

NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR

JHARKHAND-831014

Department of Mechanical Engineering

SPRING SEMESTER 2019-2020

COURSE – HANDOUT

Semester: 4thB.Tech. (Hons.)

Branch: Mechanical Engg.

Course No. : ME1403

Course Title: Steam Power System

Instructor-in-charge: Dr. Prabha Chand

Course Descriptions:

Vapour Power Cycle: Analysis & Description. Fuels, Combustion, Flue Gas Analysis, Draught System, Furnaces & Combustion Equipment's Steam Generators: Construction and Working Principle, Circulation Theory, Boiler Mountings and Accessories. Nozzles and Diffusers: Definitions and Applications, Types, The Continuity Equation, Momentum Equation and Steady Flow Energy Equation for Steam Nozzles, Nozzle Efficiency, Critical Pressure. Steam Turbine: Principle of Operation, Classification, Compounding, Flow of Steam Through Impulse Turbine Blades, Flow of Steam through Impulse-Reaction Turbine Blades,

Condensers & Cooling Towers **Scope:**

- To provide the basic concept of Steam Power Plant from the Beginning of the Cycle to the End.
- To enhance the knowledge of Thermodynamics as the application part in SPS.
- To study about one of the most important part of the Mechanical Engineering as Thermal Engineering.

Objective:

- The course - structure is so designed that the student will have the complete idea about steam power plant.
- After completion of the course the student can be familiar and able to take up the practical project in the Industry.

Text Books:

T₁ – Engineering Thermodynamics by P.K. Nag

T₂ – Steam Power Plant by P.K. Nag

T₃ – Steam & Gas Turbines and Power Plant Engineering by Dr. R. Yadav

Reference Book:

R₁- Steam Plant Operation by E.B. Woodruff , H.B. Lammers & T.F. Lammers

Course Plan:

Lecture no.	Learning Objectives	Topics to be Covered	Refer to Chapter
1-5	Analysis of Steam Power Cycle, Reheat Cycle, Regenerative Cycle, Binary Vapour Cycle	Vapour Power Cycle	T ₁ -12
6-9	Types of Fuels for Boilers, Stoichiometric and Excess Air-Fuel Ratio, Flue Gas Analysis	Fuels, Combustion	T ₃ -5
10-12	Introduction, Purpose, Natural & Forced Draught System in a Boiler.	Draught System	T ₃ -5
13-14	Classification, Construction and Working Principle of Different Boilers	Steam Generator	T ₃ -6
15-18	Circulation Theory, Down-comers and Risers, Boiler drum and its internals, Boiler Mountings and Accessories.	Boiler Theory & Parts	T ₃ -6
19-23	Applications, Types of Nozzles and Diffusers, Energy Equations, Nozzle Efficiency, Critical Pressure in Nozzle Flow or Choked Flow	Nozzles and Diffusers	T ₃ -7
24-30	Principle of Operation of Steam Turbine, Classification, Compounding of Turbine, Difference between Impulse and Reaction Turbine.	Steam Turbine	T ₃ -8
31-35	Velocity Diagrams for Impulse Turbine, Combination of Vector Diagram, Forces on the Blades and Work done by Blades, Force, Work, Power, Blade or Diagram Efficiency, Axial Thrust on the Rotor, Gross Stage Efficiency, Energy Converted to Heat by Blade Friction	Impulse Turbine	T ₃ -9
36-39	Velocity Diagrams and Work Done, Degree of Reaction, Parsons Reaction Turbine.	Impulse-Reaction Turbine	T ₃ -10
40-43	Function of a Condenser, Elements of Cooling System, Types of Condensers. Self-Study: Design Aspect of Surface Condenser, Deaeration, Circulating Water System, Once – Through and Closed Loop Cooling System.	Condenser	T ₃ -16
44-46	Types of Cooling Tower-Wet and Dry Cooling Towers, Natural Draught Cooling Towers And Mechanical Draught Cooling Tower	Cooling Tower	T ₃ -16

Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightages	Date & Time	Nature of the Component
1.	Mid term Exam	2 Hrs	30%		Closed Book
3.	End Sem Exam	3 Hrs	50%		Closed Book
4.	Assignment		10%		Take Home
5.	Surprises Quizzes	5 Min.	10%		Closed Book(Best 5 out of 7

Chamber consultation hour: Friday 7th Hour; Chamber

Notices: All notices regarding the course will be displayed only on the **Department of Mechanical Engineering** notice board.

Teacher In-Charge