COURSE CODE	COURSE TITLE	L	T	P	C
1152AE140	Turbo machinery	3	0	0	3

Course Category:

Programme Elective

a. Preamble :

This course aims to explore turbo machines, parts and its fundamental operation principle.

b. Prerequisite Courses:

Fluid Mechanics

c. Related Courses:

Nil

d. Course Educational Objectives :

- To understand the fundamental principles governing ascent and descent missions & their design
- To provide exposure to basic concepts in Celestial Mechanics, Orbital Dynamics and related topics
- To study operating environment for manmade space object and its impact on their design and operation.

e. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Explain the basic concepts of turbo machines	K2
CO2	Solve problems related to performance of hydraulic pumps and turbines.	K3
CO3	Estimate characteristics of centrifugal compressors	K3
CO4	Estimate characteristics of axial flow compressors	K3
CO5	Estimate characteristics of Axial and radial flow turbines	K3

f. Correlation of COs with POs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			**H**				H				
CO2	H			**H**				H				
CO3	H			**H**				H				
CO4	H			**H**				H				
CO5	H			**H**				H				

H- High; M-Medium; L-Low

UNIT I INTRODUCTION TO TURBO MACHINES 9

Introduction to turbo machines -Types - Dimensional Analysis - Dimensions and Equations - The Buckingham π theorem - Model testing - Energy transfer - Components - Euler turbine equations.

UNIT II HYDRAULIC PUMPS & TURBINES 9

Centrifugal pumps-Slip factor-Pump losses - effect of blade shape-Volute Collector - Vane and Vane less diffuser - Cavitation-Suction specific speed-Axial flow pump-Pumping system design life cycle analysis - Changing pump Speed Operation-Multi pump operation. Pelton wheel - velocity triangles - Losses and Efficiencies - Reaction turbines - Losses characteristics – Axial flow turbine - Cavitation.

UNIT III CENTRIFUGAL COMPRESSORS AND FANS 9

Centrifugal Compressor - Effect of Blade Shape on Performance - Velocity diagrams - Slip factor - Work done - diffuser - Compressibility effects - Mach number in the Diffuser - Centrifugal Compressor Characteristics - Stall - Surging- Chocking

UNIT IV AXIAL FLOW COMPRESSORS AND FANS 9

Velocity diagrams - Degree of reaction - Stage Loading - Lift and Drag Characteristics - Cascade nomenclature and terminology - 3- D Consideration - Multi Stage Performance - Axial Compressor Characteristics

UNIT V AXIAL FLOW AND RADIAL FLOW TURBINES 9

Introduction- velocity triangles and work output - Degree of reaction Blade loading coefficient - Stator and rotor losses - Free vortex design - Constant angle design. Radial flow turbine - Velocity and Thermodynamic analysis - Spouting Efficiency - Turbine Efficiency - Application Specific Speed

TOTAL: 45

REFERENCES:

1. Rama S.R. Gorla, Aijaz A. Khan, " Turbo machinery: Design and Theory ", CRC Press 2003.
2. George F. Round," Incompressible Flow Turbo machines : Design, Selection, Applications, And Theory", Elsevier (2011)
3. Grant ingaram," Basic Concepts in Turbomachinery",1st Edition,2012.
4. Turton R.K.," Principles of Turbo machinery, 2nd Edition, SPRINGER (SIE)