

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Environmental Engineering

Semester: 3

Subject Code

Subject Name HYDRAULICS

Sr. No.	Course content
1.	INTRODUCTION : 1.1 History and the scope of the course. 1.2 Technical terms given as below: Fluid-Fluid Mechanics-Hydraulics-Hydrostatics-Hydro kinematics Hydro Dynamics-Ideal and Real Fluid. 1.3 Properties of liquid such as: Viscosity-Density-Specific Gravity-Surface Tension-Capilarity Vapour Pressure-Elasticity. 1.4 S.I. units Used in Hydraulics
2.	LIQUID PRESSURE AND ITS MEASUREMENT: 2.1 Various Types of Pressure Such as: Atmospheric Pressure-Gauge Pressure-Absolute Pressure Vacuum Pressure-Separation Pressure 2.2 Measurement of Pressure. 2.3 Various types of pressure such as --Atmospheric pressure--Gauge pressure---Absolute pressure ---Vacuum pressure --separation pressure 2.4 Measurement of pressure 2.4.1 Measurement of light pressure by Pizometer tube 2.4.2 Measurement of moderate pressure by "U" tube manometer (Positive and Negative pressure) 2.4.3 Measurement of Gauge pressure and Vacuum pressure 2.4.4 Measurement of difference pressure using "U" tube Manometer and inverted "U" tube Manometer
3.	HYDROSTATICS: 3.1 Relation between pressure and depth of liquid 3.1.1 Establish above relationship 3.1.2 Pressure diagram for different conditions 3.1.3 Total pressure and center of pressure from pressure diagram 3.1.4 Conversion of one pressure to another pressure (using S.I.units) 3.2 Total Pressure and Center of Pressure for ---Horizontally immersed Surface--vertically immersed surface--- inclined immersed surface 3.2.1 Compute these Pressures for the above three conditions and also for practical I field situations. 3.3 Use of Transducer for measuring pressure in practical field

4.	HYDRO KINEMATICS: 4.1 Reynold's number Definition --Computation --Importance in determining type of flow 4.2 Types of flow Laminar --Turbulent --Uniform --Non-uniform --Steady Un-steady --One, Two and Three Dimensional flow 4.2.1 Practical situations where above types and their Combination occurs 4.3 Continuity Equation 4.3.1 Concept of Mean Velocity 4.3.2 Derivation and applications of Continuity Equation in solving field problems (for one & two dimensional flow only)
5.	ENERGY AND MOMENTUM EQUATION: 5.1 Water energy and its form such as ---Potential---Kinematic--Pressure 5.1.1 Expression of above energy and conversion of them in linear measurement 5.1.2 Conversion of energies from one to another form 5.2 Concept of total energy 5.2.1 Bernoulli's theorem ---statement---derivation---limitations--- applications in solving problems 5.3 Applications of Bernoulli's theorem --venturi meter---Orifice meter ---Pitot tube---Prandtl's tube --venturi flume and Numerical problems related to above 5.4 Momentum Equation 5.4.1 Statement 5.4.2 Newton's second law of motion- its derivation 5.4.3 Application for computing force on bend of same and varying diameter (two directions only)
6.	HYDRAULIC CO-EFFICIENTS: 6.1 Coefficient contraction, velocity and discharge 6.1.1 Definitions relation, expression (derivation and application) 6.2 Calibration curve-computation of discharge from curve, Interpolation and extrapolation. 6.3 Computation of total volume of water supply to field and preparation of bill for calculating water charges
7.	FLOW THROUGH PIPES: 7.1 Characteristics of flow through pipes 7.2 Energy (head) losses in flow through pipes 7.2.1 Major losses such as --loss of head due to friction- Darcy Wisbach formula 7.2.2 Minor losses such as --loss of head at entry, change in diameter, bend etc. 7.2.3 Problems on head losses 7.3 Hydraulic Gradient Line (H.G.L.) & Total Energy Line (T.E.L.) 7.3.1 Effect of entry at pipe, change in diameter, bend etc. on H.G.L. & T.E.L.

	7.3.2 Plotting of H.G.L. & T.E.L. 7.4 Design of pipeline for given flow --using formulae ---using nomograms 7.4.1 Computation of height of reservoir 7.5 Compound pipe and equivalent sizes
8.	FLOW THROUGH OPEN CHANNEL: 8.1 Characteristics of open channel flow 8.1.1 Comparison of pipe flow and open channel flow 8.1.2 Field examples of open channel flow 8.2 Analyse uniform flow in open channel 8.2.1 Froudes Number and classification of flow on Froude's number 8.2.2 Hydraulic Mean Depth---concept and computation 8.2.3 Chezy's formula, Basin's formula, Manning's formula ---use of above formulae 8.2.4 Most economical sections of channels for rectangular, trapezoidal & circular shapes 8.3 Specific Energy Diagram 8.3.1 Expression and sketch of specific energy diagram with explanation of critical and super-critical flow, critical depth hydraulic flow 8.3.2 Computation of critical depth 8.3.3 Hydraulic jump ---conditions and uses 8.4 River Gauging 8.4.1 Velocity distribution in channel flow. 8.4.2 Mean velocity – Concept Computation by --Surface float -velocity rod --Current meter
9.	FLOW OVER NOTCHES AND WEIRS: 9.1 Types of notches and weirs 9.2 Computation of discharge 9.2.1 Discharge using rectangular and “V” notch 9.2.2 Derivation of formula and its use 9.2.3 Discharge using various types of weirs 9.2.4 Derivation of formula and its use 9.2.5 End contraction and velocity of approach - their effects on computation of discharge
10.	PUMPS: 10.1 Reciprocating and centrifugal pumps---their construction--their comparison 10.2 Suitable use of each type of pump 10.3 Selection of pump 10.4 Verification of efficiency of pump

Reference Books :

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| 1. Fundamentals of Fluid Mechanics,
(in S.I. Units), | Dr.D.S.Kumar | Katson |
| 2. Fluid Mechanics & Hydraulic Machines (In S.I.Units) | R.S.Khurmi | Pub.House,
S.Chand
& Co.Ltd. |
| 3. Hydraulic Machines & Fluidics, | Dr.Jagdishlal | Metropolitan
Book Co. |
| 4. Hydraulic & Hydraulic Machines, | Prof.V.P. Priyani | Charotar
Pub.House |
| 5. Hydraulics & Hydraulic Machines | Prof.R.C.Patel & A.D.Pandya | Acharya
Book Depot, |
| 6. Fluid mechanics and Hydraulic Machines | S.C.Gupta | PEARSON
Education |
| 7. Fluid Mechanics, | Douglas | PEARSON
Education |
| 8. Fluid Mechanics, | A.K.Jain | |
| 10. Fluid Mechanics, Hydraulics
and Hydraulics Machines | K.L.Arora | |