

K L UNIVERSITY
FLUID MECHANICS (13 – CE 202)

Pre – requisite: 13 – ES 106

Competencies

1. Analyze the fluid at different states – static, kinematic and dynamic
2. Analyze the flow through pipes
3. Perform dimensional analysis and can develop and simulate models

L	T	P	Cr
3	0	2	4

SYLLABUS

Fluid properties: Definition of fluid, properties of fluid-density, specific weight, specific gravity, viscosity, classification of fluids, surface tension and capillarity, vapour pressure and cavitation.

Fluid statics: pressure, Pascal's law, hydrostatic law, measurement of pressure-simple and differential manometers, Total pressure and centre of pressure on vertical, horizontal and Inclined surfaces.

Fluid statics-buoyancy and floatation: Buoyancy, centre of buoyancy, Meta-centre, Meta-centric height.

Fluid kinematics: types of fluid flow, Discharge, Continuity equation, Continuity equation in three dimensional flow, velocity potential function and stream function. **Fluid dynamics:** Euler's equation of motion, computational approaches for solving Euler's equation Finite Volume Method, Bernoulli's equation and applications, Venturimeter, Orificemeter, Pitot-tube, coefficient of discharge, orifices and mouth pieces.

Momentum equation: Impulse-momentum equation, Force exerted by flowing fluid on pipe-bend. **Flow through pipes:** Introduction, major and minor energy losses, hagen- poiseuille law, Hydraulic gradient and total energy line, pipes in series and parallel and Water hammer.

Turbulance: Introduction to Turbulance, Navier Stokes Equations,

Dimensional analysis & model similitude: Buckingham's PI theorem, Model analysis, Types of similarities, Dimensionless numbers, Classification of models, Model laws-Reynolds and Froude model law

TEXT BOOKS:

1. Fluid Mechanics by John F. Douglas, Tata McGraw Hill publications
2. Fluid Mechanics by S.K.Som, G Biswas, Tata McGraw Hill publications

References:

1. Fluid Mechanics by Frank M white, Tata McGraw Hill publications
2. Fluid Mechanics by A. Cengel and John M. Cimbala, Tata McGraw Hill publications
3. Fluid Mechanics by G. S Sawhney, IK International Publishing house (P) Ltd. New Delhi
4. Fluid Mechanics by Edward J. Shaughnessy, Oxford University Press, USA

LIST OF EXPERIMENTS

- Determination of coefficient of discharge of rectangular notch
- Determination of coefficient of discharge of V - notch
- Determination of coefficient of discharge of orifice
- Determination of coefficient of discharge of mouth piece
- Determination of coefficient of discharge of orifice meter
- Determination of coefficient of discharge of venturimeter
- Determination of Darcy friction factor due to friction in a pipe flow
- Determination of minor losses due to sudden expansion and contraction in a pipe flow
- Verification of Bernoulli's theorem
- Fluid flow analogy using Reynolds apparatus

NOTE: In addition to physical conduction of above experiment any simulation package / program will be used for simulating the same and further correlation with experimental results obtained.