Content Product
Detailed syllabus
FLUID MECHANICS AND MACHINERY

UNIT I - FLUID PROPERTIES AND FLOW CHARACTERISTICS

Introduction - Introduction to matters, Introduction to fluids, Distinguish between solid and Fluid, Fluid concept, Liquid and gas as a fluid, Mechanics, Fluid mechanics, History of fluid mechanics, Units and dimensions. **Properties of fluid** - Properties of fluid, Specific volume and specific weight, Specific gravity and temperature, Viscosity, Newton's law of viscosity, Compressibility, Surface tension, Capillarity, Vapour pressure. **Problems on properties of fluids** - Problems on properties of fluids. **Flow characteristics** - Concept of control volume, Application of continuity equation, Example 1, Euler equation of motion, Bernoulli's equation, Applications of Bernoulli's equation, Venturimeter, Discharge through venturimeter, Orifice meter, Pitot tube, Application of control volume to momentum equation, Example 1, Impact of water jet on vanes - Linear momentum, Application of control volume to moment of momentum equation. **Problems on Bernoulli's equation** - Problems on Bernoulli's equation. **Problems on applications of Bernoulli's equation** - Problems on applications of Bernoulli's equation.

UNIT II – FLOW THROUGH CIRCULAR CONDUITS

Introduction - Types of fluid flow, Types of flow. **Laminar and Turbulent flow** - Reynolds' experiment, Reynolds number, Significance of Reynolds number, Reynolds number for non newtonian fluids, Laminar flow, Flow of viscous flow through circular pipe, Problem on Laminar and Turbulent flow, Flow of viscous fluid between two parallel plates, Turbulent flow in pipes, Friction factor in turbulent flow, Effect of roughness, Usage of friction factor chart. **Boundary layer** - Introduction to boundary layer, Classification of boundary layer, Zones of boundary layer. **Important parameters of boundary layer** - Boundary layer thickness δ, Displacement thickness δ, Momentum thickness θ, Energy thickness, Boundary layer characteristics, Problem on boundary layer. **Drag force** - Drag force and lift, Drag force on a flat plate due to boundary layer, Turbulent boundary layer on flat plate, Total drag on a flat plate due to laminar and turbulent boundary layer, Problem on boundary layer. **Boundary layer separation** - Separation of boundary layer, Effect of pressure gradient, Location of separation point and disadvantages, Control on boundary layer separation, Problems based on boundary layer separation. **Flow through pipes** - Loss of energy in pipes, Major loss in pipe, Pipe roughness, Friction factor, Moody chart, Minor energy losses, Loss of head due to sudden enlargement, Loss of head due to sudden contraction, Loss of head at the entrance of a pipe, Loss of head at the exit of a pipe, Loss of head due to an obstruction in a pipe, Loss of head due to bent, Loss of head in various pipe fittings, Other minor losses in pipe, Hydraulic gradient and total energy. **Problems on losses of flow in pipe** - Problems on losses of flow in pipe. **Flow through pipes in series and parallel** - Flow through parallel pipes, Flow through pipes in series, Equivalent pipe, Problem on flow through pipes.

UNIT III - DIMENSIONAL ANALYSIS

Dimensional analysis - Introduction, Dimensions and units, Fundamental dimensions, Important technical terms, Problem based on dimensional analysis, Benefits of dimensional analysis. **Methods of**

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dimensional analysis - Methods of dimensional analysis, Example on dimensional analysis, Buckingham π -theorem, Procedure for solving problems by Buckingham π theorem, Example on dimensional analysis. **Dimensionless numbers -** Types of forces acting on moving fluid, Important dimensionless numbers. **Model and similitude -** Model analysis, Similitude. **Model laws or similarity law -** Introduction, Reynolds model law, Froude model law, Euler's model law, Weber model law, Mach model law, Problem based on Reynold's model law, Problem based on Froude model law, Problem based on Euler's model law, Model testing of partially sub-merged bodies, Classification of models, Problem based on scale ratio for distorted model.

UNIT IV – PUMPS

Impact of jets - Introduction, Force exerted by the jet on a fixed vertical flat plat, Force exerted by the jet on a fixed inclined flat plat, Problem on impact of jets, Force exerted by jet on the moving plate, Moving flat plate arranged on rim, Impact of jet on the fixed curved plates, Jet striking an unsymmetrical vane at one of its tips, Impact of Jet on a series of vanes fixed of a wheel. **Euler's equation -** Euler's equation. **Theory of roto - dynamic machines -** Theory of roto - dynamic machines, Roto - dynamic machines, Hydraulic Machines. **Velocity component of the inlet and exit -** Velocity component of the inlet and exit. **Pumps -** Pumps, Classification of pump, Centrifugal pump, Construction of centrifugal pump, Working of centrifugal pump, Multistage centrifugal pump, Priming of centrifugal pump, Cavitation of centrifugal pump, Workdone by centrifugal pump, Head and efficiency of centrifugal pump, Characteristics curves of centrifugal pump, Problem on impact of jets.
Reciprocating Pump - Reciprocating Pump, Classification of reciprocating pump, Single acting reciprocating pump, Double acting reciprocating pump, plunger pump, Diaphragm pump, Expression fordischarge, workdone and power required for single reciprocating pump, Problem on impact of jets, Air vessel. **Rotary pump -** Rotary pump, Internal gear pump, External gear pump, Screw pump, Lobe and Vane pump.

UNIT V – TURBINES

Introduction - Introduction to turbine, Water turbines installed in India, Hydraulic terms, Derivation of water power equation, Classification of hydraulic turbine. **Pelton Wheel turbine -** Pelton Wheel turbine, Velocity triangle for pelton wheel turbine, Problem on pelton Wheel turbine. **Francis and kaplan turbine -** Francis turbine, Velocity triangle for francis turbine, Problem on francis turbine, Kaplan turbine. **Turbine specification and characteristics -** Specific speed, Characteristics curves of hydraulic turbine, Comparison between impulse and reaction turbine, Comparison between Francis and kaplan turbine, Governing of water turbine, Governing of pelton wheel (Impulse turbine), Governing of francis turbine.