

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Thermal & Hydraulic Prime Movers
Course Code:	1ET1010407
Pre-requisite Course:	Zeal to learn the subject

Course Objectives:

1. To understand the concepts of Energy in general.
2. To understand the fundamentals of general prime movers.
3. To apply the laws/concepts of thermodynamics to basic energy and fluid mechanics systems.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	-	3	28	70	12	30	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	VAPOR POWER CYCLES: Carnot Cycle, Rankine Cycle, Thermodynamic Variables Effecting Efficiency and output of Rankine Cycle, Analysis of simple Rankine Cycle and Re-heat cycle Steam turbines, Schematic layout of steam power plant, Classification of Steam Turbines: Impulse Turbine and Reaction Turbine, compounding in Turbines, Velocity Diagrams for simple Impulse and Reaction Turbines-work done & efficiency, Properties of steam and use of steam Table, T-s and h-s Diagrams. Analysis of Various Thermodynamic Processes under gone by Steam.	16	36
2	GAS TURBINES: Simple gas turbine plant, ideal cycle, closed cycle, open cycle, Efficiency, Work, ratio and optimum pressure ratio for simple gas turbine cycle. Actual cycle, analysis of simple cycles & cycles with inter cooling, reheating and Regeneration.	08	18
3	IMPACT OF JETS AND PUMPS: Impulse momentum equation, Impact of jet on stationary and moving vanes (flat and curved). PUMPS: Types of pumps, centrifugal pumps: Main components, Working principle, Multi stage pumps, performance and characteristic curves.	08	18

4	HYDRAULIC TURBINES: Classification of turbines, Working principle, Efficiency calculation of Pelton Wheel, Francis and Kaplan turbines. Governing of turbines, Performance and characteristic curves.	06	14
5	HYDRO POWER PLANT: Components of Hydroelectric power plant, Estimation of water power potential, Estimation of load on turbines: load curve, load factor, capacity factor, utilization factor, diversity factor, load – duration curve, firm power, secondary power, prediction of load.	06	14

Text Books:

1. Thermal Engineering by Rajput, Lakshmi Publication.
2. Thermal Engineering by M.L. Mathur and F.S. Mehta, Jain Brothers.
3. Power Plant Engineering, PK Nag, TMH publication.
4. Hydraulics & Fluid Mechanics, P.N. Modi and S.M. Seth, (Standard book) House, Delhi.

Reference Books:

1. Fluid Mechanics & Hydraulic Machinery, A.K. Jain, Khanna Publishers, Delhi.
2. Fluid Mechanics & Its Applications, Vijay Gupta, Santhosh. K. Gupta.
3. Fluid Mechanics & Fluid power Engineering, Dr. D.S. Kumar.

List of Experiments: NA

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understanding of basic concepts of thermodynamics and Hydraulic Machines.	2 Understanding
CLO2	Understand and differentiate between prime movers.	2 Understanding
CLO3	Analyze basic power cycles.	4 Analyze
CLO4	Apply the laws of thermodynamics and fluid mechanics to various real life systems.	3 Applying
CLO5	Understand the Components of Hydroelectric power plant.	2 Understanding
CLO6	Analyze the working of centrifugal pumps.	4 Analyze 2 Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1		L		L						M					L	L
CLO2			L			L		L						H		M
CLO3	M			L				M							L	
CLO4				H		L			M		M		M		L	
CLO5		M			L							M				M
CLO6	H				L	M		M		H			L	M	L	

H: High, M: Medium, L: Low