

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI HYDERABAD CAMPUS
INSTRUCTION DIVISION, FIRST SEMESTER 2016-2017
COURSE HANDOUT (PART II)

Date: 01.08.2016

In addition to Part I (General Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

Course No. : **CE F312**
Course Title : **Hydraulic Engineering**
Instructor-in-charge : **JAGADEESH ANMALA**
Instructors : Jagadeesh Anmala, Swathi, Madhuri

Course Description:

Boundary layer theory; lift and drag; Turbulent flow through conduits; Analysis of closed-conduit hydraulic systems including pipes, valves, fittings, and pumps, pipe networks analysis; Hardy cross method and linear graph method; analysis and design of open channel hydraulic systems; uniform and varied flow; hydraulic jump; Analysis of Impact of jets; fluid machinery; Elements of sediment transport; Interpretation of hydraulic design requirements along with hydrological variables; Overview of computational hydraulics.

Scope and Objective of the Course:

The problems encountered by man in the field of water supply, irrigation, navigation and water- power, resulted in the development of the fluid mechanics. Fluid mechanics is that branch of science, which deals with the behavior of the fluids at rest as well as in the motion. This course will stress the governing principles of Hydraulic Engineering; the assumptions made in their development and their limits of applicability, and will show how the principles can be applied to the solution of practical engineering problems such as water supply systems, waste water treatment facilities, dam spillways, flow-meters, hydraulic shock absorbers etc. Different kinds of flow of fluid under different conditions have also been included so that the students learn to apply in practical life.

Text Books:

- T1. Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard Book House, 15th ed., 2009.

Reference Books:

- R1. Douglas J. F., Gasiorek J. M., Swaffield J. A., and Jack L.B., Fluid Mechanics, Pearson Education, Second Impression, 2009.
R2. Fox, R.W. and McDonald, A.T., Introduction to Fluid Mechanics, John Wiley and Sons Inc., Singapore, Fifth Edition, 2001
R3. Arora, K.R., Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers, Delhi, 1985.
R4. Simon, A.L., Hydraulics, Willey, John., & Sons, New York, 1986.
R5. Shames, I.H., Mechanics of Fluids, McGraw-Hill Company, Second Edition, 1982

Course Plan :

S. No.	Learning Objective	Topics to be covered	Reference to Text Book (Chapter/section)	No. of Lectures
1.	Introduction to the Hydraulics and fluid mechanics. To establish a base and a perspective for the study of subject	Introduction, Fundamental definitions and concepts	T1 Chapter 1 T2 Chapter 1	2
2.	To study the behavior of real fluid flow in pipes and channels	Boundary layer theory	T1 Chapter 12 R1 Chapter 11	5
3.	To study about the type of fluid flow in general and analysis of turbulent flow specifically	Turbulent flow in pipes	T1 Chapter 14 R1 Chapter 10	5
4.	Analysis of pipe networks using Hardy Cross Method and Linear Graph Method	Flow through pipes	T1 Chapter 11	2
5.	Analysis of uniform fluid flow in open channel	Flow in open channels	T1 Chapter 15	4
6.	Analysis of Non uniform fluid flow in open channel	Non-uniform flow in channels	T1 Chapter 16	3
7.	Design of Hydraulic Structures such as Parshall Flume, Gates, Culverts etc.	Hydraulic Structures	R5 Chapter 15	3
8.	Analysis of Fluid flow around submerged objects	Lift & Drag	T1 Chapter 18 R1 Chapter 12	4
9.	Analysis of Impact of jets including jet impingement in moving Vanes and series of vanes	Study of Impact of Jets	T1 Chapter 20	3
10.	Turbo-machinery analysis, performance characteristics, applications to fluid systems	Study of fluid machineries	T1 Chapter 21,22 R2 Chapter 10	4
11.	Principles of reciprocating pumps and centrifugal pumps	Study of Pumps	T1 Chapter 23, 24	4
12.	Threshold of movement, mechanics of sediment transport and its equations, analysis, Differential equations, finite-difference method and grid generation, boundary conditions and initial conditions, applications of computational hydraulics	Study of elements of sediment transport, Overview of computational hydraulics	T1 Chapter 28, Supplementary notes by IC	3

Practical :

S. No.	Name of Experiment	No. of Turns	Reference to Lab Manual (T3)
1.	Darcy's Friction factor ' f ' of pipes of different diameter pipes (Darcy)	01	3.5
2.	Discharge through an orifice and a mouthpiece (OP/MP)	01	3.6
3.	Determination of Minor losses (Minor)/Bernoulli's Theorem	01	Suppl. Notes
4.	The coefficient of discharge ' C_d ' of the V notch and rectangular notch and to plot the calibration curve(Notches)	01	3.8
5.	Study of formation of hydraulic jump and study of multi-purpose plume (HJ)	01	3.10
6.	Study of Impact of Jet (IJ)	01	Suppl. Notes
7.	Study of Metacentric Height Apparatus (MH)	01	Suppl. Notes
8.	Flow measurement using Venturimeter/Orificemeter(VM/OM)	01	Suppl. Notes
9.	Study of Reynolds Apparatus (Reynold)	01	Suppl. Notes
10.	Boundary layer development on a flat plate (BLF)	01	Suppl. Notes
11.	Drag and Lift of Aerofoil (Aerofoil)	01	Suppl. Notes
12.	Study of Hele-Shaw Apparatus (Hele-Shaw)	01	Suppl. Notes

Reading Assignment: First 8 Chapters of textbook.

Evaluation Scheme:

Evaluation Component	Duration	Weightage (%)	Date, Time & Venue	Remarks
Test I	60 min	15	8/9, 8.30-9.30 AM	Closed book
Test II	60 min	15	25/10, 8.30-9.30 AM	Open book
Comprehensive	3 hours	40	12/12 AN	Closed book
Practical		15	As per the timetable	
Take home Assignments		5	To be announced in the class from time to time (Open book)	
Quiz		10	To be announced in the class from time to time (Closed book)	

Chamber Consultation Hour: It will be announced in the class.

Make-up Policy:

1. Make-ups are not entertained.
2. Make-up will be granted only on genuine reasons. However, prior permission is must.
3. For medical cases, a certificate from the concerned physician of the Medical Centre must be produced.

Notices:

All notices concerning the course will be displayed on the Notice Board of Civil Engineering group or Notice Board of LTC.

Instructor-in-charge
CE F312