

Th2. HYDRAULICS & IRRIGATION ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course will be imparted in two parts. Primarily it aims to explain students the need of irrigation and components of the irrigation system which is covered in the second part of the course. The course aims to explain students the intricacies of irrigation engineering with reference to basic sciences relating to fluid mechanics and hydraulic machines. The essential components of fluid mechanics and hydraulic machines will be addressed in the first part of the course.

B. COURSE OBJECTIVES

On completion of the course students will be able to -

1. Define common fluid properties and interpret results from pressure measuring instruments.
2. Realize the science behind fluid flow and compute fluid flow characteristics through notches, weirs, channels and pipes.
3. Realize the working principle of hydraulic pumps and evaluate their performance in general cases.
4. Comprehend the need of irrigation
5. Determine cause and effect of water logging
6. Comprehend the purpose of irrigation system components and elaborate on these

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name Of Topics	Periods
<i>PART: A (Hydraulics And Machines)</i>		
1	Hydrostatics	12
2	Kinematics Of Fluid Flow	18
3	Pumps	05
<i>Part: B (Irrigation Engineering)</i>		
1	Hydrology	04
2	Water Requirement Of Crops	04
3	Flow Irrigation	07
4	Water Logging And Drainage :	02
5	Diversion Head Works And Regulatory Structures	08
6	Cross Drainage Works :	07
7	Dams	08

D. COURSE CONTENTS:

PART: A (Hydraulics)

- 1 **HYDROSTATICS:**
 - 1.1 **Properties of fluid:** density, specific gravity, surface tension, capillarity, viscosity and their uses
 - 1.2 **Pressure and its measurements:** intensity of pressure, atmospheric pressure, gauge pressure, absolute pressure and vacuum pressure; relationship between atmospheric pressure, absolute pressure and gauge pressure; pressure head; pressure gauges.
 - 1.3 **Pressure exerted on an immersed surface:** Total pressure, resultant pressure, expression for total pressure exerted on horizontal & vertical surface.
- 2 **KINEMATICS OF FLUID FLOW:**
 - 2.1 **Basic equation of fluid flow and their application:** Rate of discharge, equation of continuity of liquid flow, total energy of a liquid in motion- potential, kinetic & pressure, Bernoulli's theorem and its limitations. Practical applications of Bernoulli's equation.
 - 2.2 **Flow over Notches and Weirs:** Notches, Weirs, types of notches and weirs, Discharge through different types of notches and weirs-their application (No Derivation)
 - 2.3 **Types of flow through the pipes:** uniform and non uniform; laminar and turbulent; steady and unsteady; Reynold's number and its application
 - 2.4 **Losses of head of a liquid flowing through pipes:** Different types of major and minor losses. Simple numerical problems on losses due to friction using Darcy's equation, Total energy lines & hydraulic gradient lines (Concept Only).
 - 2.5 **Flow through the Open Channels:** Types of channel sections-rectangular, trapezoidal and circular, discharge formulae- Chezy's and Manning's equation, Best economical section.
- 3 **PUMPS:**
 - 3.1 **Type of pumps**
 - 3.2 **Centrifugal pump:** basic principles, operation, discharge, horse power & efficiency.
 - 3.3 **Reciprocating pumps:** types, operation, discharge, horse power & efficiency

PART: B (Irrigation Engineering)

- 1 **Hydrology**
 - 1.1 Hydrology Cycle
 - 1.2 Rainfall: types, intensity, hyetograph
 - 1.3 Estimation of rainfall, rain gauges, Its types(concept only),
 - 1.4 Concept of catchment area, types, run-off, estimation of flood discharge by Dicken's and Ryve's formulae
- 2 **Water Requirement of Crops**
 - 2.1 Definition of irrigation, necessity, benefits of irrigation, types of irrigation
 - 2.2 Crop season
 - 2.3 Duty, Delta and base period their relationship, overlap allowance, kharif and rabi crops
 - 2.4 Gross command area, culturable command area, Intensity of Irrigation, irrigable area, time factor, crop ratio

- 3 FLOW IRRIGATION**
 3.1 Canal irrigation, types of canals, loss of water in canals
 3.2 Perennial irrigation
 3.3 Different components of irrigation canals and their functions
 3.4 Sketches of different canal cross-sections
 3.5 Classification of canals according to their alignment, Various types of canal lining – Advantages and disadvantages
- 4 WATER LOGGING AND DRAINAGE :**
 4.1 Causes and effects of water logging, detection, prevention and remedies
- 5 DIVERSION HEAD WORKS AND REGULATORY STRUCTURES**
 5.1 Necessity and objectives of diversion head works, weirs and barrages
 5.2 General layout, functions of different parts of barrage
 5.3 Silting and scouring
 5.4 Functions of regulatory structures
- 6 CROSS DRAINAGE WORKS :**
 6.1 Functions and necessity of Cross drainage works - aqueduct, siphon, super-passage, level crossing
 6.2 Concept of each with help of neat sketch
- 7 DAMS**
 7.1 Necessity of storage reservoirs, types of dams
 7.2 Earthen dams: types, description, causes of failure and protection measures.
 7.3 Gravity dam- types, description, Causes of failure and protection measures.
 7.4 Spillways- Types (With Sketch) and necessity.

E. Syllabus Coverage up to Internal Assessment: Part A: Chapters 1, 2 & Part B: 1, 2

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	Modi & Seth	Fluid Mechanics & Hydraulic machines	Standard Book House
2	D.R. Biswal	Hydraulics & Fluid Mechanics	Kalyani Pbln
3	R.K.Rajput	A Text Book of Fluid Mechanics & Hydraulic machines	S.Chand

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.K.Garg	Irrigation Engineering & Hydraulics Structures	Khanna Publishers
2	N. N. Basak	Irrigation Engineering	TMH Publishing
3	S.K. Sharma	Irrigation Engineering & Hydraulic structures.	S. Chand Pbln