

**NIRMA UNIVERSITY**

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| <b>Institute:</b>            | <b>Institute of Technology</b>                      |
| <b>Name of Programme:</b>    | <b>B. Tech. in Civil Engineering</b>                |
| <b>Course Code:</b>          | 3CL601CC24  |
| <b>Course Title:</b>         | <b>Hydraulics &amp; Water Resources Engineering</b> |
| <b>Course Type:</b>          | <b>Core</b>   |
| <b>Year of Introduction:</b> | <b>2024-25</b>                                      |

| L | T | Practical Component |    |   |   | C |
|---|---|---------------------|----|---|---|---|
|   |   | LPW                 | PW | W | S |   |
| 3 | - | 2                   | -  | - | - | 4 |

**Course Learning Outcomes (CLOs):**

At the end of the course, the student will be able to –

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|--|-------|
| 1. apply the concept of statics, kinematics, and dynamics of fluid flow                  | (BL3) |
| 2. analyse fluid flow through pipes and open channel                                     | (BL4) |
| 3. outline the concept of surface and ground water hydrology                             | (BL2) |
| 4. utilise the principle of canal design and select the irrigation method for irrigation | (BL3) |
| 5. analyse and design the gravity and earthen dams                                       | (BL4) |

| Unit     | Contents   | Teaching hours<br>(Total 45) |
|----------|--|------------------------------|
| Unit-I   | <b>Statics, Kinematics and Dynamics of Flow</b><br>statics: properties of fluids, measurement of pressure, simple and differential manometers, buoyancy and floatation. kinematics: methods describing fluid in motion, types of fluid flow, rate of flow, continuity equation in three dimensions. dynamics: Euler's equation of motion, Bernoulli's equation & practical applications. | 12                           |
| Unit-II  | <b>Flow Through Pipes and Open Channel</b><br>flow through pipes: major and minor energy losses in pipes, pipes in series and parallel, orifice and mouthpiece. open channel flow: classification of flow, discharge through open channel, notches and weir.   | 08                           |
| Unit-III | <b>Engineering Hydrology</b><br>surface water hydrology: hydrological cycle, precipitation, infiltration, evapotranspiration, runoff, hydrograph analysis, unit hydrograph. ground water hydrology: sources, aquifer properties, Darcy's law, coefficient of permeability and yield, steady flow to a well, groundwater withdrawals, types of wells.                                     | 10                           |



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| Unit-IV | <b>Irrigation Engineering</b><br>introduction, soil moisture & plant growth, surface & subsurface irrigation methods, irrigation efficiencies, duty-delta-base period and its relation. types and classification of canals, design criteria for unlined and lined canals. | 07 |
| Unit-V  | <b>Dam Engineering</b><br>types and classification of dams, criteria for dam site location and types of dams, forces acting on gravity dam, stability analysis, types and construction method of earthen dam, failure and protection of earthen dam.                      | 08 |

Self-Study: The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents.

- Suggested Readings/  
References:
- Hibbeler, R. C. *Textbook of Fluid Mechanics*, Pearson.
  - Bansal, R. K. A. *Textbook of Fluid Mechanics & Hydraulic Machines*, Laxmi Publications.
  - Ramamrutham, S. *Hydraulic Fluid Mechanics and Fluid Machines*, Dhanpat Rai.
  - Rajput, R. K. *Textbook of Fluid Mechanics and Hydraulic Machines*, S. Chand & Co.
  - Subramanya, K. *Fluid Mechanics and Hydraulic Machines*, Tata McGraw-Hill Publishing Co. Ltd.
  - Punmia B. C., *Irrigation and Hydraulic Structures*, Laxmi Publications.
  - Subramaniya, K. *Engineering Hydrology*, Tata McGraw Hill.
  - Modi P. N., *Irrigation Water Resources and Water Power Engineering*, Standard Book House.
  - Raghunath, H.M. *Ground Water*, Wiley Eastern.
  - Jayarami Reddy, P. *A Textbook of Hydrology*, Laxmi Publications.

Laboratory Work: Laboratory work will be based on the above syllabus with minimum 10 experiments to be incorporated.

Suggested List of Experiments (not restricted to the following):  
(Only for Information)

| Sr. No. | Name of Experiment/Exercise  | Hours |
|---------|--|-------|
| 1.      | Measurement of the relation of pressure & depth and metacentric height for floating body | 02    |
| 2.      | Determination of Bernoulli's theorem and orifice meter and venturi meter                 | 04    |
| 3.      | Measurement of discharge major & minor loss  | 04    |

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|-----|--|----|
| 4.  | Measurement of discharge in the open channel through notch & weir              | 04 |
| 5.  | Measurement of rainfall using non-recording and recording rain gauge           | 02 |
| 6.  | Determination of infiltration capacity of soil using double ring infiltrometer | 02 |
| 7.  | Measurement of evaporation using pan evaporimeter                              | 02 |
| 8.  | Measurement of flow velocity and discharge using current meter                 | 02 |
| 9.  | Design of gravity dam & canal design   | 06 |
| 10. | Measurement of soil moisture and groundwater level                             | 02 |

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