FIRST SEMESTER 2016-2017
Course Handout (Part II)

Date: 02/08/2016

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   : Hydraulics Engineering
Instructor-in-charge   : RAJIV GUPTA
Instructor(s)   : Anupam Singhal, Anuradha Devi, Rahul Dandautiya

Course Description:

Behavior of real fluids: boundary layer theory, flow past immersed bodies, 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; Open channel hydraulics: uniform and non-uniform flow; analysis and design of hydraulic systems; Analysis of Impact of jets; fluid machinery: theory, performance and application.

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 hydraulics, fluid mechanics and hydrology; 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, water resources engineering 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, 18th ed., 2011.

T2.   Fox, R.W. and McDonald, A.T., Introduction to Fluid Mechanics, John Wiley and Sons Inc., Singapore, Eighth Edition, 2012.

T3.   Moondra, H.S., Gupta, R., Lab. Manual for Civil Engineering, CBS publishers & Dist, 2nd ed., 2000.

Reference Books:

R1.   White F.M., Fluid Mechanics, McGaw Hill, Seventh Edition, 2011.

R2.   Douglas J. F., Gasiorek J. M., Swaffield J. A., and Jack L.B., Fluid Mechanics, Pearson Education, Second Impression, 2009.

R3.   Arora, K.R., Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers, Delhi, 1985.

R4.   Chanamala Ratnam, and Arun Vikram Kothapalli, Fluid Mechanics and Machines, I K International Publishing House, New Delhi, 2010

Course Plan:

S. No.	Learning Objective	Topics to be covered	Reference to Text Book (Chapter/section)	No. of Lectures
1.	Introduction	Introduction, Fundamental definitions & concepts	T1 Chapter 1 T2 Chapter 1	2
2.	Basics of pipe flow, use the Bernoulli equation, flow problems, concepts of static, stagnation, dynamic, and total pressures, To study the behavior of reservoirs, pumps, check valves, flow control valves and pressure reducing valves under different conditions	Flow through pipes	T1 Chapter 11 Supplementary notes by IC	6
3.	Analysis of pipe networks with different components using Different Methods	Flow through pipes	T1 Chapter 11	4
4.	To study the behavior of real fluid flow in pipes and channels	Boundary layer theory	T1 Chapter 12 R2 Chapter 11	5
5.	To study about the type of fluid flow in general and analysis of turbulent flow specifically	Turbulent flow in pipes	T1 Chapter 14 R2 Chapter 10	4
6.	Analysis of uniform fluid flow in open channel	Flow in open channels	T1 Chapter 15	4
7.	Analysis of Non uniform fluid flow in open channel	Non-uniform flow in channels	T1 Chapter 16	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	Impact of Jets	T1 Chapter 19	3
10.	Fluid machinery: classification, basic designs, and operations	Fluid machinery: theory, performance and application.	T1 Chapter 21, 22, 23	6
11.	Design of Hydraulic Structures	Analysis and Design of hydraulic systems	Class notes/ Reading Notes	3
Total				42

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	01	3.5
2.	Discharge through an orifice under constant head	01	3.6
3.	Discharge through an orifice under varying head	01	3.7
4.	The coefficient of discharge `C_d' of the V-notch and rectangular notch and to plot the calibration curve	01	3.8
5.	Study of formation of hydraulic jump	01	3.10
6.	Verify Stoke's law	01	3.2
7.	To study the type of flow using Reynolds apparatus	01	Suppl. Notes
8.	To demonstrate two-dimensional laminar flow around differently shaped models using Hele-Shaw apparatus+ Study of Metacentric Height Apparatus	01	Suppl. Notes
9.	Study of Impact of Jet	01	Suppl. Notes
10.	Study of Specific Energy Curve using Multi-purpose Flume	01	Suppl. Notes
11.	Demonstration of Multi-purpose flume for different studies on open channel flow	01	Suppl. Notes

Reading Assignment: First 10 Chapters of textbook T1.

Evaluation Scheme

Evaluation Component	Duration	Weight age (%)	Date, Time & Venue	Remarks
Mid-sem Test	90 mins	25	<TEST_1>	Closed book
Comprehensive	180 mins	35	<TEST_C>	Partly Open book
Practical		15	To be announced in the class from time to time	
Tutorials/Project		20	To be announced in the class from time to time	

Chamber Consultation Hour: To be announced in class

Notices:

All notices concerning the course will be displayed on the Notice Board of Civil Engineering Department only.

Instructor – in – charge
CE F312