Course Code	Course Name	L-T-P-Credits	Year of Introduction
CE206	FLUID MECHANICS -II	3-0-0-3	2016

Prerequisite : CE203 Fluid Mechanics I

Course objectives

- To study the Basic principles and laws governing fluid flow to open channel flow including hydraulic jump & gradually varied flow.
- To understand basic modeling laws in fluid mechanics and dimensional analysis.
- To apply the fundamental theories of fluid mechanics for the analysis and design of hydraulic machines

Syllabus

Hydraulic machines, Turbines, Pumps, Open channel flow, uniform flow, Hydraulic Jump, Gradually varied flow, Dimensional analysis and model testing.

Expected Outcome

The students will

i. become capable of analysing open channel flows & designing open channels.
ii. get an insight into the working of hydraulic machines.
iii. become capable of studying advanced topics such as design of hydraulic structures.

Text Books:

1. Kumar D.S., Fluid Mechanics and Fluid power Engineering, S. K. Kataria & Sons, New Delhi, 2013
2. Modi P. N. and S. M. Seth, Hydraulics and Fluid Mechanics (Including Hydraulic Machines), Standard Book House, New Delhi, 2013.
3. Narayana Pillai,N. Principles of Fluid Mechanics and Fluid Machines, University Press, 2011.

References:

1. Arora.K.R. Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers, 2005.
2. Bansal R. K., A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2010.
3. C S P Ojha, P N Chandramouli and R Brendtsson, Fluid Mechanics and Machinery, Oxford University Press , India , New Delhi
4. Hanif Choudhary, Open channel flow, Prentice Hall, 2010
5. Jain A. K., Fluid Mechanics, Khanna Publishers, Delhi, 1996.
6. Subramanya K., Open Channel Hydraulics, Tata McGraw Hill, 2009.
7. Ven Te Chow, Open channel Hydraulics, 2009.

COURSE PLAN

Module	Contents	Hours	Sem. Exam Marks
I	Hydraulic Machines - Impulse momentum principle, impact of jets, force of a jet on fixed and moving vanes. Turbines- classification and comparison of velocity triangles for Pelton wheel and reaction turbines (Francis and Kaplan), work done and efficiency, specific speed, draft tube- different types, penstock, surge tank - types, cavitation in turbines (Concepts only).	7	15%

II	Pumps- classification of pumps - Centrifugal pumps- types, work done, efficiency, minimum speed, velocity triangle for pumps, specific speed, priming, limitation of suction lift, net positive suction head, cavitation in centrifugal pump (Concepts only).	7	15%
FIRST INTERNAL EXAMINATION			
III	Introduction : Open channel flow and its relevance in Civil Engineering , Comparison of open channel flow and pipe flow . Flow in open channels-types of channels, types of flow, geometric elements of channel section, velocity distribution in open channels, uniform flow in channels, Chezy's equation, Kutter's and Manning's formula, Most economic section for rectangular and trapezoidal channels. Condition for maximum discharge and maximum velocity through circular channels, computations for uniform flow, normal depth, conveyance of a channel section, section factor for uniform flow.	6	15%
IV	Specific energy, critical depth, discharge diagram, Computation of critical flow, Section factor for critical flow. Specific force, conjugate or sequent depths, hydraulic jump, expression for sequent depths and energy loss for a hydraulic jump in horizontal rectangular channels, types of jump, length of jump, height of jump, uses of hydraulic jump.	6	15%
SECOND INTERNAL EXAMINATION			
V	Gradually varied flow - dynamic equation for gradually varied flow, different forms of dynamic equation, Approximation for a wide rectangular channel, classification of surface profiles, Backwater and drawdown curves, characteristics of surface profiles in prismatic (Rectangular and trapezoidal only). Computation of length of surface profiles, direct step method. Design of lined open channels : trapezoidal cross-sections only	8	20%
VI	Dimensional analysis and model studies - dimensions, dimensional homogeneity, methods of dimensional analysis, Rayleigh method, Buckingham method, dimensionless numbers, Similitude - geometric, kinematic and dynamic similarities. Model laws - Reynold's and Froude model laws, scale ratios, types of models, Concepts of distorted and undistorted models.	8	20%
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN (End semester examination) :

Maximum Marks :100 **Exam Duration: 3 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1. Each part should have at least one question from each module

2. Each question can have a maximum of 4 subdivisions (a,b,c,d)