnot vapor cycle, Rankine cycle: the ideal cycle for vapor power, the ideal reheat and regenerative and the second-law analysis of vapour power cycles. Gas power cycles, including basic considerations in the analysis of power cycles, the Carnot cycle and its value in engineering, an overview of reciprocating engines, air standard assumptions, gasoline engine Otto cycle, diesel engine cycle, gas- turbine Brayton cycle, and the second-law analysis of gas power cycles. Unit V: Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process – Sensible heat exchange processes. Latent heat exchange processes. Adiabatic mixing, evaporative cooling. Refrigerant property tables. Refrigeration cycles.

Textbook

Course Outlay Designers

- 1) MR SATYAM OM PRAKASH