GOVERNMENT POLYTECHNIC, MALKANGIRI

DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Discipline: **Mechanical Engineering**	Semester 3rd	Name of the Teaching Faculty: **BIBHASH MANDAL**
THERMAL ENGINEERING-II	No. of days/week class allotted 3	Semester From date:22.12.2025 To date:18.04.2026 No. of Week: 15
PRE-REQUISITE	knowledge of thermal engineering	
Course Outcomes	1.Explain the working cycle of gas turbines, and the working of Jet and Rocket Engines 2.Compute the work done, enthalpy, internal energy and entropy of steam 3.Distinguish between water tube and fire-tube boilers 4Calculate Velocity of steam at the exit of nozzle in terms of heat drop analytically and by using Mollier chart.. 5.Explain the principle of working of a steam turbine and distinguish between the impulse turbines and reaction turbines.	

Week	Class Day	Theory/Practical Topics
1st	1st	**Gas Turbines**:Introduction Air-standard Brayton cycle
	2nd	Description with p-v and T-S diagrams
	3rd	Gas turbines Classification: open cycle gas turbines and closed cycle gas turbines
2nd	1st	Gas turbines Classification: open cycle gas turbines and closed cycle gas turbines
	2nd	comparison of gas turbine with reciprocating I.C. engines and steam turbines.
	3rd	Applications and limitations of gas turbines; General lay-out of Open cycle constant pressure gas turbine
3rd	1st	P-V and T-S diagrams and working; General lay-out of Closed cycle gas turbine
	2nd	**Jet Propulsion**: Principle of jet propulsion; Fuels used for jet propulsion
	3rd	Applications of jet propulsion; Working of a turbojet engine; Principle of Ram effec,Working of a turbojet engine
4th	1st	Working principle of a rocket engine; Applications of rocket propulsion; Comparison of jet and rocket propulsions.
	2nd	**Properties of Steam**: Formation of steam under constant pressure; Industrial uses of steam
	3rd	Basic definitions: saturated liquid line, saturated vapor line, liquid region, vapor region, wet region
5th	1st	superheat region, critical point, saturated liquid, saturated vapor, saturation temperature
	2nd	sensible heat, latent heat, wet steam, dryness fraction, wetness fraction, saturated steam
	3th	superheated steam, degree of superheat; Determination of enthalpy, internal energy,
6th	1st	internal latent heat, entropy of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart
	2nd	Isochoric process, Isobaric process, Hyperbolic process, Isothermal process
	3rd	Isentropic process, Throttling process, Polytropic process, Simple direct problems on the above using tables and charts
7th	1st	Steam calorimeters: Separating, throttling, Combined Separating and throttling calorimeters
	2nd	Steam calorimeters: problems.
	3rd	**Steam Generators**: Function and use of steam boilers; Classification of steam boilers with examples
8th	1st	Brief explanation with line sketches of Cochran, Babcock and Wilcox Boilers; Comparison of water tube & fire tube boilers
	2nd	Description with line sketches and working of modern high pressure boilers Lamont and Benson boilers
	3rd	Boiler mountings: Pressure gauge, water level indicator, fusible plug, blow down cock, stop valve
9th	1st	safety valve, (dead weight type, spring loaded type, high pressure and low water safety alarm)
	2nd	Boiler accessories: feed pump, economizer, super heater and air preheater; Study of steam traps & separators
	3rd	Explanation of the terms:Actual evaporation equivalent evaporation,factor of evaporation,boiler horse power & boiler efficiency
10th	1st	Formula for the above terms without proof; Simple direct problems on the above; Draught systems (Natural, forced & induced)
	2nd	**Steam Nozzles**: Flow of steam through nozzle
	3rd	Velocity of steam at the exit of nozzle in terms of heat drop using analytical method and Mollier chart
11th	1st	Velocity of steam at the exit of nozzle in terms of heat drop using analytical method and Mollier chart
	2nd	Discharge of steam through nozzles
	3rd	Critical pressure ratio
12th	1st	Methods of calculation of cross- sectional areas at throat and exit for maxi- mum discharge
	2nd	Methods of calculation of cross- sectional areas at throat and exit for maxi- mum discharge
	3rd	Effect of friction innozzles and Super saturated flow in nozzles;
13th	1st	Working steam jet injector; Simple numerical problems
	2nd	Working steam jet injector; Simple numerical problems
	3rd	**Steam Turbines**: Classification of steam turbines with examples,Difference between impulse & reaction turbines
14th	1st	Principle of working of a simple De-lavel turbine with line diagrams- Velocity diagrams
	2nd	Expression for work done, axial thrust, tangential thrust, blade and diagram efficiency, stage efficiency
	3rd	nozzle efficiency; Methods of reducing rotor speed; compounding for velocity, for pressure or both pressure and velocity
15th	1st	Working principle with line diagram of a Parson's Reaction turbine–velocity diagrams
	2nd	Simple problems on single stage impulse turbines and reaction turbine including data on blade height. Bleeding
	3rd	Re-heating and re-heating factors(Problems omitted); Governing of steam turbines: Throttle, By-pass & Nozzle control governing

Learning Resources:

Thermal Engineering – S. Domkundwar & C. P. Kothandaraman, Dhanpat Rai
Thermal Engineering – R. K. Rajput, Laxmi Publication New Delhi
Thermal Engineering – P. L. Ballaney, Khanna Publishers, 2002

Bibhash Mandal
Signature of Faculty

Signature of HOD/ ~~Signature of Principal~~

Signature of Academic Coordinator

Sing of Principal