FIRST SEMESTER 2015-2016
Course Handout (Part II)

Date: 03/08/2015

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 : SANGHAMITRA KUNDU
Instructor(s)   : Anupam Singhal, G. Muthukumar, 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 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 understand the basics of pipe flow, use the Bernoulli equation (stand-alone or in combination with the continuity equation) to solve simple flow problems, apply the 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 (such as reservoirs, pumps, valves etc) using Hardy Cross Method and Linear Graph Method	Flow through pipes	T1 Chapter 11	2
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.	To introduce and classify fluid machinery into two broad categories, pumps and	Fluid machinery: theory,	T1 Chapter 21, 22, 23	6

	turbines and to study basic principles of their design and operations. How to properly match the requirements of fluid flow system to the performance characteristics of fluid machinery.	performance and application.		
11.	Design of Hydraulic Structures such as Parshall Flume, Gates, Culverts etc.	Hydraulic Structures	R5 Chapter 15	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	01	Suppl. Notes
9.	Study of Impact of Jet	01	Suppl. Notes
10.	Study of Metacentric Height Apparatus	01	Suppl. Notes
11.	Study of Specific Energy Curve using Multi-purpose Flume	01	Suppl. Notes
12.	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	Weightage (%)	Date, Time & Venue	Remarks
Mid-sem Test	90 mins	25	6/10 8:00 - 9:30 AM	Closed book
Comprehensive	180 mins	35	3/12 FN	Partly Open book
Practical		15	To be announced in the class from time to time	
Tutorials/Assigments		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 Civil Engineering Department Notice Board.

Make-up Policy:

1. Make-up will be granted only on genuine reasons. However, prior permission is must.
2. For medical cases, a certificate from the concerned physician of the Medical Centre must be produced.
3. Please also refer item no. 6 on page 2 of Part I of course handout mentioned in the Timetable for First Semester 2013-14 for more details.

Academic honesty and academic integrity Policy:

Academic honesty and academic integrity are to be maintained by all of the students throughout the Semester and no type of academic dishonesty is acceptable.

Notices:

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

Instructor – in – charge
CE F312