III Year B.Tech. Mechanical Engg. I - Semester	L	T	P	To	C
	3	1	-	4	4

ME323 THERMAL ENGINEERING - II

Course Description & Objectives:

To establish an understanding of the types of steam boilers and its performance parameters and working of different steam turbines,steam nozzles, steam condensers gas turbines and jet propulsive devices. To make them understand thoroughly the methods to improve the thermal efficiency of the cycles. To provide students with exposure to the systematic methods for solving engineering problems on boiler performance, steam nozzles, steam condensers, steam turbines jet engines and rocket engines. To build the necessary theoretical background that suits the power sector needs.

Course Outcomes:

1. *Classifydifferent types of boilers and its applications and its various mountings and accessories and its performance parameters.*
2. *Understanding the working phenomenon ofchimney and condition for maximum discharge of mass through it.*
3. *Understand the working of different types of condensers, performance parameters and its applications in steam power plants.*
4. *Calculate the thermal efficiency ofRankine Cycle and methods to improve the efficiency of a steam power plant.*
5. *Understand the working of different types of steam nozzles and its applications, conditions for maximum discharge of steam through it*
6. *Classify different types of steam turbines and working of impulse turbine and its performance parameters and methods of compounding to reduce rotor speed of an impulse turbine.*

UNIT - I Boilers:

Classification - Working principles - H.P. Boilers, Mountings and Accessories. Properties of steam-dryness fraction of steam.

Performance of boilers - Parameters, equivalent evaporation, efficiency.

Draught - classification-artificial and forced draughts. Design of chimney for given draught and discharge,condition for maximum discharge, efficiency of chimney.

Steam Condensers: Use and Classification of condensers, working principles of different types, vacuum efficiency and condenser efficiency, air leakage - sources and its effects, air pump-cooling water requirement.

UNIT - II Vapour Power Cycles:

Rankine cycle, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance, Regeneration &

Reheating.

Steam Nozzles: Function of nozzle and its types - Flow through nozzles, thermodynamic analysis,assumptions, velocity of nozzle at exit-ideal and actual expansion in nozzle, condition for maximum discharge,criteria to decide nozzle shape, super saturated condition-Wilson line.

UNIT - III Steam Turbines:

Impulse Turbine : Classification, Mechanical details of Impulse turbine, Velocity diagram -effect of friction - power developed, axial thrust, blade or diagram efficiency - condition for maximum efficiency, De-Laval Turbine - its features.Methods to reduce rotor speed - Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow, combined velocity and pressure compounding of impulse turbine.

Reaction Turbine: Mechanical details - principle of operation, Thermodynamic analysis of a stage, degree of reaction - velocity diagram - Parson's reaction turbine - condition for maximum efficiency.

UNIT - IV Gas Turbines:

Simple gas turbine plant - ideal cycle, essential components - parameters of performance -actual cycle - regeneration, inter cooling and reheating - Closed and Semi-closed cycles - merits and demerits.

UNIT - V Jet Proupulsion:

Classification of jet propulsive engines - Working Principles with schematic diagrams and representation on T.S. diagram. Thrust, Thrust Power and Propulsion Efficiency of Turbo jet engines-Thermodynamic Cycle, Performance Evaluation, Thrust Augmentation Methods.

Rocket Propulsion: Application - Working Principle - Classification - Propellant Type - Thrust, Propulsive Efficiency - Specific Impulse - Solid and Liquid propellant Rocket Engines.

TEXT BOOKS :

1. R.K. Rajput, "Thermal Engineering", 8th Edition, Laxmi Publications, New Delhi, 2010.
2. M M El Wakil, "Power Plant Technology", 2nd Edition, McGraw Hill International, 2002.

REFERENCE BOOKS :

1. V.Ganesan, "Gas Turbines", 3rd ed., Tata McGraw Hill, New Delhi, 2010.
2. Sarkar B. K, " Thermal Engineering", 1st ed., Tata McGraw Hill, 2005.
3. P K Nag, "Power Plant Engineering", 3rd ed.,Tata McGraw Hill, 2008.
4. Ballaney, P.L., "Thermal Engineering", 23rd ed., Khanna Publishers, 2007.