

NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR

JHARKHAND-831014

Department of Mechanical Engineering

AUTUMN SEMESTER 2020-2021

COURSE – HANDOUT

Semester: 3rd B.Tech. (Hons.)

Branch: Mechanical Engg.

Course No. : ME1302

Course Title: Engineering Thermodynamics

Professor -in-charge: Dr. Prabha Chand

Credit : (3-1-0) 4

Course Descriptions:

Basic concepts of Thermodynamics. Work and Heat Interaction. First Law of Thermodynamics and its application to Flow Process. Second law of Thermodynamics. Reversibility. Carnot's Theorem and Absolute Temperature Scale. Entropy Principle. Inequality of Clausius. Availability and Irreversibility, Maxwell Equation. Properties of Pure substances. Phase Equilibrium Diagrams. Power Cycles.

Scope:

- To provide the basic concept of Engineering Thermodynamics which is the Beginning of Thermal Engineering of Mechanical Engineering.
- To enhance the knowledge of Thermodynamics as the application part starts in the next session.
- To study about one of the most important part of the Mechanical Engineering as application part

Objective:

- The course - structure is so designed that the student will have the complete idea about Thermodynamics.
- After completion of the course the student can be familiar and able to take up the application part of Thermal Engineering.

Text Books:

T₁ – Engineering Thermodynamics by P.K. Nag

T₂ – Thermodynamics: An Engineering Approach by Cengel, Y.A and Boles, M.A.

Reference Book:

R₁- Fundamentals of Thermodynamics by Sonntag, R.E., Borgnakke, C., and Van Wylen, G.J.

Course Plan:

Lecture no.	Learning Objectives	Topics to be Covered	Refer to Chapter
1-3	Macroscopic Vs. Microscopic, Thermodynamic system and control volume, Properties, Process and Cycles, Homogeneous and Heterogeneous systems, Thermodynamic Equilibrium, Quasi-Static Process, Zeroth law of Thermodynamics.	Basic concepts of Thermodynamics	T ₁ -1,2
4-7	Work Transfer, Displacement work, Indicator diagram, Heat Transfer, Path function and Point function, Specific and Latent heat.	Work and Heat Interaction	T ₁ -3
8-11	First Law for a closed system undergoing a Cycle / Change of state, Energy- A property of the system, Enthalpy, Specific heat at constant volume and at constant pressure, PMM 1 .	First Law of Thermodynamics	T ₁ - 4
12-14	Control Volume, Steady Flow Process, Steady Flow Energy Equation, Variable Flow Process	First Law applied to Flow Process	T ₁ - 5
15-18	Cyclic Heat Engine, Statement of the Second law, Equivalence of Statements, Refrigerator & Heat Pump, Reversibility & Irreversibility, Carnot's Theorem, Absolute Thermodynamics Temperature Scale	Second law of Thermodynamics	T ₃ -6
19-22	Clausius Theorem, Property, Inequality of Clausius, Entropy Principle.	Entropy	T ₃ -7
23-26	Energy & Exergy, Availability and Irreversibility	Available Energy	T ₃ -8
27-30	p-v Diagram, p-T Diagram, T-s Diagram & h-s Diagram or Mollier Diagram for a Pure Substance, Quality or Dryness Fraction, Steam Table.	Properties of Pure substances	T ₁ - 9
31-35	Air Standard Cycles : Otto Cycle, Diesel Cycle, Dual Cycle	Gas Power Cycles	T ₁ - 13

Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightages	Date & Time	Nature of the Component
1.	Mid term	120 Min.	40%		Closed Book
2.	End Sem Exam	3 Hrs	40%		Closed Book
3.	Assignment		10%		Take Home
4.	Surprises Quizzes	5 Min.	10%		Closed Book(Best 5 out of 7

Professor In-Charge