

K L UNIVERSITY
HYDRAULICS AND HYDRAULIC MACHINES (13 CE 204)

Pre – requisite: 13 CE 202

Competencies:

1. Analyze open channel flow
2. Analyze impact of jets
3. Analyze and design turbines
4. Understand working principles and analyze pumps

L	T	P	Cr
3	0	2	4

SYLLABUS:

Open Channel Flow: classification, and Comparison between open channel flow and pipe flow, Types of channels, Chezy's and Manning's equation, Flow through rectangular, Trapezoidal and Circular channels, Most efficient channel section -Rectangular, Trapezoidal, Specific energy, Specific energy diagram, Critical flow, critical flow in rectangular channel, critical slope, Froude's number, Channel transitions.

Gradually Varied Flow: Gradually varied flow in rectangular channels – equation for GVF, Water surface slope w.r.t. channel bed and horizontal, Classification of channel slopes, classification of surface profiles, Backwater and draw down curves.

Rapidly Varied Flow: Hydraulic jump, elements and characteristics of hydraulic jump, Types of hydraulic jump, Location and applications of hydraulic jump, Energy loss in a hydraulic jump.

Impact of Jets: Force exerted by the jet on a stationary plate – vertical, inclined and curved, Force exerted by a jet on a hinged plate, on moving plates, force exerted by jet on flat plates and series of vanes.

Turbines: classification of turbines, pelton wheel, velocity triangles and work done on Pelton wheel, Design of Pelton wheel. Radial flow reaction turbine, Velocity triangles and work done by water on runner, Francis turbine, Design of Francis turbine, Axial flow reaction turbine – Kaplan turbine, head and efficiency, Draft tube – types, draft tube theory, efficiency of draft tube, Specific speed, Unit quantities, Selection of turbines, Cavitation.

Centrifugal Pumps: Manometric head; losses and efficiencies; work done; working principle; priming; velocity triangles; performance and characteristics curves; multistage and double suction pumps, Cavitation effects.

Reciprocating Pumps: Classification of reciprocating pump, working principle, Discharge through reciprocating pump, negative slip Discharge, work done and power required to drive double acting pump.

TEXT BOOKS:

1. Hydraulics & Fluid Mechanics by P. N. Modi & S. N. Seth; Standard Book house, New Delhi
2. Introduction to Fluid Mechanics by Robert W.Fox and Alan T. Mc Donald, Fourth Edition, John Willey & sons, New York, 1995

REFERENCE BOOKS:

1. Open Channel flow by V.T.Chow, Mc.Graw Hill book company

2. Flow in Open channels by K . Subramanya, Tata McGraw-Hill Publishing Company,1994.
3. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi
4. Hydraulic Machines by Jagadhishlal; Metropolitan Company, Delhi

LIST OF EXPERIMENTS

1. Determination of Manning's and Chezy's coefficients in Open Channel flow.
2. Determination of Coefficient of impact of jets on different Vanes.
3. Performance studies on Pelton turbine.
4. Performance studies on Francis turbine
5. Performance studies on Kaplan turbine.
6. Performance studies on single stage Centrifugal pump.
7. Performance studies on variable speed on Centrifugal pump.
8. Performance studies on Reciprocating pump.
9. Determination of efficiencies of hydraulic Ram.
10. Water – hammer studies.