

Course Code	Course Name	L-T-P-Credits	Year of Introduction
CE367	WATER CONVEYANCE SYSTEMS	3-0-0-3	2016

**Pre requisite : CE206 : Fluid Mechanics - II**

**Course objectives:**

- To understand the mechanics of flow through open channel.
- To develop the ability to analyse the flow in a channel in order to design canals and canal structures.
- To enable identification of the components of pipe network system.
- To familiarize with analysis of water distribution systems.

**Syllabus :**

Open channel flow- Pressure distribution in curvilinear flows. Channel transitions with hump or change in width. Uniform flow-composite sections, Hydraulic exponents N and M Design of channels for uniform flow-Non erodible channel-Minimum permissible velocity-channel slopes-best hydraulic section. Erodible channels which scour but do not silt-. Gradually varied flow computations. Unsteady flow-Gradually and Rapidly varied unsteady flow. Head loss due to friction in pipes , Friction factor for smooth and rough pipes, Reservoirs, pumps and special valves, pipe network types and parameter interrelationships Analysis of water distribution network using Hardy cross method

**Expected Outcomes:**

- i. The students will be able to predict the behaviour of flow in a channel under different conditions.
- ii. The students will understand the underlying principles and the design parameters involved in analysis of water distribution system and become capable of analysing a typical pipe network.

**Text Books :**

1. Bhawe P. R. and R. Gupta, Analysis of Flow in Water Distribution Networks, Narosa Publishing House, 2013
2. Rajesh Srivastava, Flow through Open Channels, Oxford University Press, 2007.
3. Subramanya.K. Flow in Open Channels, Tata McGraw Hill Publishing Co. 2009

**References :**

1. Chow V. T., Open Channel Hydraulics, McGraw Hill Book Co. New York, 1990.
2. Hanif Chaudhry.M., Open Channel Flow, Springer, 2008.
3. Hubert Chanson, Hydraulics of Open channel flow, Elsevier Butterworth-Heinemann, 2004.
4. Lary W Mays, Water distribution system Hand book, Mc Graw Hill, 2000.
5. Modi P. N. and S. M. Seth, Hydraulics & Fluid Mechanics, S.B.H Publishers, New Delhi, 2002
6. Richard H French, Open Chanel Hydraulics, Mc Graw Hill, 2000
7. Walksi T M, Analysis of water distribution System, Van Nostrand Reinheld G, New York, 1984

**COURSE PLAN**

Module	Contents	Hours	Sem. Exam Marks %

I	Open channel flow- Pressure distribution in curvilinear flows. Application of specific energy principle to channel transitions with hump or change in width. Uniform flow-composite sections, Equivalent roughness, Hydraulic exponents N and M	6	15
II	Design of channels for uniform flow-Non erodible channel-Minimum permissible velocity-channel slopes-best hydraulic section. Erodible channels which scour but do not silt-Methods of approach-Method of permissible velocity-Tractive force – Method of tractive force-stable hydraulic section.	6	15
<b>FIRST INTERNAL EXAMINATION</b>			
III	Gradually Varied flow computations- Direct integration method, standard step method, Unsteady flow-Gradually varied unsteady flow, Rapidly varied unsteady flow channels- Positive surges, Negative surges.(No numerical problem from negative surges)	7	15
IV	Head loss due to friction in pipes-Nikuradse experiment with artificially roughened pipe, Moody diagram, Friction coefficient for laminar and turbulent flows, reduction of carrying capacity with age. Hazen William's formula. Reservoirs-Impounding reservoir, Service and Balancing reservoir. Two reservoir system, Three Reservoir system. Pumps- system head discharge curve and pump head discharge curve. Special valves-Check valve, Pressure reducing valve-modes of operation(No numerical problem with pressure reducing valve)	6	15
<b>SECOND INTERNAL EXAMINATION</b>			
V	Pipe Network types and parameter interrelationships. Rules for solvability of pipe networks.Formulation of equations-Basic unknown parameter, Pipe discharge equations, Nodal Head equations, Pipe discharge correction equations, Nodal Head correction equations	8	20
VI	Analysis of water distribution network- Single and multisource networks with known pipe resistances- Hardy cross method- Method of balancing head, Method of balancing flow.	9	20
<b>END SEMESTER EXAMINATION</b>			

**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)