TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (AUTONOMOUS), MADURAI- 11

DIPLOMA IN CIVIL ENGINEERING

N - 20-SCHEME

(Implemented from the Academic year 2021-2022 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**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (AUTONOMOUS), MADURAI- 11

DIPLOMA IN CIVIL ENGINEERING

N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

CURRICULUM OUTLINE

FOURTH SEMESTER (PART TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4010330	Surveying	4	-	-	4
4010430	Transportation Engineering	4	-	-	4
4010360	Material Testing Laboratory-I	-	-	2	2
4010370	Surveying Practice-I	-	-	2	2
40002	Computer Application Practical	-	-	3	3
40025	Engineering Graphics - II	-	3	-	3
	TOTAL	**8**	**3**	**7**	**18**

IV SEMESTER

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN CIVIL ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010410

Semester : IV Semester

Subject Title : **THEORY OF STRUCTURES**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
THEORY OF STRUCTURES	**6 Hrs.**	**96 Hrs.**	**25**	**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	Slope and Deflection of beams, Propped Cantilever	18
II	Fixed Beams Continuous Beams – Theorem of Three moments method	18
III	Continuous Beams – Moment Distribution method portal frames - moment distribution method	18
IV	Columns and Struts Combined bending and direct stresses	18
V	Masonry Dams Earth pressure and Retaining walls	17
	Test & Model Exam	7
	TOTAL	**96**

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 SYLLABUS

4010410 THEORY OF STRUCTURES

Contents: Theory

Unit	Name of the Topics	Hours
I	**SLOPE AND DEFLECTION OF BEAMS** 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. **PROPPED CANTILEVERS** 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.	**10** **8**
II	**2.1 FIXED BEAMS – AREA MOMENT METHOD** 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.	**9**

II	**2.2 CONTINUOUS BEAMS – THEOREM OF THREE MOMENTS 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.	**9**
III	**3.1 CONTINUOUS BEAMS – MOMENT DISTRIBUTION METHOD** Introduction to Carry over factor, Stiffness factor and Distribution factor –Stiffness Ratio or Relative Stiffness- Concept of distribution of un balanced 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** 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.	**10** **8**

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

	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.**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN CIVIL ENGINEERING

(Implemented from the Academic Year 2021 – 2022 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			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
HYDRAULICS	**6 Hrs.**	**96 Hrs.**	**25**	**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 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.

DETAILED SYLLABUS

4010420 - HYDRAULICS

Contents: Theory

Unit	Name of the Topics	Hours
I	**INTRODUCTION** 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. **MEASUREMENT OF PRESSURE** 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. **HYDROSTATIC PRESSURE ON SURFACES** 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.	**6** **9** **5**
II	**2.1 FLOW OF FLUIDS** 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.	**8**

	2.2 FLOW THROUGH ORIFICES AND MOUTHPIECES 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** 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.	**6** **6**
III	**3.1 FLOW THROUGH NOTCHES** 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** 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.	**6** **10**
IV	**4.1 FLOW THROUGH OPEN CHANNELS** 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 –	**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	**5.1 PUMPS** 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 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.	**18**
	Test & Model Exam	**7 Hrs.**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN CIVIL ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name	:	1010: DIPLOMA IN CIVIL ENGINEERING
Subject Code	:	4010430
Semester	:	IV Semester
Subject Title	:	**TRANSPORTATION ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
TRANSPORTATION ENGINEERING	**5 Hrs.**	**80 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

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

Topics and Allocation of Hours

Unit	Topics	Hours
I	Highway Engineering	15
II	Highway Engineering (Contd.)	15
III	Railway Engineering	15
IV	Railway Engineering (Contd.)	14
V	Bridge Engineering	14
	Test & Model Exam	7
	TOTAL	**80**

RATIONALE:

Construction of roads is one of the areas in which diploma holders in Civil Engineering get employment. These diploma holders are responsible for construction and maintenance of highways. Basic concepts of road geo-metrics, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course.

In addition, this subject will cater the needs of those technicians who would like to find employment in the construction of railway tracks, bridges. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges.

OBJECTIVES:

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

- Study the importance of the roads, development of roads and classification of roads.
- Know about highway pavements, Geometrical design, Traffic controls, Road Arboriculture and Highway Lighting
- Study the highway alignment, road machineries and construction of different types of Roads
- Study the Railway fixtures, Types of stations, Signalling and Control of movement of trains
- Study the Maintenance of Track and Rapid Transport System of Railways
- Know about Bridges, Classifications and its Components

DETAILED SYLLABUS

4010430 - TRANSPORTATION ENGINEERING

Contents: Theory

Unit	Name of the Topic	Hours
I	**HIGHWAY ENGINEERING**	
	INTRODUCTION General – Development of Roads in India - Modes of transportation - Nagpur Plan - Ribbon development - Advantages of Roads - Importance of roads in India - Requirements of an ideal road - Indian Road Congress - Objects of Highway planning - Classifications of Highways.	**3**
	HIGHWAY PAVEMENTS Objectives - Types of Pavement - Flexible and Rigid Pavements - Comparative study of Flexible and Rigid pavements - Factors affecting the design of pavements - Other types of pavements (Description not reqd.)	**2**
	GEOMETRICAL DESIGN OF HIGHWAYS General - Road structure - Right of way - Land width - Width of formation - Road Camber - Super elevation - Sight distances - Road gradient - Road Curves - Horizontal curves - Vertical curves - Types - Widening of pavement on horizontal curves.	**3**
	TRAFFIC ENGINEERING Objectives - Traffic surveys - Road accidents - Causes of road accidents - Preventive measures - Parking - Methods of parking - Road junctions (Grade intersections and Grade separators) - Traffic signals - Advantages - Types of road signs - Expressways.	**3**

I	**SUB GRADE SOIL** Significance - Soil mass as a three phase system - Grain size classification - Atterberg limits - Definition and description - I S Classification of soils - Compaction - Definition - Objects of compaction - Standard Proctor Compaction test - Shear strength - Definition - importance - Direct shear test.	**2**
	ROAD ARBORICULTURE AND LIGHTING Objects of Arboriculture - Selection of trees - Location of trees - Highway lighting - Benefits.	**2**
II	**HIGHWAY ENGINEERING (Contd.)** **HIGHWAY ALIGNMENT AND SURVEYS** Definition - Principles for ideal highway alignment - Factors affecting highway alignment - Surveys - Engineering surveys - Reconnaissance, Preliminary and Location surveys - Project Report and Drawings - Highway Re-alignment projects.	**3**
	ROAD MACHINERIES Excavating equipments - Tractor, Bull dozer, Grader, Scraper, J C B - Compaction equipments - Road roller - Types and description - Equipment for Bituminous road.	**2**
	LOW COST ROADS General - Classifications - Earthen road, Gravel road, Water Bound Macadam roads - Construction with sketches - Advantages and disadvantages - Maintenance - Soil stabilization - Methods.	**3**
	BITUMINOUS ROADS General - Advantages and disadvantages - Bituminous materials used - Types of Bituminous roads - Surface dressing - Types - Bituminous Concrete - Maintenance of Bituminous roads.	**3**

	CEMENT CONCRETE ROADS General - Advantages and disadvantages - Methods of construction of cement concrete roads with sketches - Construction procedure for concrete roads.	**2**
	HILL ROADS Factors considered in alignment - Formation of hill roads - Hair pin bends - Retaining and Breast walls.	**2**
III	**RAILWAY ENGINEERING**	
	3.1 INTRODUCTION Introduction to Railways - Classifications of Indian Railways - Rail Gauges - Types - Uniformity in gauges - Loading gauge - Construction gauge.	**3**
	3.2 RAILS General - Functions of rails - Requirements of an ideal rail - Types of rail sections - Length of rails - Welding of rails - Wear of rails - Coning of wheels - Hogged rails - Bending of rails - Creep of rails - Causes and prevention of creep.	**4**
	3.3 SLEEPERS AND BALLAST Functions of Sleepers - Types of sleepers - Requirements of sleepers - Materials for sleepers - Sleeper density – Ballast- Functions of Ballast - Requirements of ballast - Materials used as ballast.	**4**
	3.4 RAIL FASTENINGS AND PLATE LAYING Rail joints - Types - Rail fastenings - Fish plates - Fish bolts Spikes -Chairs and Keys -Bearing plates - Blocks- Elastic fastenings - Anchors and anti-creepers - Plate laying Methods of plate laying -PQRS method of relaying.	**3**
	3.5 MAINTENANCE OF TRACK Necessity - Maintenance of Track, Bridges and Rolling stock.	**1**

IV	**RAILWAY ENGINEERING (Contd.)**	
	STATIONS AND YARDS Definition of station - Purpose of railway station - Types of stations - Wayside, Junction and Terminal stations - Platforms - Passenger and Goods platforms - Definition of Yard - Types of yard - Passenger yard, Goods yard, Marshalling yard and Locomotive yards - Level crossings.	**3**
	STATION EQUIPMENTS General - Engine shed - Ash pits - Examination pits - Drop pits - Water columns - Triangles - Turn table - Traversers - Scotch Block - Buffer stops - Fouling marks - Derailing switch - Sand hump - Weigh bridges.	**2**
	POINTS AND CROSSINGS Purpose - Some definitions - Turnouts - Right hand and left hand turnouts -Sleepers laid for points and crossings - Types of switches - Crossings - Types of crossings.	**2**
	SIGNALLING General - Objects of signalling - Types of signalling - Based on function and location - Special signals - Control of movement of trains - Different methods - Following train system - Absolute block system - Automatic signalling - Pilot guard system - Centralized traffic control system.	**3**
	INTERLOCKING Definition - Principles of interlocking - Methods of interlocking - Tappets and locks system - Key system - Route relay system - - Improvements in interlocking and signalling.	**2**
	RAPID TRANSPORT SYSTEM General - Underground railways - Advantages - Tube railways - Its features.	**2**

V	**BRIDGE ENGINEERING** **5.1 INTRODUCTION** Bridge: Definition - Components of bridge - IRC loadings - Selection of type of bridge - Scour - Afflux - Economic span - Waterway - Factors governing the ideal site for bridge - Alignment of bridge - Factors to be considered in alignment.	**2**
	5.2 FOUNDATIONS Functions of foundation - Types of foundations - Selection of foundations - Control of ground water for foundation - Caisson foundation – Coffer dam – Types.	**2**
	5.3 CLASSIFICATION OF BRIDGES Classification according to IRC loadings, Materials, Bridge floor, Type of superstructure - Culverts and Cause ways - Classifications with sketches - Conditions to construct causeways.	**3**
	5.4 SUBSTRUCTURE Abutments - Types - Piers - Types - Wing walls - Types.	**2**
	5.5 SUPERSTRUCTURE Types - Description - Simple bridge - Types according to bridge floor - Continuous bridge - Cantilever bridge - Balanced cantilever bridge - Arch bridge - Bow-string girder type bridge - Rigid frame bridge - Suspension bridge - Continuous steel bridges - Steel arched bridges.	**4**
	5.6 BRIDGE BEARINGS Definition - Purpose - Importance of bearings - Types of bearings – Elastomer bearings - Pot bearings.	**1**
	Test & Model Exam	**7 Hrs.**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN CIVIL ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010440

Semester : IV Semester

Subject Title : **HYDRAULICS LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
HYDRAULICS LABORATORY	**4 Hrs.**	**64 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

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

RATIONALE:

Subject of hydraulics lab is a practical subject which deals with the basic concepts and principles in hydrostatics, hydro-kinematics and hydrodynamics and their applications in solving fluid flow problems.

OBJECTIVES:

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

- Understand parameters associated with fluid flow and hydrostatic pressure.
- Measure the fluid pressure using manometers
- Determine the co-efficient of discharges of Orifice, mouthpiece, orifice meter, venturimeter, notches etc.,
- Determine pipe friction factor.
- Draw the characteristic curves for centrifugal and Reciprocating pumps.

DETAILED SYLLABUS

4010440 - HYDRAULICS LABORATORY

Contents: Practical

List of Experiments

64 Hrs.

Flow of Fluids:

1. Verification of Bernoulli‟s theorem.
2. Flow through Venturimeter – Determination of Co-efficient of Discharge.
3. Flow through Orificemeter – Determination of Co-efficient of Discharge.

Flow through orifice:

4. Determination of Co-efficient of Discharge by Time fall - Head method
5. Determination of Co-efficient of Discharge by Constant head method.

Flow through external cylindrical mouth piece:

6. Determination of Co-efficient of Discharge by Timing fall in head method
7. Determination of Co-efficient of Discharge by Constant head method

Flow through pipes:

8. Determination of friction factor for the given GI pipe / PVC pipe.

Flow through notch:

9. Determination of Co-efficient of Discharge for Rectangular Notch / V-Notch

Pumps:

10. Reciprocating pump – To draw characteristic curves and determine the efficiency
11. Centrifugal pump – To draw characteristic curves and determine the efficiency
12. Study of working principle of a pelton wheel.

4010440 - Hydraulics Laboratory

DETAILED ALLOCATION OF MARKS

S.No	Description	Marks
1	Procedure	10
2	Tabulation and Observation	35
3	Calculations	30
4	Sketch / Graph	15
5	Accuracy of result	5
6	Viva-Voce	5
	Total	**100**

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	**List of Equipments required**	**Quantity required**
1.	Bernoulli‟s theorem apparatus (closed circuit)	1 No.
2.	Venturimeter/Orificemeter apparatus (closed circuit) with all accessories	1 No.
3.	Pipe Friction apparatus (closed circuit) with all accessories	1 No.
4.	Orifice/Mouthpiece apparatus (closed circuit) with all accessories	1 No.
5.	Notch apparatus (closed circuit) with accessories	1 No.
6.	Reciprocating Pump test rig with accessories	1 No.
7.	Centrifugal Pump test rig	1 No.
8	Pelton wheel	1 No.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN CIVIL ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name	:	1010: DIPLOMA IN CIVIL ENGINEERING
Subject Code	:	4010450
Semester	:	IV Semester
Subject Title	:	**MATERIAL TESTING LABORATORY- II**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
MATERIAL TESTING LABORATORY- II	**3 Hrs**	**48 Hrs**	**25**	**100***	**100**	**3 Hrs.**

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

RATIONALE:

The understanding of the structural, physical and mechanical properties and behaviour of engineering materials is at the very core of engineering design. A command of this knowledge is essential for all civil engineers. This laboratory provides hands-on experience with the testing and evaluation of civil engineering materials, including sand, clay, fine aggregates, course aggregates and water.

OBJECTIVES:

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

- Test the properties of fine aggregate and coarse aggregate.
- Test the properties of soil.
- Analyse the properties of water/waste water

DETAILED SYLLABUS

4010450 - MATERIAL TESTING LABORATORY- II

Contents: Practical Total : 48 Hrs.

LIST OF EXPERIMENTS

PART A 24 Hours

1. Determination of Voids ratio and porosity of sand.
2. Determination of liquid limit and plastic limit of the given soil.
3. Determination of bulk density and specific gravity of Fine aggregates.
4. Determination of bulk density and specific gravity of Coarse aggregates.
5. Proctor's compaction test on soil.
6. Direct shear test on sand.
7. Field Density of Soil by core cutter method / sand replacement method.

PART B 14 Hours

1. Attrition test on Aggregate.
2. Abrasion test on Aggregate.
3. Aggregate crushing value test.
4. Aggregate impact value test.
5. Determination of Water absorption of coarse aggregate.

PART C 10 Hours

1. Determination of Total solids present in the given sample of water.
2. Determination of Turbidity of water by "Jackson candle turbidity meter."
3. Determination of settleable solids present in the given sample of water/ waste waterby "Imhoff cone."
4. Determination of Organic and inorganic matters present in the given sample of water.

4010450 - MATERIAL TESTING LABORATORY- II

SCHEME OF EXAMINATION:

In the examination question has to be given either as a single question from Part A or two questions, one from Part B and another from Part-C.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part - A Max.Marks (95)	Part - B Max.Marks (50)	Part - C Max.Marks (45)
1.	Procedure	10	5	5
2.	Tabulation and Observation	40	25	20
3.	Calculations	30	10	10
4.	Sketch / Graph	10	5	5
5.	Accuracy of result	5	5	5
	TOTAL	95	50	45
	VIVA VOCE	5	5	
	GRAND TOTAL	**100**	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

S.No.	List of equipments required	Quantity Required
1.	Pycnometer	4 nos.
2.	Liquid limit device with all accessories	2 nos.
3.	Field density of soil apparatus (sand pouring cylinder) with complete set	2 nos.
4.	Proctor compaction mould with all accessories	2 nos.
5.	Direct shear machine with complete accessories	1 no.
6.	Devals attrition testing machine with complete accessories	1 no.
7.	Dorry‟s abrasion testing machine with complete accessories	1 no.
8.	Aggregate impact testing machine with complete accessories	1 no.
9.	Crushing strength apparatus	1 no.
10.	Jackson Candle Turbidity Meter	1 no.
11.	Imhoff Cone	1 no.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN CIVIL ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : ` 4010460

Semester : IV Semester

Subject Title : **CONSTRUCTION PRACTICE LABORATORY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
CONSTRUCTION PRACTICE LABORATORY	**4 Hrs.**	**64 Hrs.**	**25**	**100***	**100**	**3 Hrs.**

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

RATIONALE:

Diploma holders in Civil Engineering are supposed to supervise construction of buildings. To perform the above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their constructional details. Therefore, the subject of Construction Practice is very important for Civil Engineering diploma holders.

OBJECTIVES:

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

- Prepare center line plan and foundation plan for a building.
- Set out foundation in the field for spread footing and column footing for a building.
- Determine the Workability of concrete by Compacting factor, slump cone test and Vee - Bee consistometer test.
- Cast Concrete cubes and to test for compressive strength.
- Determine the fineness Modulus of fine and coarse aggregate.

- Perform Shape test on coarse aggregate.
- Determine the bulking characteristics of the given sand.
- Perform Non-Destructive test on hardened concrete

DETAILED SYLLABUS

4010460- CONSTRUCTION PRACTICE LABORATORY

Contents: Practical **Total:64 Hrs.**

List of Experiments

Part A **30 Hrs.**

1. Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)
2. Identify the available construction materials in the laboratory on the basis of their sources.
3. Identify the grain distribution pattern in given sample of teak wood in the laboratory and draw the various patterns. (along and perpendicular to the grains)
4. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples.
5. Select first class, second class and third class bricks from the stake of bricks and prepare report on the basis of its properties.
6. Measure dimension of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.
7. Apply the relevant termite chemical on given damaged sample of timber.
8. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/ rollers adopting safe practices.
9. Prepare mortar using cement and Sand/ Fly ash or Granite/marble polishing waste in the proportion 1:6 or 1:3.

Part B **34 Hrs.**

10. Prepare and develop a centre line plan, foundation Plan and set out spread footing in the field for the given line sketch of a building.
11. Prepare and develop a centre line plan, foundation Plan and set out the layout of columns and footing in the field for the given line sketch of a building (Framed structure).
12. Arrangement of bricks using English bond for one brick thick wall and one and half brick thick wall for right angled corner junction.
13. Arrangement of bricks using English Bond for one brick thick wall, one and half brick thick wall for Tee junction.
14. Arrangement of bricks using English bond for one brick thick,one and half and two brick thick square pillars.
15. Straightening, cutting, hooking and bending and arrangement of Steel reinforcement bars.

    a. Singly reinforce beam b. Lintel and Sunshade c. Column and footing

SCHEME OF EXAMINATION:

In the examination the students have to be given two experiments one from Part A and another from Part-B.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part – A Max. Marks(35)	Part – B Max.Marks (60)
1.	Procedure	5	5
2.	Tabulation and Observation	20	25
3.	Calculations/Field work		20
4.	Sketch / Graph		5
5.	Accuracy of result/ Report	10	5
	Viva Voce	5	
	Total	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

Sl.No.	List of Equipments Required	Quantity Required
1.	Pegs, thread, cranking tools	As required
2.	Consumables like Bricks, aggregate, paints, Fly ash, polish, steel rods	As required

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N - 20 SCHEME

DIPLOMA IN CIVIL ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 1010: DIPLOMA IN CIVIL ENGINEERING

Subject Code : 4010470

Semester : IV Semester

Subject Title : **SURVEYING PRACTICE-II**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
SURVEYING PRACTICE-II	4 Hrs.	64 Hrs.	25	100*	100	3 Hrs.

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

RATIONALE:

The important functions of a civil technician include the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works. While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like Theodolite surveying, Tachometric surveying and surveying using Total station that the Civil Engineering diploma holder will normally be called upon to perform.

OBJECTIVE:

At the end of the course, students will have experiences:

- In handling surveying equipments
- To do practical exercises in Theodolite surveying,
- To do Tachometric surveying.

- To do surveying using Total station.

DETAILED SYLLABUS

4010470 - SURVEYING PRACTICE- II

Contents: Practical **Total:64 Hrs.**

LIST OF EXPERIMENTS

PART A: THEODOLITE SURVEYING **20 Hrs.**

1. Study of a Theodolite – Temporary adjustments Reading horizontal angles.
2. Measurement of horizontal angle by:
    i. Reiteration method (not for Exam)
    ii. Repetition method (not for Exam)
3. Determination of distance between two points when their bases are accessible, using Theodolite – Measuring Horizontal angles by repetition method and distances from a Theodolite Station.
4. Determination of distance between two points when their bases are inaccessible, using Theodolite – Measuring Horizontal angles by reiteration method from a baseline.
5. Measurements of vertical angles to different points.
6. Determination of Elevation of an object when the base is accessible.
7. Determination of Elevation of an object when the base is inaccessible by :
    a) Single plane method
    b) Double plane method.
8. Run a closed theodolite traverse for measuring length, included angles and bearing at initial Station and Plot the traverse.

PART B: TACHEOMETRIC SURVEYING **12 Hrs.**

8. Determination of constants of a tacheometer.
9. Determination of distance and elevation of points by Stadia tacheometry.
10. Determination of gradient between two points (with different elevations) by Stadia tacheometry.
11. Determination of distance and elevation of points by Tangential tacheometry

PART C: TOTAL STATION **11 Hrs**

12. Study of Total Station General commands used – Instrument preparation and setting Reading distances and angles.
13. Measurement of distances and co-ordinates of given points, using Total station.
14. Measurement of altitude of given elevated points, using Total Station.
15. Run closed traverse using Total Station and plotting the traverse.
16. Determination of area of a field / land / College Campus etc. using Total station.

SURVEY CAMP : (Outside/Inside the Campus) **Duration: 4 days**

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in Survey camp. The camp must involve work on a large area of not less than 10 acres outside/Inside the campus. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plotting. Three working days and one Saturday will be used for the Camp work during the 14^{th} week.

20 marks to be allotted for Survey file in the Autonomous Examination for the works carriedout by the students in survey camp:

i. L.S and C.S for a road / canal alignment
ii. Radial Tachometric contouring
iii. Contouring by block levels
iv. Curve setting by deflection angle
v. Theodolite / Tacheometric traverse (Balancing the traverse by Bowditch rule)
vi. Total Station (Closed Traverse) – Plotting & Finding the area of the given field.

4010470 - SURVEYING PRACTICE - II

SCHEME OF EXAMINATION:

In the examination the students have to be given two experiments one from Part A orPart B and another from Part-C.

DETAILED ALLOCATION OF MARKS

S.No	Description	Part – A/ B Max. Marks (45)	Part - C Max. Marks (30)
1.	Procedure	5	5
2.	Tabulation and Observation	20	10
3.	Calculations	10	5
4.	Sketch / Graph	5	5
5.	Accuracy of result	5	5
	Total	45	30
	Survey Camp	20	
	Viva Voce	5	
	GRAND TOTAL	**100**	

LIST OF EQUIPMENTS (for a batch of 30 students):

Sl.No.	List of Equipments Required	Quantity Required
1.	Vernier Theodolite	6 nos.
2.	Total Station	3 nos.