4025 - HYDRAULICS

Teaching Schedule Per Week			Progressive Assessment	Examination Schedule (Marks)			
Lectures	Practical	Credits		Theory		Practical Ex.	Total
3	2	5	25	4 Hrs.	100	25	150

Pre-requisite	Source
Nil	CIV-MEC

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	25	–	125

RATIONALE:- Hydraulics as a branch of fluid mechanics is a basic subject for all branches of Engineering disciplines. The subject is designed to teach the students the concepts, principles. And procedures of hydraulics for planning designing supervising, executing and maintaining of the works related to Irrigation, Environmental Engineering systems & Transportation Engineering system.

COURSE CONTENTS	Hrs	Mks
1. INTRODUCTION Definition and classification of fluids. 2. Branches of hydraulic - Hydraulics & Hydrodynamics. 3. Fluid properties – Density, specific gravity, specific weight, viscosity, surface tension, capillarity, compressibility.	2	4
2. HYDROSTATICS 1 Liquid pressure, pressure head. 2 Atmospheric pressure Absolute pressure; gauge pressure. 3 Pressure measuring devices-Manometers-principle & working of Piezometer tube, simple 'U' tube, differential 'U' tube, & inverted 'U' tube manometers. Mechanical gauges: Bourdes pressure gauge-its working principle. 4 Pressure on plane surfaces immersed in liquid, total pressure,Centre of pressure pressure diagrams.	12	24
3. HYDRODYNAMICS 1. Types of flow: steady, unsteady, - uniform, non uniform, laminar & turbulent flow. Compressible, incompressible flow. 2. Discharge principles of continuity, Energies of liquid – pressure head, Datum head velocity head. Total energy of liquid, Bernoullis theorem – Pitot tube, Venturi-meter.	6	12
4. FLOW THROUGH ORIFICES & MOUTH PIECES 1. Definition of an orifice, types, Vena contracta. 2. Hydraulic coefficients Co.Cv & Cd discharge through an orifice. 3. Mouthpieces: Types, external, convergent, divergent, Bordas mouthpiece, calculation of discharge.	4	10
5. NOTCHES & WEIRS 1. Definition, types of notches, Rectangular, 'V' & trapezoidal discharges over notches. 2. Discharge over a weir, end contraction, velocity of approach, Francis & Bazier's formula.	4	0
6. FLOW THROUGH PIPES 1. Laws of fluid friction, 2. Reynold's number; it significance. 3. Various losses in pipe flow, Major & minor, friction loss, Loss of head due to entrance, sudden enlargement, sudden contraction, obstruction line & total energy line.	6	12

4 Hydraulic gradient line & total energy line.
5 Flow through pipes in series & parallel, compound pipe & equivalent pipe.
6 Water hammer – causes, effect and remedial measure – (no Derivation required)
7 Use of nomogram in the distribution system.

7. FLOW THROUGH OPEN CHANNEL 8 16

1 Types of channel flow, different shapes of artificial channels , Rectangular, trapezoidal. Wetted perimeter, Hydraulic mean Depth.
2. Most economic section of channel for Rectangular & Trapezoidal.
3. Hydraulic jump – significance & application.

8. HYDRAULIC MACHINES 6 12

(Principles of working, No mathematical treatment required)
1. Introduction, 2. Hydraulic Accumulator, 3. Hydraulic Intensifier, 4 Centrifugal pump, 5 Reciprocating Pump, 6 Power required to drive the pump and selection of pump, 7 Hydraulic Ram

Total 8 00

PRACTICAL

1. Verification of Bernoulli`s Theorem.
2. Determination of coefficient of Venturimeter and Orificemeter.
3. Determination of Hydraulic coefficients for circular orifice.
4. Determination of coefficient of discharge for Rectangular Notch, 'V- notch & Trapezoidal Notch.
5. Determination of coefficient of discharge for External Mouthpiece.
6. Determination of coefficient of friction for flow through pipes.
7. Study of simple Hydraulic Machines.(any two)

REFERENCE BOOKS

1. A Textbook of Fluid Mechanics and Hydraulic Machines in S.I. Units – by R.K. Rajput.
2. Hydraulic and Hydraulic Machines – by Modi & Seth.
3. Hydraulic and Hydraulic Machines – by R.S. Khurmi.
4. Hydraulic and Hydraulic Machines – by Jagdish Lal.