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	Subject Name	Hours Per Week				
Code	Subject Name	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	3112	-	3	3	
4010460	Construction Practice Laboratory	THE	J.C	4	4	
4010470	Surveying Practice –II	-	-	4	4	
Co- curricular	Physical Education	-	-	-	2	
activities	Library	-	-	-	1	
	TOTAL	17	-	15	35	

ANNEXURE - II

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)

SCHEME OF EXAMINATION

FOURTH SEMESTER (FULL TIME)

		Exam	Examination Marks			
Subject Code	Subject Name	Internal assessment Marks	Board Examination Marks (Converted to 75)	Total Mark	Minimum for pass	Duration of Exam Hours
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.

DETAILED SYLLABUS4010410 THEORY OF STRUCTURES

Contents: Theory

Unit	Name of the Topics	Hours
I	1.1 SLOPE AND DEFLECTION OF BEAMS	10
	Deflected shapes / Elastic curves of beams with different support	
	conditions –Definition of Slope and Deflection- Flexural rigidity and	
	Stiffness of beams- Mohr's Theorems – Area Moment method for slope	
	and deflection of beams – Derivation of expressions for maximum slope	
	and maximum deflection of standard cases by area moment method for	
	cantilever and simply supported beams subjected to symmetrical UDL	
	& point loads – Numerical problems on determination of slopes and	
	deflections at salient points of Cantilevers and Simply supported beams	
	from first principles and by using formulae.	
	1.2 PROPPED CANTILEVERS	8
	Statically determinate and indeterminate Structures- Stable and	
	Unstable Structures- Examples- Degree of Indeterminacy- Concept of Analysis of Indeterminate beams - Definition of Prop-Types of Props-	
	Prop reaction from deflection consideration – Drawing SF and BM	
	diagrams by area moment method for UDL throughout the span, central	
	and non-central concentrated loads – Propped cantilever with	
	overhang – Point of Contra flexure.	
II	2.1 FIXED BEAMS – AREA MOMENT METHOD	9
	Introduction to fixed beam - Advantages –Degree of indeterminacy of	
	fixed beam- Sagging and Hogging bending moments – Determination	
	of fixing end(support) moments(FEM) by Area Moment method –	
	Derivation of Expressions for Standard cases – Fixed beams subjected	
	to symmetrical and unsymmetrical concentrated loads and UDL –	
	Drawing SF and BM diagrams for Fixed beams with supports at the	
	same level (sinking of supports or supports at different levels are not	
	included) – Points of Contra flexure –Problems- Determination of Slope	
	and Deflection of fixed beams subjected to only symmetrical loads by	
	area moment method – Problems.	

II	2.2 CONTINUOUS BEAMS – THEOREM OF THREE MOMENTS	9
	METHOD	
	Introduction to continuous beams – Degree of indeterminacy of	
	continuous beams with respect to number of spans and types of	
	supports –Simple/Partially fixed / Fixed supports of beams- General	
	methods of analysis of Indeterminate structures – Clapeyron's theorem	
	of three moments – Application of Clapeyron's theorem of three	
	moments for the following cases – Two span beams with both ends	
	simply supported or fixed - Two span beams with one end fixed and	
	the other end simply supported – Two span beams with one end simply	
	supported or fixed and other end overhanging –Determination of	
	Reactions at Supports- Application of Three moment equations to	
	Three span Continuous Beams and Propped cantilevers –Problems-	
	Sketching of SFD and BMD for all the above cases.	
III	3.1 CONTINUOUS BEAMS – MOMENT DISTRIBUTION METHOD	10
	Introduction to Carry over factor, Stiffness factor and Distribution factor	
	Stiffness Ratio or Relative Stiffness- Concept of distribution of unbalanced moments at joints - Sign conventions	
	- Application of M-D method to Continuous beams of two / three spans	
	and to Propped cantilever (Maximum of three cycles of distribution	
	sufficient) –Finding Support Reactions- Problems - Sketching SFD and	
	BMD for two / three span beams.	
	3.2 PORTAL FRAMES – MOMENT DISTRIBUTION METHOD	8
	Definition of Frames – Types – Bays and Story - Sketches of	
	Single/Multi Story Frames, Single/Multi Bay Frames- Portal Frame -	
	Sway and Non- sway Frames- Analysis of Non sway (Symmetrical)	
	Portal Frames for Joint moments by Moment Distribution Method and	
	drawing BMD only- Deflected shapes of Portal frames under different	
	loading / support conditions.	

Unit	Name of the Topics	Hours
IV	4.1 COLUMNS AND STRUTS	9
	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.	
	4.2 COMBINED BENDING AND DIRECT STRESSES	9
	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.	
V	5.1 MASONRY DAMS	8
	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.	
	5.2 EARTH PRESSURE AND RETAINING WALLS	9
	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	

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

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.





DIPLOMA IN CIVIL ENGINEERING

II YEAR
N-SCHEME



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

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

^{*} 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	20
	Surfaces	
II	Flow of fluids, Flow through Orifices and Mouthpieces, Flow through	20
	Pipes	
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.

DETAILED SYLLABUS

4010420 - HYDRAULICS

Contents: Theory

Unit	Name of the Topics	Hours
ı	1.1 INTRODUCTION	6
	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.	
	1.2 MEASUREMENT OF PRESSURE	9
	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.	
	1.3 HYDROSTATIC PRESSURE ON SURFACES	5
	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.	
II	2.1 FLOW OF FLUIDS	8
	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.	

	2.2 FLOW THROUGH ORIFICES AND MOUTHPIECES	6
	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.	
	2.3 FLOW THROUGH PIPES	6
	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.	
III	3.1 FLOW THROUGH NOTCHES	6
	Definitions- Types of notches – Rectangular, Triangular and Trapezoidal	
	notches – Derivation of equations for discharges - Simple problems - Comparison of V-Notch and Rectangular Notch.	
	3.2 FLOW THROUGH WEIRS	40
	Definitions - Classification of weirs - Discharge over a rectangular weir	10
	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.	
IV	4.1 FLOW THROUGH OPEN CHANNELS	15
	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 -	

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

Reference Books

- 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
- S. Ramamirtham-Hydraulics, Fluid Mechanics and Hydraulics Machines-Dhanpat Rai
 & Sons, New Delhi
- 4. K.L.Kumar Fluid Mechanics Eurasa Publishing 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

www.binils.com