

AMEV-09- APPLIED HYDRAULICS AND FLUID MACHINES

OBJECTIVES:

The objective of the course is to understand the types of flow in open channel, dimensional analysis, momentum principle and application of various turbines and pumps in fluid problems.

UNIT I UNIFORM FLOW

Properties of open channel- types of flow - Uniform flow - Chezy's and Manning's equations - determination of roughness coefficients - hydraulically best sections - specific energy - critical depth - Uniform flow in mild, steep and critical slopes.

UNIT II VARIED FLOWS

Dynamic equation for gradually varied flow - free surface profiles in various slopes - specific force
- rapidly varied flow - hydraulic jump - classification - unsteady flow - types of surges.

UNIT III MOMENTUM PRINCIPLE

Impulse momentum equation - Application of linear momentum principle - Impact of Jet- Force exerted by a jet on normal, inclined and curved surfaces for stationary and moving cases - Angular momentum principle - construction of velocity vector diagrams.

UNIT IV HYDRAULIC TURBINES

Classification - working principles - design of Pelton wheel, Francis and Kaplan Turbines - Head, losses, work done and efficiency - Draft tube - theory and types - similarity laws - specific speed
- operating characteristics - Governing of turbines - Selection of turbines.

UNIT V HYDRAULIC PUMPS

Classification - centrifugal pump - working principle - head, discharge and efficiencies - minimum starting speed - Net positive suction head - performance curves - specific speed - Reciprocating pump - components and working - slip - indicator diagram - air vessel - selection of pumps.

OUTCOMES:

The students completing the course will

- have an insight into the uniform and varied flow of fluids, momentum principle and its application to hydraulic turbines and pumps
- be able to perform calculations relevant and applicable to flow in open channel, dimensional analysis, momentum principle and its application to turbines and pumps

TEXT BOOKS:

- Subramanya K., "Flow in open channels", Tata McGraw Hill, New Delhi, 2000.
- Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2002.
- Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2008.

REFERENCES:

- Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 200-.
- Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
- Jain. A.K., "Fluid Mechanics", Khanna Publishers, Delhi, 2010.

