19CE4501D - HYDRAULIC MACHINES

Course Category:	Program Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	2-1-0
Prerequisites:	19CE3302 - Fluid Mechanics 19CE3301- Engineering Mechanics 19BS1101 - Engineering mathematics – I 19BS1201 - Engineering mathematics – II	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Understand** the basic concepts of turbo machinery	K2
CO2	**Apply** basics of hydro machinery and water power engineering concepts	K3
CO3	**Analyze** and select suitable type of turbine	K4
CO4	**Analyze** performance of the centrifugal pumps	K4
CO5	**Understand** efficiency of various pumps	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**IMPACT OF FREE JETS ON VANES** Impulse Momentum Equation – Force exerted by fluid jet on stationary and moving vanes, torque exerted on a wheel with radial curved vanes, velocity triangles.	**CO1**
UNIT-2	**HYDRAULIC TURBINES:** Elements of hydropower plants, classification of turbines – Impulse Turbines (Pelton wheel), Reaction Turbines (Francis, Kaplan) –components, functioning, work done and efficiencies (theory only); applications of draft tube, surge tank.	**CO2**
UNIT-3	**PERFORMANCE OF TURBINES:** Performance under unit head and specific conditions (unit quantities), expressions for specific speeds, performance characteristic curves, cavitation in turbines, selection of turbines.	**CO3**
UNIT-4	**PUMPS:** Rotodynamic Pumps (Centrifugal Pumps) – components, working, types, work done, efficiencies, specific speed (theory only), advantages of centrifugal pumps, pumps in series and parallel.	**CO4**
UNIT-5	Functionality and working principles of Monoblock pump, submersible pump, jet pump, Tubular turbine, bulb turbine.	**CO5**

Learning Resources

Text Books	1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines, 20/e, Standard Book House, 2015. 2. A.K. Jain, Fluid Mechanics, 12/e, Khanna publishers, 2014.
Reference Books	1. K. Subramanya, Hydraulic Machines, Tata McGraw Hill, 2017. 2. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, 9/e, Tata McGraw

	Hill,2013. M. Franck White, Fluid Mechanics, Tata McGraw Hill, 2014.
e-Resources& other digital material	1. https://nptel.ac.in/courses/112/104/112104117/ 2. https://nptel.ac.in/courses/112/103/112103249/