FLUID MECHANICS AND HYDRAULIC MACHINES

Course Code: 13CE1157

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Course Educational Objectives:

✧ To familiarize the students with fluid statics and fluid dynamics.
✧ To introduce the concepts of the working and design aspects of hydraulic machines like turbines and pumps and their applications.

Course Outcomes:

✧ Student will be able to develop to gain basic knowledge on Fluid Statistics, Fluid Dynamics, closed conduit flows, hydro-electric power stations.
✧ Student will be able to design various components of pumps and turbines and study their characteristics.

UNIT-I (12 Lectures)

FLUID STATICS: DIMENSIONS AND UNITS:

Physical properties of fluids – mass density, specific weight, specific volume, specific gravity, viscosity, surface tension, vapour pressure and their influence on fluid motion. Atmospheric pressure, gauge pressure and vacuum pressure, measurement of pressure – Piezometers, U-tube and differential manometers – mechanical pressure gauges.

FLUID KINEMATICS:

Stream line, path line and streak lines and stream tubes. Classification of flows ideal fluid and real fluid – steady and unsteady flows, uniform and non-uniform flows, laminar and turbulent flows, rotational and irrotational flows, equation of continuity for one-dimensional flows.
UNIT-II (12 Lectures)

FLUID DYNAMICS:

UNIT-III (12 Lectures)

HYDRO-ELECTRIC POWER STATIONS :
types – concept of pumped storage plants – storage requirements, mass curve, estimation of storage capacity for a uniform demand, estimation of power developed from a given catchment area, heads and efficiencies.

BASICS OF TURBO MACHINERY :
Hydrodynamic force on jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT-IV (12 Lectures)

HYDRAULIC TURBINES :
Classification of turbines – Impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine – working principles, work done, efficiencies, hydraulic design, draft tube theory, functions and efficiency.

PERFORMANCE OF HYDRAULIC TURBINES:
Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

UNIT-V (12 Lectures)

CENTRIFUGAL AND RECIPROCATING PUMPS:
Classification working of centrifugal pump, work done – manometric head – losses and efficiencies – specific speed – pumps in series and

**TEXT BOOKS:**


**REFERENCES:**

