Subject Code	:	**06ME55**
IA Marks	:	25
No. of Lecture Hrs./ Week	:	04
Exam Hours		

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

Unit - 1

Introduction: Definition of a Turbomachine; parts of a Turbomachine; Comparison with positive displacement machine; Classification: Application of First and Second Laws to Turbomachines, Efficiencies. Dimensionless parameters and their physical significance; Effect of Reynolds number; Specific speed; Illustrative examples on dimensional analysis and model studies.

6 Hours

Unit - 2

Energy Transfer in Turbo Machine: Euler Turbine equation; Alternate form of Euler turbine equation – components of energy transfer; Degree of re action; General analysis of a Turbo machine – effect of blade discharge angle on energy transfer and degree of reaction; General analysis of centrifugal pumps and compressors – Effect of blade discharge angle on performance; Theoretical head – capacity relationship;

6 Hours

Unit - 3

General Analysis of Turbo Machines: Axial flow compressors and pumps – general expression for degree of reaction; velocity triangles for different values of degree of reaction; General analysis of axial and radial flow turbines – Utilization factor; Vane efficiency; Relation between utilization factor and degree of reaction; condition for maximum utilization factor – optimum blade speed ratio for different types of turbines

7 Hours

Unit - 4

Thermodynamics of Fluid Flow and Thermodynamic Analysis of Compression and Expansion Processes: Sonic velocity and Mach number; Classification of fluid flow based on Mach number; Stagnation and static properties and their relations; Compression process – Overall isentropic efficiency of compression; Stage efficiency; Comparison and relation between overall efficiency and stage efficiency; Polytropic efficiency; Preheat factor; Expansion Process – Overall isentropic efficiency for a turbine; Stage efficiency for a turbine; Comparison and relation between stage efficiency and overall efficiency for expansion process; polytropic efficiency of expansion; Reheat factor for expansion process.

7 Hours

PART - B

Unit - 5

Centrifugal Compressors: Classification; Expression for overall pressure ratio developed; Blade angles at impeller eye root and eye tip; Slip factor and power input factor; width of the impeller channel; Compressibility effect – need for pre-whirl vanes **;**

Diffuser design: Flow in the vaneless space, determination of diffuser inlet vane angle, width and length of the diffuser passages; Surging of centrifugal compressors;

Axial Flow Compressors: Classification; Expression for Pressure ratio developed per stage – work done factor, radial equilibrium conditions.

6 Hours

Unit - 6

Centrifugal Pumps: Definition of terms used in the design of centrifugal pumps like manometric head, suction head, delivery head, pressure rise, manometric efficiency, hydraulic efficiency, volumetric efficiency, overall efficiency, multistage centrifugal pumps, minimum starting speed, slip, priming, cavitation, NPSH,

6 Hours

Unit - 7

Steam Turbines: Classification, Single stage impulse turbine; Condition for maximum blade efficiency, stage efficiency. Compounding – Need for compounding, method of compounding. Impulse Staging – Condition fo maximum utilization factor for multi stage turbine with equiangular blades; effect of blades and nozzle losses. Reaction turbine; Parson's reaction turbine, condition for maximum blade efficiency, reaction staging.

7 Hours

Unit - 8

Hydraulic Turbines: Classification; Pelton Turbine-velocity triangles, Design parameters, turbine efficiency, volumetric efficiency; Francis turbine – velocity triangles, runner shapes for different blade speeds, Design of Francis turbine; Function of a Draft tube, types of draft tubes; Kaplan and Propeller turbines – Velocity triangles and design parameters.

7 Hours

Text Books:

1. **An Introduction to energy conversion**, Volume III – Turbo machinery, V. Kadambi and Manohar Prasad, New Age International Publishers (P) Ltd.

2. **"Turbines, Compressors & Fans",** S. M. Yahya, Tata-McGraw Hill Co., 2nd Edition (2002).

Reference Books:

1. **"Principles of Turbo Machinery",** D. G. Shepherd, The Macmillan Company (1964)

2. **Fundamentals of Turbomachinery**: William W Perg, John Wiley & Sons, Inc. 2008.

3. **A Text book of Turbomechanics-** M.S.Govindgouda & A.M.Nagaraj-M.M.Publications-IV Edition-2008

4. **"Turbo Machinaries"** B. K. Venkanna, PHI.