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

1. Application of the Basic principles and laws governing fluid flow to open channel flow including hydraulic jump & gradually varied flow.
2. An understanding of basic modeling laws in fluid mechanics and dimensional analysis.
3. An ability 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

1. The students become capable of analysis of open channel flows & design of open channels.
2. They get an insight into the working of hydraulic machines.
3. They become capable of studying advanced topics such as design of hydraulic structures.

Text Books:

1. Modi P. N. and S. M. Seth, Hydraulics and Fluid Mechanics (Including Hydraulic Machines), Standard Book House, New Delhi, 2013.
2. Narayana Pillai,N. Principles of Fluid Mechanics and Fluid Machines, University Press, 2011.

References:

1. Ven Te Chow, Open channel Hydraulics, 2009.
2. C S P Ojha, P N Chandramouli and R Brendtsson , Fluid Mechanics and Machinery, Oxford University Press , India , New Delhi
3. Hanif Choudhary, Open channel flow, Prentice Hall, 2010
4. Arora.K.R. Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers, 2005.
5. Jain A. K., Fluid Mechanics, Khanna Publishers, Delhi, 1996.
6. Bansal R. K., A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2010.
7. Subramanya K., Open Channel Hydraulics, Tata McGraw Hill, 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.	8	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.	6	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 Bazin's equations, Manning's formula, Most economic section for rectangular, trapezoidal and triangular 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 channels. Computation of length	8	20

	of surface profiles, direct step method. Design of lined open channels : triangular and trapezoidal cross-sections only		
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, distorted and undistorted models, scale effect in models.	8	20
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN (End semester exam)

Maximum Marks :100 Exam Duration: 3 Hrs

The question paper shall have three parts.

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

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

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

Note : 1.Each part should uniformly cover the two modules in that part.

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