

# 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.	<b>Fundamentals of Turbomachines:</b> 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.	<b>Compressors:</b> <b>a. Axial Flow Compressor:</b> 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>b. Centrifugal flow compressors:</b> 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.	<b>Turbines:</b> <b>a. Axial Turbine:</b> 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>b. Radial Turbine:</b> Elements of radial turbine stage, Stage velocity triangles, H-S diagram, Stage losses, Outward flow radial stage and Performance characteristics.
4.	<b>Component Matching and Performance Evaluation:</b> 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.