

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: V
AERONAUTICAL ENGINEERING

Subject Name: **Fundamentals of Turbomachines**

Subject Code: **150102**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Internal Assessment (I)
3	1	0	4	70	30	50

Sr. No.	Course Content
1.	Fundamentals of Turbomachines: Turbo machines, Turbines, Pumps and compressors, Fans and blowers, Incompressible and compressible flow machine, Stages: Axial, radial, mixed, reaction and impulse. Variable reaction stage, Multistage, Stage velocity triangle, Design and off-design conditions.
2.	Compressors: a. Axial Flow Compressor: Introduction. Geometry and working principle, Stage velocity triangles, H-S diagram. Flow through blade row, Stage losses and efficiency, Work done factor, Low hub-tip ratio, Supersonic and transonic stages, Performance characteristics. b. Centrifugal flow compressors: Introduction and different parts of centrifugal compressor, Principles of operation. H-S diagram. Nature of impeller flow, Slip factor, Diffuser, Volute casing, Performance characteristics and losses in centrifugal compressor.
3.	Turbines: a. Axial Turbine: Introduction, Stage velocity triangle, Single impulse stage, Multistage velocity compounded impulse and Multistage pressure compounded impulse, Reaction stages, Blade to gas speed ratio, Losses and efficiencies, Performance charts, Low hub-tip ratio stage. b. Radial Turbine: Elements of radial turbine stage, Stage velocity triangles, H-S diagram, Stage losses, Outward flow radial stage and Performance characteristics.
4.	Component Matching and Performance Evaluation: Introduction, Buckingham's theorem, Principle of similarity, Incompressible & compressible flow machine, Performance characteristics, Equilibrium running diagram, Determination and procedure to find equilibrium points, Performance evaluation of single spool turbojet engine, Operating line, General matching procedure and transient operation.

Reference Books:

1. Compressors Turbines and Fans: S.M.Yahya, Tata-McGraw Hill Publishing Company Ltd, New Delhi.
2. Gas Turbine: Tata-McGraw Hill Publishing Company Ltd, New Delhi.
3. Gas turbine theory: Cohen & Rogers, Longman Green & Co. Ltd, Orient.
4. Gas turbine Theory: Longman Private Ltd Khajooria & Dubey.
5. Steam & Gas turbines: R. Yadav.
6. Elements of Gas Turbine Propulsion: Mattingly.
7. Mechanics and Thermodynamics of Propulsion: Philip G. Hill & Carl Peterson Addison Wesley: Longman, Inc.