Kurigram Polytechnic Institute,Kurigram.

Semester plan

Course name: **Hydraulics**(66456)

Tech: Construction 5th & Civil 5th Semester.

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2	3	3

No.of week	No.of Class	General Topics & Specific Topics.	Remarks
1	1 2 3	**1. Understand the basic concept of fluid and its properties.** 1.1 Define fluid, liquid, gases, fluid mechanics and hydraulics. 1.2 Differentiate fluid, liquid and gases. 1.3 Define density of fluid and specific weight. 1.4 Mention the application of hydraulics.	
2	1 2 3	**2. Understand the aspects of fluid pressure.** 2.1 State the meaning of intensity of pressure. 2.2 State the meaning of pressure head and static head of liquid. 2.3 Define free surface of liquid, atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure. 2.4 Compute the intensity of pressure and total pressure at the base / side wall of a tank full of water. 2.5 Identify hydraulic ram and plunger. 2.6 Explain the working principle of a hydraulic ram. 2.7 Calculate the weight lifting capacity of ram.	
3	1 2 3	**3. Understand the technique of measuring the fluid pressure.** 3.1 Define piezometer, manometer, differential manometer and inverted differential manometer. 3.2 Outline the specific uses and limitations of each of the fluid pressure measuring devices in 3.1. 3.3 Compute liquid pressure using piezometer. 3.4 Compute liquid pressure using simple manometer. 3.5 Compute difference of fluid pressure between two sections of a pipe line using differential manometer. 3.6 Compute difference of fluid pressure between two sections of a pipe line using inverted differential manometer.	
4	1 2 3	**4. Understand the concept of total pressure and center of pressure on immerged plane surface.** 4.1 Explain total pressure and center of pressure on an immerged plane surface. 4.2 Explain total pressure and center of pressure on an immerged inclined plane surface. 4.3 Express the deduction of formula for computing total pressure and center of pressure on a vertically immerged plane surface. 4.4 Express the deduction of formula for computing center of pressure on an inclined immerged surface. 4.5 Compute total pressure and center of pressure on a vertically immerged plane surface. 4.6 Compute total pressure and center of pressure on an inclined immerged surface.	

5	1 2 3	**5. Understand the fundamental concepts of buoyancy.** 5.1 Define buoyancy and center of buoyancy. 5.2 State metacentre and metacentric height. 5.3 Mention the conditions of equilibrium of a floating body. 5.4 Compute the metacentric height using experimental formula. **6. Understand the principles of flow of liquid under different conditions.** 6.1 Define various types of flow such as: laminar flow, turbulent flow, steady flow, unsteady flow, uniform flow, non-uniform flow, incompressible flow, rotational flow, irrotational flow, continuous flow. 6.2 Explain the term discharge. 6.3 State the equation of continuity of liquid flow. 6.4 Explain datum head, velocity head, pressure head and total head of a liquid.	
6	1 2 3	**7. Understand the concept of Bernoulli's theorem.** 7.1 State the Bernoulli's theorem. 7.2 Prove the Bernoulli's theorem. 7.3 Describe construction of venturimeter and pitot tube.	
7	1 2 3	**7. Understand the concept of Bernoulli's theorem.** 7.4 Compute the discharge in a given pipe line by using venturimeter. 7.5 Compute velocity and discharge in a section of a flowing liquid by using a pitot tube.	
8	1 2 3	**8. Understand the aspects of flow through orifice and mouthpiece.** 8.1 Define the terms: orifice, jet of water and venacontracta. 8.2 State the meaning of coefficient of contraction (Cc), coefficient of velocity (Cv), coefficient of discharge (Cd). 8.3 State the relation between Cc, Cv and Cd. 8.4 Calculate the time of emptying a rectangular tank and hemispherical vessel through orifice.	
9	Mid Term Exam		
10	1 2 3	**8. Understand the aspects of flow through orifice and mouthpiece.** 8.4 Calculate the time of emptying a rectangular tank and hemispherical vessel through orifice. 8.5 Define the term mouthpiece. 8.6 Explain the functions of a mouthpiece. 8.7 Distinguish between external and internal mouthpieces.	
11	1 2 3	**9. Understand the aspects of different types of losses of head of flowing liquid.** 9.1 Define loss of head of flowing fluid. 9.2 Explain different types of losses of head of flowing liquid such as: a) Loss of head due to friction. b) Loss of head due to bend and elbows. c) Loss of head due to sudden enlargement. d) Loss of head due to sudden contraction. e) Loss of head at entrance to pipe. f) Loss of head due to obstruction. 9.3 Calculate loss of head due to friction.	

12	1 2 3	**10. Understand the aspects of friction and flow through pipes.** 10.1 Describe friction of fluid flowing through pipes. 10.2 State the Chezy's formula for loss of head due to friction in pipes. 10.3 State the Darcy's formula for loss of head due to friction in pipes. 10.4 Calculate the loss of head due to friction in pipes using Chezy's formula. 10.5 Calculate the loss of head due to friction in pipes using Dracy's formula.	
13	1 2 3	**11. Understand the principle of flow through notches.** 11.1 Describe notch. 11.2 Identify different types of notches. 11.3 Outline the advantages of triangular notch over rectangular notch. 11.4 State the formulae for measuring discharges through rectangular notch, V-notch and trapezoidal notch. 11.5 Calculate the discharges through rectangular notch using discharge formulae. 11.6 Calculate the discharges through triangular notch using discharge formulae. 11.7 Calculate the discharges through trapezoidal notch using discharge formulae.	
14	1 2 3	**12. Understand the principle of flow through weirs.** 12.1 Describe weir. 12.2 Outline the differences between weir and notche. 12.3 State Francis' formula for discharge through a rectangular weir. 12.4 State Bazin's formula for discharge through a rectangular weir. 12.5 Calculate the discharges through rectangular weir using Francis' formula. 12.6 Calculate the discharges through rectangular weir using Bazin's formula.	
15		**13. Understand the aspects of flow of liquid through open channel.** 13.1 Describe open channel, wetted perimeter, hydraulic radius, Laminar and turbulent flow, Reynold's number, hydraulic jump, critical depth, Critical velocity and hydraulic gradient. 13.2 State the different types of open channels. 13.3 State the Chezy's formula for velocity of flow in open channel. 13.4 State the Manning's formula for velocity of flow in open channel. 13.5 Select the conditions for most economical section of a rectangular channel. 13.6 Mention the uses of current meter and float to determine velocity of flow. 13.7 Measurement of velocity of flow by current meter and float.	
16		Extra Class	

PRACTICAL:

1. Measure pressure at a particular section / point of a tank or pipe line:
2. Measure difference of pressure between two sections of a flowing liquid:

a) by differential manometer.

b) by inverted differential manometer.

3. Demonstrate proof of Bernoulli's theorem.
4. Measure discharge through a pipe line by venturimeter.
5. Determine coefficient of discharge (Cd), coefficient of velocity (Cv) and coefficient of contraction (Cc).
6. Measure discharge through a triangular notch (V-notch) and determine the coefficient of discharge.
7. Observe different types of flow in a typical open channel.

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