III B. Tech – I Semester

(20ME5010) STEAM AND GAS TURBINES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisites: Thermodynamics

Course Objectives:

The Students will acquire the knowledge:

- To interpret the principles of nozzles and analyze the performance of nozzles
- Todiscusstheperformanceandapplicationsofimpulsesteamturbinesinpowerplants.
- Tooutlinetheconceptsofperformanceandapplicationsofreactionsteamturbinesin power plants.
- To discuss the working of Gas Turbine and methods to improve efficiency.
- To illustrate the performance of jet propulsion system, know the principle of operation of Rocket Propulsion Systems.

UNIT- I: 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, effect of friction and nozzle efficiency, general relationship between area, velocity and pressure in nozzle flow.

UNIT-II: Impulse Steam Turbine

Principle of operation, types of impulse steam turbines, compounding of steam turbines, impulse turbine- velocity diagram, calculation of work, power and efficiency, condition for maximum efficiency.

UNIT-III: Reaction Turbines

Velocity diagram, degree of reaction, Parson turbine, work, power, efficiencies, blade height, condition for maximum blade efficiency for Parson turbine, reheat factor, governing of steam turbine- throttle, nozzle and bypass governing, regenerative feed heating, reheating of steam, Losses in steam turbine.

UNIT-IV: Gas Turbines

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 means of improving efficiency, Open cycle turbine with regeneration, reheating and Intercooling, combined steam and gas turbine plant, requirements of combustion chamber, types of combustion chambers.

UNIT-V: Jet Propulsion

Turbojet Engine, thrust, thrust power, propulsive efficiency, thermal efficiency, turboprop, and ramjet and pulsejet engines.
Rocket Propulsion: Principle, classification-chemical, rocket-solid propellant, liquid propellant, advantages.

Course Outcomes:

A student who successfully fulfills this course requirement will be able to:

S. No	Course Outcome	BTL
1.	Illustrate the principles of nozzles and analyze the performance of nozzles	L2
2.	Explain the performance and applications of impulse steam turbines in power plants.	L4
3.	Summarize the performance and applications of reaction steam turbines in power plants.	L2
4.	Describe the working of Gas Turbine and methods to improve efficiency.	L4
5.	Outline the performance of jet propulsion system; know the principle of operation of Rocket Propulsion Systems.	L4

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO2	3	2	3	2	3	3	2	3	2	3	2	3	2	2
CO3	3	2	3	2	3	3	2	3	2	3	2	3	3	2
CO4	3	2	3	2	3	3	2	3	2	3	2	3	3	1
CO5	3	2	3	2	3	3	2	3	2	3	2	3	3	2

Reference Books:

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