

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Mechanical Engineering (For Equivalency)

SUBJECT NAME: Steam and Gas Turbines

SUBJECT CODE: 2171917

B.E. 7th SEMESTER

Type of course: Applied Engineering

Prerequisite: Engineering Thermodynamics, Fluid Mechanics, Heat Transfer

Rationale: The course is designed to give fundamental knowledge of construction and working of various types of turbines and their components i.e. steam turbine, gas turbine, nozzles etc.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
				PA	ALA	ESE	OEP			
3	0	0	3	70	20	10	0	0	0	100

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Steam Nozzles: Types of nozzles, velocity of steam, discharge through nozzle, critical pressure ratio and condition for maximum discharge, physical significance of critical pressure ratio, nozzle efficiency	8	20
2	Steam Turbine: Principle of operation, types of steam turbines, compounding of steam turbines, impulse turbine – velocity diagram, calculation of work, power and efficiency, condition for maximum efficiency, Reaction turbines – velocity diagram, degree of reaction, reheat factor, governing of steam turbine – throttle, nozzle and bypass governing, Methods of attachment of blades to turbine rotor, Labyrinth packing, Losses in steam turbine, Special types of steam turbine- back pressure, pass out and mixed pressure turbine.	14	33
3	Gas Turbine: Classification, open and closed cycle, gas turbine fuels, actual Brayton cycle, optimum pressure ratio for maximum thermal efficiency, work ratio, air rate, effect of operating variables on the thermal efficiency and work ratio, and air rate, simple open cycle turbine with regeneration, reheating and Intercooling, Combined steam and gas turbine plant, requirements of combustion chamber, types of combustion chambers.	14	33
4	Jet Propulsion: Fundamental of propulsion technology, Turbojet Engine, thrust, thrust power, propulsive efficiency, thermal efficiency, Turboprop, Ramjet and Pulsejet engines	6	14

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
05	15	20	15	10	05

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Power Plant Engineering, P.K. Nag, McGraw-Hill Education
2. Power Plant Engineering, R. K. Hegde, Pearson India Education
3. Gas Turbines, V. Ganeshan, McGraw Hill Education
4. Thermal Engineering, R.K.Rajput, Laxmi Publication
5. Steam Turbine Theory and Practice, William J. Kearton, CBS Publication

Course Outcome:

After learning the course the students should be able to:

- Analyse thermodynamic cycles of steam power plant and understand construction, working and significance of its various components
- Analyse thermodynamic cycles of gas turbine power plant and jet propulsion systems

List of Open Source Software/learning website:

<http://nptel.ac.in/courses/112104117/18>

<http://nptel.ac.in/courses/112104117/4>

<http://nptel.ac.in/courses/112104117/17>

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.