

ANNEXURE - I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1010 : DIPLOMA IN CIVIL ENGINEERING SYLLABUS

N-SCHEME

(To be implemented for the students from the year 2020-21 onwards)

CURRICULUM OUTLINE

FOURTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010410	Theory of Structures	6	-	-	6
4010420	Hydraulics	6	-	-	6
4010430	Transportation Engineering	5	-	-	5
4010440	Hydraulics Laboratory	-	-	4	4
4010450	Material Testing Laboratory-II	-	-	3	3
4010460	Construction Practice Laboratory	-	-	4	4
4010470	Surveying Practice -II	-	-	4	4
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	17	-	15	35

ANNEXURE – II

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(To be implemented for the students from the year 2020-21 onwards)

SCHEME OF EXAMINATION

FOURTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Examination Marks (Converted to 75)	Total Mark		
4010410	Theory of Structures	25	100	100	40	3
4010420	Hydraulics	25	100	100	40	3
4010430	Transportation Engineering	25	100	100	40	3
4010440	Hydraulics Laboratory	25	100	100	50	3
4010450	Material Testing Laboratory–II	25	100	100	50	3
4010460	Construction Practice Laboratory	25	100	100	50	3
4010470	Surveying Practice –II	25	100	100	50	3
TOTAL			700	700		

RATIONALE:

Study of structural behaviour, analysis and design is a principal part of civil engineering courses and is essential for professional accreditation. This subject enhances the structural analytical ability of the students.

OBJECTIVES:

On completion of the course, the students will be able to:

- Determine the of Slope and Deflection of Determinate beams by area moment method.
- Analyse of Propped cantilevers and Fixed beams by Area-Moment method and draw SFD, BMD.
- Analyse of Continuous beams by Theorem of Three moments and draw SFD, BMD.
- Analyse of Continuous beams, Portal frames and Substitute frames by Moment Distribution Method and draw SFD, BMD.
- Define the different types of Columns and finding critical loads of Columns.
- Analyse of Columns and Chimneys subject to eccentric loading / moment / horizontal loads and find maximum and minimum combined stresses in their sections.
- Calculate the maximum and minimum bearing pressures and check the stability of Masonry Dams
- Calculate the maximum and minimum bearing pressures and check the stability of Retaining walls.

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Unit	Name of the Topics	Hours
IV	<p>4.1 COLUMNS AND STRUTS</p> <p>Columns and Struts – Definition – Short and Long columns – End conditions – Equivalent length / Effective length– Slenderness ratio – Axially loaded short column - Axially loaded long column – Euler’s theory of long columns – Derivation of expression for Critical load of Columns with hinged ends – Expressions for other standard cases of end conditions (separate derivations not required) – Problems – Derivation of Rankine’s formula for Crippling load of Columns– Factor of Safety- Safe load on Columns- Simple problems.</p>	9
	<p>4.2 COMBINED BENDING AND DIRECT STRESSES</p> <p>Direct and Indirect stresses – Combination of stresses – Eccentric loads on Columns – Effects of Eccentric loads / Moments on Short columns – Combined direct and bending stresses – Maximum and Minimum stresses in Sections– Problems – Conditions for no tension – Limit of eccentricity – Middle third rule – Core or Kern for square, rectangular and circular sections – Chimneys subjected to uniform wind pressure – Combined stresses in Chimneys due to Self weight and Wind load- Chimneys of Hollow square and Hollow circular cross sections only – Problem.</p>	
V	<p>5.1 MASONRY DAMS</p> <p>Gravity Dams – Derivation of Expression for maximum and minimum stresses at Base – Stress distribution diagrams – Problems – Factors affecting Stability of masonry dams – Factor of safety- Problems on Stability of Dams– Minimum base width and maximum height of dam for no tension at base – Elementary profile of a dam – Minimum base width of elementary profile for no tension - Middle third rule.</p>	8
	<p>5.2 EARTH PRESSURE AND RETAINING WALLS</p> <p>Definition – Angle of repose /Angle of Internal friction of soil– State of equilibrium of soil – Active and Passive earth pressures – Rankine’s theory of earth pressure – Assumptions – Lateral earth pressure with level back fill / level surcharge (Angular Surcharge not required)– Earth pressure due to Submerged soils –(Soil retained on vertical back</p>	

	of wall only) – Maximum and minimum stresses at base of Trapezoidal Gravity walls – Stress distribution diagrams – Problems – Stability of earth retaining walls – Problems to check the stability of walls-Minimum base width for no tension.	
	Test & Model exam	7 Hrs.

Reference Books :

1. S. Ramamrutham, “Theory of structures”, Dhanpat Rai Publications, New Delhi
2. B.C. Punmia, Ashok Jain & Arun Jain,” Theory of structures “,Laxmi Publications, 9th Edition, April1992.
3. S.B. Junnarkar, Mechanics of structures (Vol.II) Charator Publishing House Anand, Gujarat.
4. V.N. Vazirani & M.M. Ratwani, “Analysis of structures”, Khanna Publishers, New Delhi.
5. R.L. Jindal , “Elementary Theory of Structures”, S.Chand Pvt., Co. Ltd.New Delhi.
6. Madhan Mohan Dass, “ Structural Analysis” PHI Learning Pvt. Ltd., New Delhi.

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DIPLOMA IN CIVIL ENGINEERING

II YEAR

N-SCHEME

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IV SEMESTER
HYDRAULICS

IMPLEMENTED FROM 2020 -2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI - 600 025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN CIVIL ENGINEERING SYLLABUS
N-SCHEME

(To be implemented to the students admitted from the year 2020-2021 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING
Subject Code : 4010420
Semester : IV Semester
Subject Title : **HYDRAULICS**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
HYDRAULICS	6 Hrs.	96 Hrs.	Internal	Board	Total	3 Hrs.
			Assessment	Examination		
			25	100*	100	

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	Introduction of measurement of Pressure Hydrostatic Pressure on Surfaces	20
II	Flow of fluids, Flow through Orifices and Mouthpieces, Flow through Pipes	20
III	Flow through Notches and Flow through weirs	16
IV	Flow through Open channels	15
V	Pumps	18
	Test & Model Exam	7
	Total	96

RATIONALE:

Subject of hydraulics is a science subject and helps in solving problems in the field of Aeronautical, Electronics, Electrical, Mechanical, Metallurgical Engineering subject. The subject deals with basic concepts and principles in hydrostatics, hydro- kinematics and hydrodynamics and their application in solving fluid flow problems.

OBJECTIVES:

On completion of the course, the students will be able to:

- Define the properties of fluids and their physical quantities.
- List the different types of pressures and various pressure measuring devices.
- Calculate hydrostatic forces on plane surfaces immersed in water.
- Understand types of forces, energy and application of Bernoulli's theorem.
- Know the different types of Orifices and Mouthpieces and to derive discharge formulae and their practical applications.
- State the different losses of head of flowing liquids in pipes and their equations.
- Know the different types of Notches and Weirs, and deriving the discharge formulas and their Practical applications.
- Study the different types of Channels and their discharge formulas and to determine the condition for maximum discharge.
- Learn the construction details, specifications and efficiencies of Reciprocating Pumps and Centrifugal Pumps.

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DETAILED SYLLABUS

4010420 - HYDRAULICS

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>1.1 INTRODUCTION</p> <p>Hydraulics – Definition - Properties of fluids - Mass, force, weight, specific volume, specific gravity, specific weight, density, relative density, compressibility, viscosity, cohesion, adhesion, capillarity and surface tension - Dimensions and Units for area, volume, specific volume, velocity, acceleration, density, discharge, force, pressure and power.</p> <p>1.2 MEASUREMENT OF PRESSURE</p> <p>Pressure of liquid at a point – Intensity of pressure - Pressure head of liquid – Conversion from intensity of pressure to pressure head and vice-versa - Formula and Simple problems - Types of pressures - Static pressure, Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute pressure – Simple problems - Measurement of pressure - Simple mercury barometer - Pressure measuring devices- Piezometer tube - Simple U-tube manometer - Differential manometer – Micrometer - Problems.</p> <p>1.3 HYDROSTATIC PRESSURE ON SURFACES</p> <p>Pressure on plane surfaces - Horizontal, vertical and inclined surfaces- Total pressure-Centre of pressure - Depth of centre of pressure - Resultant pressure – Problems on Practical application - Sluice gates, Lock gates and Dams- Descriptions.</p>	<p>6</p> <p>9</p> <p>5</p>
II	<p>2.1 FLOW OF FLUIDS</p> <p>Types of flow – Laminar and turbulent flow - Steady and unsteady flow – Uniform and Non-uniform flow - Equation for continuity of flow (law of conservation of mass) – Energy possessed by a fluid body - Potential energy and Potential Head – Pressure energy and Pressure Head - Kinetic Energy and Kinetic Head - Total Energy and Total Head – Bernoulli's theorem – (No proof) – Problems on Practical applications of Bernoulli's theorem – Venturimeter - Orificemeter (Derivation not necessary) - Simple problems.</p>	8

	<p>2.2 FLOW THROUGH ORIFICES AND MOUTHPIECES</p> <p>Definitions- Types of orifices - Vena contracta and its significance – Hydraulic coefficients Cd, Cv and Cc - Formula - Simple problems - Large orifice – Definition – Discharge formula – Simple problems - Practical applications of orifices – Types of mouthpieces - External and internal mouthpieces - Discharge formula - Simple problems.</p>	6
	<p>2.3 FLOW THROUGH PIPES</p> <p>Definition of pipe-Losses of head in pipes – Major losses - Minor losses - Sudden enlargement, sudden contraction, obstruction in pipes (no proof) - Simple problems – Energy / Head losses of flowing fluid due to friction - Darcy's equation - Chezy's equation (No derivation) – Problems - Transmission of power through pipes – Efficiency - Pipes in parallel connected to reservoir - Discharge formula - Simple problems.</p>	6
III	<p>3.1 FLOW THROUGH NOTCHES</p> <p>Definitions- Types of notches – Rectangular, Triangular and Trapezoidal notches – Derivation of equations for discharges - Simple problems - Comparison of V-Notch and Rectangular Notch.</p> <p>3.2 FLOW THROUGH WEIRS</p> <p>Definitions - Classification of weirs - Discharge over a rectangular weir and trapezoidal weir – Derivation – Simple problems – End contractions of a weir – Franci's and Bazin's formula – Simple problems - Cippoletti weir – Problems - Narrow crested weir – Sharp crested weir with free over fall - Broad crested weir - Drowned or Submerged weirs - Suppressed weir - Stepped weir – Problems - Definition of terms - Crest of sill, Nappe or Vein, Free discharge - Velocity of approach – Spillways.</p>	6 10
IV	<p>4.1 FLOW THROUGH OPEN CHANNELS</p> <p>Definition - Classification - Rectangular and Trapezoidal channels – Discharge – Chezy's formula, Bazin's formula and Manning's formula - Hydraulic mean depth – Problems - Conditions of rectangular/trapezoidal sections - Specific energy, critical depth –Conditions of maximum discharge and maximum velocity - Problems - Flow in a venturiflume –</p>	15

	Uniform flow in channels – Flow through a sluice gate – Types of channels – Typical cross- sections of irrigation canals - Methods of measurements of velocities – Channel losses - Lining of canals – Advantages of lining of canals - Types of lining- Cement concrete lining with sketches - Soil cement lining with sketches – LDPE lining.	
V	<p>5.1 PUMPS</p> <p>Pumps – Definition – Difference between a pump and a turbine- Classification of pumps - Positive displacement pumps and roto-dynamic pressure pumps - Characteristics of modern pumps - Maximum recommended suction, lift and power consumed- Reciprocating pump - Construction detail and working principle - Types - Single acting and Double acting -Slip -Air vessels- Discharge and Efficiency- Problems - Centrifugal pump</p> <p>Advantages and disadvantages over a reciprocating pump - Layout - Construction details – Priming of centrifugal pump – Working of the pump – Classification – Functions of Foot valve, Delivery valve and Non-return valve – Fundamental equation of centrifugal pump - Characteristics of a centrifugal pump – Discharge, power and efficiency - Problems - Specifications of centrifugal pumps and their sections- Hand pump - Jet pump- Deep well pump - Plunger pumps - Piping system- Computation of power required for pumps, Other types of pumps (not for exam)- Selection and choice of pump.</p>	18
	Test & Model Exam	7 Hrs.

Reference Books

1. Dr. Jagadish Lal - Hydraulics, Fluid Mechanics and Hydraulic Machines- Metropolitan Book Company- New Delhi
2. P.N. Modi & S.M. Sethi - Fluid Mechanics - Standard Publishers – New Delhi
3. S. Ramamirtham-Hydraulics,Fluid Mechanics and Hydraulics Machines-Dhanpat Rai & Sons, New Delhi
4. K.L.Kumar - Fluid Mechanics – Eurasia Publshing House – New Delhi
5. R.K. Bansal - Fluid Mechanics - Lakshmi Publications
6. Prof. S. Nagarathinam - Fluid Mechanics - Khanna Publishers – New Delhi
7. K.R. Arora - Hydraulics, Fluid Mechanics and Hydraulics Machines –Standard Publishers & Distributors, New Delhi
8. B C S Rao, “Fluid Mechanics and Machinery” Tata-McGraw-Hill Pvt. Ltd., New Delhi

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