## CE432 HYDRAULIC MACHINES (3L-0T-0P:3Cr, 3Hr)

Introduction: Types of hydraulic machines, pumps, theory of rotodynamic machines, Euler's equation.

Impulse turbines: Work done by impulse turbine, power produced by an impulse turbine, efficiencies of an impulse turbine, design of pelton wheel turbine.

Reaction turbines: Differences between an impulse & reaction turbine, classification of reaction turbines, power produced by a reaction turbine, efficiencies of a reaction turbine, Francis turbine, Kaplan turbine, cavitation in reaction turbines, draft tube, types of draft tubes, efficiencies.

Governing of turbines: Purpose of governing, elements of governing system, double regulation of turbines, governing of impulse turbines, governing of reaction turbines, relief valve/pressure regulator.

Performance of turbines: Characteristics of turbines, unit power, unit speed & unit discharge, specific speed of a turbine, selection of turbines based on head of water & specific speed, characteristic curve of turbines.

Reciprocating & Centrifugal pumps: Pumps & their classification, reciprocating pumps, types, discharge, power required, slip of pump, indicator diagram, advantage of centrifugal pumps over reciprocating pumps, components of a centrifugal pump, workdone by impeller, heads of pumps, losses & efficiencies.

Hydel power plant: Hydro-electric plants & their classification, essential components of hydel power plant, advantages & disadvantages, pumped storage plants.

## COURSE OUTCOME

1. Identify and analyse the appropriate hydraulic machine based on the given conditions and their working principles.
2. Apply knowledge of mathematics and engineering principles to estimate the performance parameters of hydraulic machines.
3. Design the various components of a hydraulic machines.
4. Apply the information from contextual knowledge of pumps and hydel power plants for its safety and operations.

## TEXT BOOKS

1. R.K Bansal; A Text Book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) ltd., New Delhi
2. Dr. Modi &Dr.Seth ; Hyraulic and Fluid Mechnics Including Hydraulic Machines, Standard Book House.
3. K. Subramanya , Theory and Applications of Fluid Mechanics, Including Hydraulic Machines , Tata McGraw Hill Pub. Co., New Delhi, 1992.
4. Dr. Jagdish Lal, Hydraulic Machines, Metropolitan Publication.