PART- II
(5th & 6th Sem.)

CURRICULUM OF DIPLOMA PROGRAMME ON

CIVIL ENGINEERING (CE)

IN

MULTI POINT ENTRY & CREDIT SYSTEM

For the State of Nagaland

Path Finder for Excellence in Technical Education

National Institute of Technical Teachers' Training & Research, Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106
http://www.nitttrkol.ac.in

SAMPLE PATH: TERM - V

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory				Practical				
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva-voce		
1	CE505	Estimating II	CE504	2	0	4	75	10	10	5	0	25	0	125	4
2	CE509	Water Supply & Sanitary Engineering	CE406	3	0	2	75	10	10	5	25	25	0	150	4
3	CE502	Design & Detailing II	CE501	3	0	2	75	10	10	5	0	25	0	125	4
4	CE506	Geo-Technical Engineering I	CE401	3	0	2	75	10	10	5	0	25	0	125	4
5	CE510	Highway & Transportation Engg.		3	1	2	75	10	10	5	25	25	0	150	5
6	CE409	Theory of Structure	CE401	3	1	0	75	10	10	5	0	0	0	100	4
7	CE515	Professional Practices – IV*		0	0	2	-	-	-	-	-	50	0	50	1
TOTAL				17	2	14	450	60	60	30	50	175	0	825	26

*This includes industrial visit

*** To be conducted after TERM - V**

* Industrial Training										100	100	200	10

SAMPLE PATH: TERM - VI

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory				Practical				
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva-voce		
1	G304	Soft Core II		3	0	0	75	10	10	5	0	0	0	100	3
2	CE511	Irrigation Engineering	CE406	3	0	0	75	10	10	5	0	0	0	100	3
3	CE507	Geo-Technical Engineering II	CE506	3	1	0	75	10	10	5	0	0	0	100	4
4	CE601-604	Elective I		3	1	0	75	10	10	5	0	0	0	100	4
5	CE601-604	Elective-II		3	1	0	75	10	10	5	0	0	0	100	4
6	CE517	Project		0	0	10	0	0	0	0	0	50	50	100	5
7	CE516	Professional Practices – V*		0	0	4	0	0	0	0	0	50	0	50	2
TOTAL				15	3	14	375	50	50	25	0	100	50	650	25

*This includes seminar on project

TERM - V

Name of the course : ESTIMATION – II	
Course code: CE505	**Semester : FIFTH**
Teaching Scheme	**Maximum Marks : 125**
	PA and End Examination Scheme
Theory : 2 hrs/week	Class test: 10 Marks
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks Sessional : 25 Marks
Practical : 4 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA & End Semester Practical Exam:
Rationale:	
The subject of estimating is of prime importance, as the students are required to know the various aspects of rate analysis, types of estimates, details of specifications for arriving at a correct estimate of construction units for civil engineering projects	
Course Objective :-	
Module/Unit	After completion of the course, students will be able to:
UNIT - I	Analyze rates of various items of construction of simple civil engineering structures
UNIT- II	Explain different types of estimation techniques and estimate cost of various items
UNIT III	Consolidate ideas about specifications for various items of work as per IS specification
UNIT - IV	Describe different forms of valuation and develop ideas to value real estate properties
Pre-Requisite :-	
	Estimating I

MODULE / UNIT	**Contents (Theory)**	Hrs	Marks
UNIT - I	**1.0 RATE ANALYSIS** 1.1 Analysis of rates of brick work, plain cement concrete work, RCC work, doors, windows, plastering, cement concrete floor, white washing centering and shuttering, damp proof course coverage, carriage of materials, earth work for foundation and for cutting and filling of trenches	8	10
UNIT- II	**2.0 TYPES OF ESTIMATES** 2.1 Plinth area estimate, carpet are estimate, cube rate estimate, revised estimate, supplementary estimate, repair estimate. 2.2 Bill of quantities, building cost index, annual repair estimate	6	10
UNIT- III	**4.0 CONTRACTS & TENDERS** 4.1 Definition, types of contracts – - lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost Plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, fee contract, Target contract,	6	14

	negotiated contract . 4.2 Class of contractor, Registration of contractor. 4.3 Filling the tender by contractor and points to be observed by him. 4.4 Necessity of tender-sealed quotations and tenders. Tender notice-tender documents EMD and security deposit. Opening of tenders – Scrutiny of tenders – contract agreement – conditions of contract – execution of agreement		
UNIT IV	**3.0 GENERAL AND DETAILED SPECIFICATION** 3.1 Preparation of detailed specification: earth work in excavation, first class brick work , wood work in doors and windows, CGI sheet and AC sheet roofing, rolling and consolidation of road metals, construction of cement concrete floor, RCC slab/box culvert, plastering, white washing, plain concrete, cement mortar, mosaic floor, lime concrete in terracing, centering and shuttering. 3.2 Legal aspects of specification	10	23
UNIT - V	**4.0 VALUATION** 4.1 Definition, necessity of valuation, Definitions – cost price, value, difference between them, characteristics of value, factors affecting value. 4.2 Types of value: - book value, scrap value, salvage, Value, speculative value, distress value, market value, monopoly value, sentimental value, factors affecting value . 4.3 Depreciation, obsolescence, sinking fund; Methods of calculation of depreciation – straight line method, Sinking fund method constant percentage method quantity survey method. 4.4 Computation of capitalized value, gross income, outgoing, net Income, years purchase. Types of outgoing and their percentages. 4.5 Valuation of lands & buildings, factors affecting their valuation, Book value method, replacement value method and comparison method. Use of valuation tables .deferred value of land. 4.6 Fixation of rent as per PWD practice	12	18
	CLASS TESTS	3	
	Total	45 hrs	75

Tutorial Problems	
1.	To prepare a detailed estimate of an irrigation canal partly cutting and partly banking
2.	To prepare a detailed estimate of a double storied RCC framed building with verandah, latrines, septic tank, fencing wall with decorative finish (including plumbing, sanitary, steel and timber works)
3.	To prepare a detailed estimate of finishing items such as plastering, painting, varnishing etc.
4.	To prepare a supplementary estimate of a RC building for addition, alteration or deviation from the original plan of the building after part execution
5.	To prepare an estimate for annual repair of a RC building
6.	To prepare an estimate for RC box culvert.

Note: The above exercise will be given to the students as specific guided project work. They will be supplied with necessary drawing details. These exercises should be preferably run in parallel with the theoretical instruction

	Text /Reference Books:	
Sl. No.	**Name of Book**	**Author**
1.	Estimating and costing	B.N. Dutta & R.C. Rangwala
2.	A Text Book of Estimating Costing and Accounts	D.D. Kohli & R.C. Kar
3.	Estimating, Costing and Specification	M. Chakraborty
4.	Estimating & Costing - by	S. Ramamrutham;

Name of the course : WATER SUPPLY & SANITARY ENGINEERING	
Course code: CE509	**Semester : FIFTH**
Teaching Scheme	**Maximum Marks : 150**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 5 Marks Attendance : 5 Marks Sessional : 25
Practical : 2 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical: 25 Marks

Rationale:

Providing potable water, one of the basic necessities of life, to a community is an important activity of a civil engineer. Knowledge and skill in the field of water supply engineering and waste water disposal is essential for maintaining the health and sanitation of a community

Course Objective :-

	After completion of the course, students will be able to:
1.	Protect water supply
2.	Calculate water demand for the people
3.	Maintain quality of water
4	Describe the importance of sanitary system
5	Manage the sewage system
6	Manage the sewage treatment and disposal process.

Pre-Requisite :-

1.	

Contents (Theory)		Hrs	Marks
UNIT - I	**1.0 INTRODUCTION** 1.1 Necessity of protected water supply 1.2 Historical development	1	2

UNIT- II	**2.0 QUANTITY OF WATER:** 2.1 Water requirements and different uses of water 2.2 Per capita demand, variation in demand and factors affecting demand 2.3Methods of forecasting population, Numerical problems using different methods	2	2
UNIT - III	**3.0 SOURCES OF WATER:** 3.1 Surface sources- Lake, stream, river and impounded reservoir 3.2 Underground sources- aquifer type & occurrence- Infiltration gallery, infiltration well, springs, well- types, suitability 3.5 Sanitary protection of wells and maintenance of well	2	2
UNIT - IV	**4.0 CONVEYANCE OF WATER:** 4.1 Intakes- types, description of river intake, reservoir intake, canal intake 4.2 Pumps for conveyance & distribution types, selection, installation, capacity of pump, most economic diameter of pumping main 4.3 Pipe materials-types, suitability, merits & demerits of each type, selection of pipe material 4.4 Pipe joints-necessity, types of joints, suitability, methods Of jointing [*Note: Detailed study covered under practical, hence students may be asked to prepare detailed sketches as home assignment*]	2	4
UNIT - V	**5.0 QUALITY OF WATER:** 5.1 Impurities in water- organic and inorganic, classification 5.2 Harmful effects of impurities 5.3 Analysis of water- sampling and tests for physical, chemical and bacteriological quality ,significance of tests (*detailed methods of tests will be discussed in laboratory class*) 5.4 Water quality standards for different uses	3	4
UNIT - VI	**6.0 TREATMENT OF WATER:** 6.1 Flow diagram of conventional water treatment system 6.2 Treatment process/units: 6.2.1 Aeration:Necessity, types of aerators, essential features 6.2.2 Plain Sedimentation:Necessity, working principles, Sedimentation tanks types, essential features, operation & maintenance 6.2.3Sedimentation with coagulation: Necessity, types of coagulants, determination of coagulant dose (*procedure of Jar test to be covered under practical*) Types, essential,operation of Flash Mixer, Flocculators and Clarifier 6.2.4Filtration: Necessity, principles, types of filters Slow Sand Filter- essential features, operation, clearing & maintenance	5	7

	Rapid Sand Filter- essential features, operation, cleaning & maintenance, comparison with slow sandfilter, description & working operation accessories, head-loss gauge etc., Pressure Filter essential features, operation & maintenance, suitability of use 56.2.5 Disinfection: Necessity, methods of disinfection, types of chemical disinfectants Chlorination - free and combined chlorine demand, available chlorine, residual chlorine, pre-chlorination, break-point chlorination, super chlorination, determination of chlorine dose (testingprocedure to be covered under practical), chlorinators- types, feeding 6.2.6 Miscellenous treatment methods: Removal of iron & manganese-Necessity, working principles Softening of water - Necessity, Methods of softening - Lime soda process, Ion exchange method, working principles Removal of arsenic & fluoride-Necessity, working principles 6.3 Chemicals required in various treatment units, their uses and feeding devices 6.4 Determination of dosage of chemical requirement for coagulation, chlorination, (Jar test, Residual chlorine test to be discussed in laboratory)		
UNIT - VII	**DISTRIBUTION SYSTEM:** 7.1 General requirements, types of distribution system-gravity, direct and combined 7.2 Methods of supply- intermittent and continuous 7.3 Maintenance of required pressure in distribution system head loss in system, calculation of size of pipes -application of Hazen-William's formula, numerical problems on determination of size of pipe 7.4 Storage- necessity, types- underground, ground level, overhead reservoirs, suitability, accessories 7.5 Distribution system layout-types, comparison, suitability 7.6 Loss and wastage-causes, detection, remedial measures	6	5
UNIT - VIII	**APPURTENANCES IN DISTRIBUTION SYSTEM:** 8.1 Valves-types, features, uses, purpose-sluice valves, check valves, air valves, scour valves 8.2 Definition of Fire hydrants, Water meters, 8.3 Various types of pipes and joints 8.4 Layout of water supply pipes 8.6 Installation of water supply plumbing systen in a building [*Note: detailed study covered under practical. Students may be asked to prepare sketches as home assignment*]	5	4
UNIT IX	**RAIN WATER HARVESTING** 9.1 Rain water potential of Sikkim 9.2 Rain water harvesting concept, 9.3 Different process of rain water harvesting 9.4 Advantage and disadvantage of rain water harvesting 9.5 Capacity of storage tank for rain water harvesting	2	2

UNIT X	**INTRODUCTION ON SANITARY ENGINEERING:** 10.1 Aims and objectives of sanitary engineering 10.2 Definition of terms related to sanitary engineering 10.3 Systems of collection of wastes- Conservancy and Water Carriage System- features, comparison, suitability	5	4
UNIT XI	**QUANTITY OF SEWAGE:** 11.1 Quantity of sanitary sewage- domestic & industrial Sewage, variations in sewage flow, numerical problem on computation quantity of sanitary sewage, Storm water flow-rational method of computation of flow 11.2 Computation of size of sewer, application of Chezy's formula, Limiting velocities of flow- self-cleaning and scouring	5	4
UNIT XII	**SEWERAGE SYSTEM** 12.1 Types of system, separate, combined, partially separate, features, comparison between the types, suitability 12.2 Shapes of sewer, features,suitability 12.3 Sewer materials- suitability, handling & maintenance of stoneware, cast iron, cement concrete, asbestos cement, pre-cast & cast in situ sewer 12.4 Laying of sewer-setting out sewer alignment, excavation, and supporting, checking the gradient, preparation of bedding, handling , lowering, laying and jointing, testing of sewer, backfilling, ventilation of sewer, cleaning	5	5
UNIT XIII	**SEWER APPURTENANCES:** 13.1 Manholes and Lampholes- types, features, location,function, construction 13.2 Inlets, Grease & oil trap- features, location, function construction 13.3 Storm regulator, inverted syphon-feature, location, function, construction 13.4 Sewage Pumping-necessity, ejectors, location, component of pumping station, types of pumps and selection. 13.5 Maintainance of sewers	3	5
UNIT XIV	**SEWAGE CHARACTERISTICS:** 14.1 General importance, strength of sewage, Characteristics of sewage-physical, chemical & biological 314.2 Analysis of sewage sampling , tests for- solids, pH, dissolved oxygen, BOD, COD, Nitrogen *(Detailed methods of test to be discussed in laboratory)* 14.3 Bacteriology of sewage decomposition cycles of sewage- aerobic & anaerobic –C,N,S cycle		5
UNIT XV	**SEWAGE DISPOSAL:** 15.1 Disposal on land-sewage farming, sewage application and dosing, sewage sickness-causes & remedies 15.2 Disposal by dilution standards for disposal in different types of waterbodies, self purification of stream	3	5

UNIT XVI	**SEWAGE TREATMENT** 16.1 Principles of treatment, Flow diagram of conventional treatment 16.2 Primary treatment -necessity, principles, essential features, functions, operation and maintenance of different units-Screens and racks, Grit chamber, primary sedimentation tank 16.3 Secondary treatment–necessity, principles, essential features, functions, operation and maintenance of different units contact bed, trickling filter, activated sludge process, aerated lagoon, oxidation ditch, rotating biological disc 16.4 Sludge disposal-sludge digestion necessity, principles, features, Operation, disposal of digested sludge 16.5 Isolated treatment units features, principles, operation, construction, maintenance of septic tank and soakpit/soaktrench, design of septic tank according to I.S.code oxidation pond— principles & essential features	4	5
UNIT XVII	**SANITARY PLUMBING FOR BUILDING:** 17.1 Method of connection from water mains to building supply 17.2 Plumbing arrangement of single storied & multi-storied Building as per I.S. code of practice 17.3Requirements of building drainage, layout of lavatory blocks in residential buildings, layout of building drainage 17.4 Sanitary fixtures features, function, and maintenance and fixing of the fixtures- water closets, flushing cisterns, urinals, inspection chambers, traps, anti-syphonage pipe 17.5 Inspection, testing and maintenance of sanitary fixtures	2	5
UNIT XVIII	**RURAL SANITATION:** 18.1 Single pit & two pit latrine-features, construction, Maintenance, disposal of sludge 18.2 Advantage of two pit laterin, use of sludge	2	5
	Class Test	3	
	Total	60	75

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
G.S.Birdie	Text book on Water Supply and Sanitary Engineering		
N.N Basak	Environmental Engineering		
Hussain	Public Health Engineering		
Rangawala	Water supply & Sanitary Engineering		

WATER SUPPLY & SANITARY ENGINEERING (Practical)

COURSE CONTENT:

The students will perform the following tests/exercises to determine different parameters of given samples of water and waste water.

UNIT TOPIC/SUB-TOPIC **Hrs. Total hrs.**

SL.NO	NAME OF EXPERIMENT	HRS
1	Determination of Turbidity of a water sample using Turbidimeter/ Nephlometer/ Jackson's Candle Turbidimeter.	2
2	Determination of PH of a water sample using (a) PH-meter b) colour comparator	2
3	Determination of conductivity of a water sample using conductivity meter	2
4	Determination of Acidity/ Alkalinity of a water sample using method of Titration	2
5	Determination of Iron content of a water sample calorimetric method using Nesslers' Tubes	2
6	Determination of chloride content of a water sample using method of titration	2
7	Determination of Bacteriological quality of a water sample by Coliform Test	2
8	Determination of Coagulant (Alum) close requirement for a turbid water sample by method of Jar Test	2
9	Determination of Dissolved Oxygen of a water sample, collected from the field, using Winkler's method	2
10	Determination of total solids, suspended solids and dissolved Solids of a waste water sample by Gravimetric method	2
11	Determination of Bio-chemical Oxygen Demand (BOD) of a waste water sample	2
12	Study of different types of pipe joints, valves, water meters	2
13	Study of plumbing fixtures and fitting for water supply & sanitary arrangement	2
14	Field visits to study: Water supply and Sewerage System of the Polytechnic Campus, including a building 14.2 A water Treatment Plant 14.3 Waste water Treatment Plant	2

Name of the course : DESIGN AND DETAILING-II	
Course code: CE502	**Semester : Fifth**
Teaching Scheme	**Maximum Marks : 125**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks Sessional : 25
Practical : 2 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical : 00 Marks

Rationale: Safety and durability of a structure depend on appropriate design, proper detailing and construction as per detailed drawing and specification. For this reason, 'Design and Detailing' is an important subject for Civil Engineering Diploma holders. They are most often asked to act as a supervisor in construction projects. In addition to this they may also require to work as a draftsmen responsible for preparing detailed drawing for construction sites. Diploma holders are also called upon to assist designers, suggest modifications for repair and renovation works and also to design simple structural elements. The subject attempts to cover the above aspects of civil engineering profession.

Aim: The subject aims to expose the civil engineering diploma students to design of simple structural elements and also to drawing structural details for construction.

Course Objective :-	
Module/Unit	After completion of the course, students will be able to:
	Effectively design different types of structural elements made of different construction materials
	Apply the basic principles governing the design in a proper manner
	Apply the basic requirements envisaged in the relevant Indian Standards in design to ensure safety and serviceability of structures
	Analyze and convey to others how success and failure of a major Civil Engineering project can have a severe impact on the human society
	Translate theory to practice at the site including good quality detailing and fabrication
	Update oneself regularly with latest technological developments in this field as the knowledge in this field is expanding in leaps and bounds

Pre-Requisite :-		
Contents (Theory)	Hrs	Marks

UNIT - I	**1.0 STRUCTURAL DETAILING** 1.1 Draw details of the following steel structures from the given line diagrams: a) A steel roof truss with details of bolted or riveted and welded joints and connections including that of the steel column at base level with foundation (Plate I) b) A two storied steel building frame showing typical details of possible bolted and welded connections including that of column at base with the foundation (Plate II) 1.2 Details of an underground RCC water tank (such as Sheet No. 19 of SP 34 or any other) - Plate III. 1.3 Combined detailed drawing of a two storied building with load-bearing wall spread footing and R.C. isolated column footing. (Plate IV).	7	12
UNIT II	**2.0 DESIGN OF SIMPLE STEEL STRUCTURES** 2.1 State and sketch types of joints, explain and show failure of joints through sketches. 2.2 State the permissible stresses in rivets and bolts; Design joints (excluding joints subjected to moments). 2.3 Design determinate framed structure connections, solve problems for riveted and bolted connections. 2.4 Welding: State and explain the uses and types of welding. 2.5 State the permissible stresses in welding, minimum size of welding. 2.6 Design simple welded connections for axial forces.	5	10
UNIT- III	**3.0 TENSION MEMBERS** 3.1 State and sketch the common sections of tension members. State the permissible stresses for structural steel. 3.2 Explain the net effective sectional area for angles and tees under different conditions, use structural steel section hand book, Design tension members (angle & tubular sections) with detailing, and solve problems.	4	10
UNIT - IV	**4.0 COMPRESSION MEMBERS** Distinguish between a strut and a column, short and a long column. Explain effective length, state maximum slenderness ratio of different compression members. Explain and perform design of axially loaded compression members (angle & tubular sections) as per IS 800, solve problems	4	10
UNIT - V	**DESIGN OF SIMPLE STEEL BEAMS** **5.1** design of steel beam bending and shear	5	10
UNIT - VI	**DESIGN (AS PER IS:883-1970) OF TIMBER STRUCTURAL ELEMENTS FOR TENSION, COMPRESSION AND FLEXURE AS WELL AS**	5	6

	DETAILING OF JOINTS		
UNIT-VII	**DESIGN OF FOOTINGS (RCC - LSM)** 7.1 Design of footings (RCC - LSM) 7.2 State and sketch different types of footings 7.3 Explain design loads for foundation design, basis of design of footings, soil pressure on foundation, design of independent footings, checking for development lengths, procedure for design of footings 7.4 Design simple masonry foundation and R.C. slab foundation for a masonry wall 7.5 Design isolated reinforced concrete square & rectangular footings for given data & draw detailed drawings Solve problems	10	10
UNIT-VIII	**CONCEPT OF SEISMICS IN PLANNING AND DESIGN OF BUILDINGS** 8.1 Introduction of earthquakes. 8.2 Seismic Zoning, zones of different cities (IS:1893- PART 1 2016) 8.3 Planning a building in a seismic prone area, general structural arrangement and concept of tying the different elements (IS:4326)	5	7
	CLASS TEST	3	
	Total	45	75

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
V.N. Vazirani & M.M. Ratwani	Design of Steel Structure		
S. Ramamrutham	Design of Steel Structure		
B.N. Duggal	Design of Steel Structure		
P.C. Varghese	Limit State Design of Reinfc		
Code of Practice for design of structural timber in building - IS:883-1970			
Design Aids for Reinforced Concrete IS: 456-1978, BIS, SP-16			
Handbook on Concrete Reinforcement & detailing, BIS, SP-34			

DESIGN AND DETAILING II PRACTICAL

UNIT	**TOPIC/SUB-TOPIC**	**Hrs.**	**Total hrs.**
1.0	Structural Detailing		
1.1	Draw details of the following steel structures from the given line diagrams:		
	a) A steel roof truss with details of bolted or riveted and welded joints and connections including that of the steel column at base level with foundation (Plate I)		
	b) A two storied steel building frame showing typical details of possible bolted and welded connections including that of column at base with the foundation (Plate II)		
1.2	Details of an underground RCC water tank (such as Sheet No. 19 of SP 34 or any other) - Plate III.		
1.3	Combined detailed drawing of a two storied building with load-bearing wall spread footing and R.C. isolated column footing. (Plate IV).		
			TOTAL:

Name of the course : GEOTECHNICAL ENGINEERING- I	
Course code: CE506	**Semester : FIFTH**
Teaching Scheme	**Maximum Marks : 125**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 2 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical: 25 Marks

Rationale:

The knowledge and skills of Geo-Technical Engineering is an important as any other subject of Civil Engineering. Practical works in Geo-Technical Engineering are equally important. The theory together with practices of this subject will help the practicing Civil Engineers in Civil Engineering Construction Works, especially in the design and construction of building foundation.

Course Objective :-

Module/Unit	After completion of the course, students will be able to:
I.	Explain fundamentals of soil formation and types of soil
II.	Explain different term related to index properties and consistency limits of soil
III.	Classify soil according to grain size distribution and consistency limits of soil as per IS and other specification specification
IV.	Explain structure of different types of soil
V.	Explain permeability and factors affecting permeability
VI.	Determine seepage through soil formations
VII.	Explain compaction characteristics of soil and conduct tests as per IS specification
VIII.	Develop the basic concept of consolidation in soil
IX.	Define and explain different parameter related to shear strength of soil and determine them

Pre-Requisite :-

	Basic concepts of engineering mechanics, engineering mathematics

UNIT	**Contents (Theory)**	Hrs	Marks
UNIT - I	**2.0 INTRODUCTION** 1.1 Definition of soil, formation of soil, residual and transported soil, Soil as a three phase system	2	3

UNIT- II	**2.0 INDEX PROPERTIES** 2.1 Preliminary definition of water content, density, specific gravity, void ratio, degree of saturation, density index, numerical problems 2.2 Determination of water content, specific gravity and particle size distribution of coarse and fine grained soil. Numerical problems 2.3 Definition of Void ratio, density index, porosity, degree of saturation, air content, 2.4 Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weigh 2.5 Specific gravity of soil solid - determination of specific gravity by pycnometer. 2.5 Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, plasticity index, liquidity index, flow index, toughness index, activity number, shrinkage ratio, classification based on these index properties Numerical problems	8	15
UNIT III	**3.0 CLASSIFICATION OF SOIL** 3.1 Identification and description of coarse and fine grained soils 3.2 Particle size classification, textual classification, HRB classification, unified soil classification , IS classification 3.3 Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils.	6	10
UNIT - IV	**4.0 SOIL STRUCTURE** 4.1 Particle arrangement in course grained, clay and composite soil	2	4
UNIT V	**5.0 PERMEABILITY** 5.1 Definition of head, gradient 5.2 Darcy's law, Validity of Darcy's law 5.3 Laboratory and field determination of permeability 5.4 Factors effecting permeability	4	6
UNIT - VI	**6.0 SEEPAGE ANALYSIS** 6.1 Definition and concept of seepage flow 6.2 Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines and equipotential lines, exit gradient, quick sand condition (no derivation) 3.6 Flow net, characteristics of flow net, application of flow net (no numerical problems)	4	5
UNIT VII	**7.0 COMPACTION** 7.1 Definition, purpose of compaction, field situations where compaction is required- maximum dry density, optimum moisture content, Zero air voids line. 7.2 Standard proctor test & Modified proctor test – test procedure as per IS code, 7.3 Factors affecting compaction	6	10

	7.4 Light and heavy compaction test as per IS specification 7.5 Field compaction methods - rolling, ramming, kneading& vibration and Suitability of various compaction equipment.		
UNIT - VIII	**8.0 CONSOLIDATION** 8.1 Principle of consolidation, spring-analogy method, Brief concept of compressibility and consolidation 8.2 Terzaghi's one dimensional consolidation theory, its assumption and field of application, standard one dimensional consolidation test by consolidometer 8.3 compression index, coefficient of compressibility, coefficient of volume compressibility, coefficient of consolidation and their inter-relation (no deduction, only mathematical expression), swelling index 5.4 computation of ultimate settlement – simple numerical problems 8.4 difference between consolidation and compaction	5	10
UNIT - IX	**9.0 SHEAR STRENGTH** 9.1 Definition of shear and shear parameters, Concept of shear strength of soil, Shear failure of soil, field situation of shear failure 9.2 Components of shearing resistance of soil – cohesion, internal friction 9.3 Mohr circle, unconfined compression test, direct shear test, UU test, numerical problems 9.3 Introduction to Triaxial tests	8	12
	CLASS TESTS	3	
	Total	48 hrs	75

Texts / Reference

Sl. No.	Name of Book	Author	Publishers
1.	Principles of Geotechnical Engineering	B. M. Das	Thomson
2.	Basic and Applied Soil Mechanics	Gopal, Ranjan	New Age International (P) Ltd.
3.	Soil Mechanics and Foundations, 2ed, w/CD	Budhu	Wiley India
4.	Soil Mechanics SI Version	Lambe	Wiley India
5.	Soil Mechanics & Foundation Engineering	Raj	Pearson
6.	Soil Mechanics & Foundations	B. C. Punmia, Ashok Jain & Arun Jain	Laxmi Publication
7.	Basic Soil Mechanics & Foundation	Alam Singh	CBS Publishers
8.	Soil Mechanics & Foundation Engineering	VNS Murthy	CBS Publishers

GEO-TECHNICAL ENGINEERING – I (PRACTICAL) Marks: **30** (Thirty)

Sl. No.	Experiment
1.	Determination of water content and specific gravity of a given soil sample.
2.	Determination of field density of a soil using core-cutter and sand replacement method.
3.	Determination of grain size distribution of a cohesionless soil sample by Mechanical Analysis
4.	Determination of grain size distribution of a fine grain soil sample by Hydrometer analysis
5.	Determination of consistency limits of a given soil sample by using Casagrande's liquid limit device, cone penetrometer
6.	Determination of coefficient of permeability: Constant head and variable head method
7.	Determination of maximum dry density and optimum moisture content by light and heavy compaction
8.	Conduction of Unconfined compression test, direct shear test
9.	Demonstration tests in the laboratory — One dimensional consolidation test and Triaxial test

Practical :-	
Sl. No	**Skills to be developed**
1.	**Intellectual skills:** 1. Application of basic principles to classify soil, determine various parameter related to strength and consolidation and compaction characteristics of soil 2. Analyze and solve problems of soil mechanics
2.	**Motor skills-** 1. Development of understanding for conduction of tests for determination of characteristics of soil
3	**Social skills-** 1. Will learn to work with peer as group 2. Able to communicate with teachers and peers to clarify doubts.

Name of the course : HIGHWAY & TRANSPORTATION ENGINEERING	
Course code: CE510	**Semester : FIFTH**
Teaching Scheme	**Maximum Marks : 150**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 1 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks Sessional : 25
Practical : 2 hrs/week	End Semester Theory Exam:75 Marks
Credit : 5	PA Practical: 25 Marks

Rationale:

The subject of highway engineering is very important as it deals with road and airport.It is essential for the students to get a through input into the different components of road constructions, maintenance, drainage and related traffic engineering.

Aim:

To develop a thorough knowledge & skill in highway development, highway plans and administration, highway economics and financing, traffic engineering, bituminous materials, bituminous surface treatment, carpet coat, road-mix and intermediate type bituminous plant mix surfaces, high type bituminous pavement and their design portland cement concrete pavement and their base courses, verified brick and block pavement, pavement design both flexible and rigid, highway maintenance and airport engineering.

Course Objective :-

Module/Unit	After the completion of course the students will be able to
1.	Classify the different types of roads and their necessity and benefits to the society
2.	Identify the basic requirements, considerations, maintenance and different stages for the construction of Roads
3.	List out the different technical terms related to geometry of the Roads
4	Regulate and plan the traffic control on the road
5	Identify the different construction procedure of the highway
6	Design the pavement for the road
7	Maintain the hill road
8	Define and list out different terms related to airport

Pre-Requisite :-

Contents (Theory)		Hrs	Marks

UNIT - I	**1.0 INTRODUCTION** 1.1 Role of Transportation. Modes of Transportation, History of road development. 1.2 Classification of roads and pattern. Necessity and benefits of roads.	3	6
UNIT- II	**2.0 HIGHWAY ALIGNMENT AND SURVEYS** 2.1 Stages of Engineering survey for highway location- map study, reconnaissance, preliminary survey and final location survey Drawings required for road project- Key map, Index map, Preliminary survey plan and detailed 2.2. Alignment- basic requirements, factors affecting alignment, special considerations for aligning hill roads. 2.3 Highway project – steps involved in a new project and in a realignment project -2 Investigation for Road Project	11	15
UNIT - III	**3.0 GEOMETRIC DESIGN** 3.1 Cross sectional elements-Kerbs, road margin, road formation, right of way, Shoulders 3.2 Camber- definition, purpose, types, IRC specifications. 3.3 Gradient- definition, types, IRC specification. 3.4 Sight distances- definition, types, IRC specification. Horizontal curves, extra widening, transition curves, vertical curves- summit and valley curves. 3.5 Super elevation-definition, formula for calculating super elevation, minimum and maximum values of super elevation.	12	14
UNIT - IV	**4.0 TRAFFIC ENGINEERING** 4.1 Traffic characteristic, Traffic surveys- volume study, speed study, capacity, parking study, accident study. 4.2 Traffic control devices-Road signs, marking, signals, traffic islands. 4.3 Road intersections- Intersection at grade and grade separator intersections, 4.4 Design factors of Highway Lighting 4.5 Road accidents –causes and its prevention	10	8
UNIT - V	**5.0 ROAD CONSTRUCTION METHODS** 5.1 Types of road materials and Tests – soil, aggregates, bitumen, Cement Concrete. Test on soil sub grade- C.B.R. test, Test on Aggregate – Los Angeles abrasion, impact, and shape test. Tests on bitumen- Penetration, Ductility and Softening point test. 5.2 Necessity of soil stabilization and various method used (brief) 5.3 Construction procedure of Earth road, Gravel road and W.B.M. road. 5.4 Construction of bituminous roads - Terms used– bitumen, asphalt, emulsion, cutback, tar, common grades adopted for construction. Types of bituminous surface – prime coat, tack coat, seal coat, Construction 5.5 Construction procedure of - Surface dressing, bituminous	12	16

	carpeting, bituminous penetration macadam Bitumen/Tar carpets, premixed macadam 5.6 Detailed construction procedure of cement concrete roads, construction joints, joint filler, joint sealer		
UNIT - VI	**6.0 HIGHWAY PAVEMENTS** 6.1Types of Pavements-Flexible and rigid, pavement components and their functions**.** Pavement design factors. 6.2 Design methods for flexible pavement and rigid pavement 6.3 Significance and requirements of drainage system. Surface drainage, subsurface drainage 6.4 Maintenance operation of roads.	7	8
UNIT - VII	**7.0 HILL ROADS** 7.1 Introduction, factors considered in alignment. Landslides-causes and prevention. 7.2 Methods of formation, hairpin bends, retaining wall, revetment wall. 7.3 Surface drainage, cross drainage, subsurface drainage.	5	8
Class Test			
	Total	60	75

Text /Reference Books:			
Name of Authors	Titles of the Book	Edition	Name of the Publisher
S. K. Khanna &C.E.G.Justo	Highway Engineering		
S. K. Khanna, M. G. Arora& S. S. Jain.	Airport Planning & Design		
L. R. Kadiyali	Transportation Engineering		
S. K. Sharma	Highway Engineering		

13.0 PRACTICAL: 30 hours

UNIT TOPIC/SUB-TOPIC **Hrs. Total hrs.**

13.1 Determination of size and shape of road aggregates
13.2 Determination of crushing value of road aggregates
13.3 Determination of impact value of road aggregates
13.4 Determination of Los Angales Abrasion value of coarse road aggregates
13.5 Determination of C.B.R. value of subgrade soil
13.6 Determination of penetration value of bitumen
13.7 Determination of softening point of bituminous material
13.8 Determination of ductility of bitumen
13.9 Determination of Marshall stability value of bituminous Mixture

Name of the course : THEORY OF STRUCTURES	
Course code: CE409	**Semester : FIFTH**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 1 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 0 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	

Rationale:

Theory of structures is a very important subject for diploma holders in Civil Engineering. Many of them are entrusted with the responsibility to supervise constructions, make minor remedial changes in maintenance work, analyze simple structures etc. An adequate knowledge of behaviour of structures is very essential for developing self-confidence among the diplomats for delivering quality service of work. An understanding of 'why' part of structural behiviour and failures enables them to give adequate comparative weightage of heir attention to different components of construction supervision jobs.

The course content has been designed with a view to enabling students to solve problems of beams related to permissible stresses in bending and shear,
explain and apply the principle of superposition, analyze the determinate trusses, apply the formulae for deflection to solve the problems of propped cantilever, understand and draw qualitatively the deflected shapes of beams and frames to identify the positions of main reinforcements and apply the concept of principal stresses and strains to explain and identify different types of cracks in reinforced concrete beams.

While teaching the deformation of indeterminate structures without going into theory and analysis, a teacher of the subject is advised to make use of indigenous flexible elastic model.

Course Objective :-

Module/Unit	After the completion of course the students will be able to
1.	Calculate slope and deflection of simply supported and cantilever beam
2.	Calculate BM and SF for propped cantilever, fixed and continuous beam
3.	Solve problem by moment distribution method
4	Analyse the different truss problem

Pre-Requisite :-

Contents (Theory)	Hrs	Mar

			ks
UNIT - I	**1.0 SLOPE AND DEFLECTION** 1.1 Calculation of slope and deflection in simply supported and cantilever beams with different loads by: a. Double integration method b. Macaulay's method	8	7
UNIT- II	**2.0 PROPPED CANTILEVER BEAM** 2.1 Concept of propped cantilever beam, S.F.D and B.M.D with point loads and udl 2.2 Slope and deflection for point loads and U.D.L	10	10
UNIT - III	**3.0 FIXED BEAMS** 3.1 Concept. 3.2 Drawing of SFD and BMD using fixing moment of fixed beam.	8	10
UNIT - IV	**4.0 CONTINUOUS BEAMS** 4.1 Concept. 4.2 Drawing of SFD and BMD for continuous beams loaded with point load and udl using Claypeyron's theorem of three moments.	8	12
UNIT - V	**5.0 INTRODUCTION TO MOMENT DISTRIBUTION METHOD** 5.1 Sign convention, carry over factor, stiffness factor, distribution factor. 5.2 Numerical problems.	6	15
UNIT - VI	**6.0 APPLICATION OF MOMENT DISTRIBUTION METHOD** 6.1 Single stored single bay symmetrical portal frames, SF and BM diagrams	10	10
UNIT - VII	**7.0 TRUSS** 7.1 Introduction, Definition, different types of truss. 7.2 Advantages and disadvantages. 7.3 Analysis of truss- Method of joints, method of section, graphical method. 7.4 Difference between frame and truss.	10	10
Total		60	70

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
R. S. Khurmi & J. K. Gui	Theory of Structure		
V. Rajaraman	Theory of Structure		
R. S. Khurmi	Strength of Materials		
S. P. Timoshenko and D. H. Young	Elements of Strength of Materials		

Name of the course : PROFESSINAL PRACTICES- IV	
Course code: CE515	**Semester : Fifth**
Teaching Scheme	**Maximum Marks : 50**
	PA and End Examination Scheme
Theory : 0 hrs/week	Class test: 0 Marks
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 0 Marks Attendance : 0 Marks
Practical : 2 hrs/week	End Semester Theory Exam:00 Marks
Credit : 1	PA Practical : 50 Marks

Rationale:

The diploma-holders in Civil Engineering, many a times , are involved with project work at site as a supervisor for managing the construction of the project. Major works involved in that case rull and regulation at site ,safety related to equipments and human life, construction related procedure and some measurement and analysis of data also their other related components.They are also expected some industrial visits for gathering knowledge about the different stages of the constructionand management process at the site.

Course Objective :-

Module/ Unit	After completion of the course, students will be able to:
1.	Describe different process of construction management and their interrelated terms
2.	Handle the construction related machine/ equipment.
3.	Aware cause and effect of accident and safety measure in construction works
4	Describe different rules and regulation related construction works
5	Explain the quality control of construction works
6	

Pre-Requisite :-

Contents (Theory)	Hrs	Marks in %

UNIT- I	**1.0 INTRODUCTION** 1.1Aims & objectives of construction management 1.2 Functions of construction management 1.3 The construction team components-owner, engineer, architect, contractor-their functions and interrelationship and jurisdiction 1.4 Resources for construction management, men, machines, materials, money 1.5 Collecting an estimate from P.W.D.	3	5
UNIT - II	**2.0 CONSTRUCTIONAL PLANNING:** 2.1 Importance of constructional planning 2.2 Developing work break down structure for construction works 2.3 Construction planning stages- Pretender stage, Post- tender stage 2.4 Construction scheduling by bar charts preparation of bar charts for simple construction works 2.5 Preparation of schedules for labour, materials, machinery, finance for small works 2.6 Limitations of bar charts 2.7 Construction scheduling by network techniques. Definitions of terms- PERT and CPM techniques, advantages and disadvantages of two techniques, network analysis, estimation of time and critical path, application of PERT & CPM techniques in simple construction works	8	15
UNIT - III	**3.0 SITE MANAGEMENT** 3.1 Factors influencing selection, design and layout of temporary facilities and services at construction site 3.2 Principles of storing materials at site 3.3 Location of equipment Organizing labour at site	3	5
UNIT - IV	**4.0 SAFETY IN CONSTRUCTION WORKS:** 4.1 Importance of safety 4.2 Causes and effects of accidents in construction works 4.3 Safety measures in work sites for-excavation, scaffolding, formwork, fabrication and erection, demolition 4.4 Development of safety consciousness 4.5 Safety legislation-workmen's compensation act, contract labour act	5	14
UNIT - V	**5.0 DISPUTES:** 5.1 Nature of disputes between contractor and owner 5.2 Causes of disputes and claims 6.3 Arbitration-procedure, criterion for arbitrator, conditions for arbitration.	3	5
UNIT -VI	**6.0 QUALITY CONTROL:** 6.1 Principles of inspection - enforcement of specifications - stages of inspection and quality control for earth work, masonary, RCC, sanitary and water supply services 6.2 Quality standards -during construction, after construction 6.3 Methods of testing-during construction, after construction,	3	6

	Destructive & non-destructive methods		
	Guest lecture on construction management	2	
Total		32 hrs	50

Practical :-

S.No	**Skills to be developed**
1.	**Intellectual skills-** 1. Interact with industry people-executive and working level 2. Implementation of work schedule 3. Exchange of ideas. 4. Adopting safety precautions.
2.	**Motor skills-** 1. Development of managerial and quality control skill.
3	**Social skills-** 1. Development of ethics. 2. Will learn to work with peer as group. 3. Able to keep safe and amicable working environment

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
	Construction management and planning		

TERM – VI

ENGINEERING ECONOMICS AND ACCOUNTANCY

L	T	P	**Curri. Ref. No.: G303**
3	0	0	

Total Contact hrs.:
Theory: 45
Tutorial: 0
Practical: 0
Credit: 3

Total marks: 100

Theory:
End Term Exam: 75
P.A.: 25

RATIONALE

The knowledge of Engineering Economics and Accountancy is needed by personnel dealing with the cost of products of any kind related to quality and standards of production including its financial control. Engineers / Technicians, in general, need to know the cost of the final products for marketing purposes. The knowledge of Economics as well as Accountancy is required by all people dealing in any business or enterprise.

This particular subjects deals in basic concepts of economics, production of commodities, different types of industries, market forms, objective of economic planning, concept of value of money, causes of unemployment, industrial policy, business transaction and accountancy, maintenance of cash and balances, receipt and expenditures and final accounts.

DETAIL COURSE CONTENT

THEORY:

UNIT	TOPIC / SUB-TOPIC	Lecture Hrs.
1.0	**INTRODUCTION**	**1**
1.1	Introduction to Economics and its Utility of study	
1.2	Importance of the study of Economics	
2.0	**BASIC CONCEPTS OF ECONOMICS**	**3**
2.1	Definition of Utility, Consumption, Want, Value, Price, Goods, National Income.	
2.2	Classification of goods, characteristics and classification of wealth.	
2.3	Basic Laws of demand and supply.	
2.4	Concept and Measurement of Elasticity of demand	
3.0	**PRODUCTION**	**3**

3.1 Meaning and factors of production.

3.2 Land, Labour, Capital and Organisation

3.3 Formation of Capital, Break even chart-its uses.

4.0 SCALE OF INDUSTRIES **2**

4.1 Definition, advantages and disadvantages of small, medium and large scale production

4.2 Internal and External Economies

5.0 MARKET FORMS **3**

5.1 Definition and types of Markets in respect of present trends.

5.2 Features of Perfect, Imperfect and monopoly markets.

5.3 Price determination under perfect competition and monopoly

6.0 ECONOMIC PLANNING **3**

6.1 Features of Under-developed and Developing Countries.

6.2 Meaning, objectives and needs of planning.

6.3 Introduction to industrial development in India during the five year plans.

7.0 MONEY **3**

7.1 Meaning and functions of Money

7.2 Introduction to the concept of the value of money

7.3 Meaning of Inflation, Deflation, Stagnation.

8.0 UNEMPLOYMENT **2**

8.1 Meaning, types and causes of Unemployment

8.2 Unemployment problems in India

9.0 INDUSTRIAL POLICY **3**

9.1 Current Industrial Policy

9.2 Industrial licensing Policy, De-licensing

9.3 Monopolistic and Restricted Trade practices (MRTP) Foreign Exchange Regulation Act (FERA).

10. 0 BUSINESS TRANSACTIONS AND ACCOUNTANCY 5

10.1 Transactions and classifications, need and objectives of proper records including double entry system.

10.2 Classification of Accounts and its description

(in respect of real accounts, personal accounts and nominal accounts)

10.3 Debit and credit concept; golden rules of debit and credit.

10.4 Objectives and principles of double entry book-keeping.

11.0 BOOKS OF ACCOUNTS 2

11.1 Journal and Ledger, their sub-divisions; posting from journals to ledger.

11.2 Balancing of Accounts

12.0 CASH BOOK 2

12.1 Objective of Cash Book (in respect of all kinds of Cash transactions)

12.2 Single column, double column and triple column cash book

12.3 Imprest system of Petty Cash Book.

13.0 TRIAL BALANCE 2

13.1 Objective, Preparation, errors and rectification (in respect of balance of accounts for the total period).

14.0 FINAL ACCOUNTS 5

14.1 Steps of preparing accounts; Trading Account; Profit and Loss Account

14.2 Revenue and Depreciation adjustment

14.2 Introduction to balance sheet

15.0 **CAPITAL AND REVENUE EXPENDITURE DISTRIBUTION** **3**

15.1 Receipts and payments

15.2 Income and Expenditure differences

16.0 MEANING AND PURPOSE OF COSTING **2**

16.1 Elements of Cost-Analysis and classification of expenditure for cost accounts.

16.2 Cost Control – Prime cost, Overhead cost, and Indirect materials and tools.

17.0 ELECTRONICS COMMERCE – MEANING – SCOPE **1**

17.1 Accounting Software – Tally latest version

SUGGESTED LEARNING RESOURCES:

Reference Books :

1. Agrawal, A.N., Indian Economy, New Delhi ; wish Prahashan, 2005

2. Wali, B.M., and A.B. Kalkundrikar – Managerial Economics, New Delhi : R.Chand and Co., 1983

ENTREPRENEURSHIP DEVELOPMENT

L	T	P	Curri. Ref. No.: G304
3	0	0	

Total Contact hrs.: Theory: 45, Tutorial :0, Practical: 0, Credit: 3

Total marks: 100

Theory: End Term Exam: 75, P.A.: 25

RATIONALE

The course intends to provide the fundamental aspects of entrepreneurship as a means for self employment and culminating in economic development of the country. It deals with basic issues like entrepreneurial characteristics and quality, governmental policy support and overall scenario along with opportunities and the facilities available for entrepreneurship development.

DETAIL COURSE CONTENT

THEORY:

UNIT	TOPIC / SUB-TOPIC	Lecture Hrs.
1.0	**INTRODUCTION**	**10**
1.1	Definition and functions of Entrepreneur, entrepreneurship quality, entrepreneurial spirit, need for entrepreneurship.	
1.2	Individual and social aspects of business – achievement motivation theory	
1.3	Social responsibilities of Entrepreneurs	
2.0	**FORMS OF BUSINESS ORGANISATION**	**4**
2.1	Types of company	
2.2	Merits and demerits of different types	
2.2	Registration of small scale industries	
2.4	Conglomeration.	
3.0	**SMALL SCALE AND ANCILLARY INDUSTRIES**	**8**
3.1	Definition – scope with special reference to self employment.	
3.2	Procedure to start small scale and Ancillary industries	
3.3	Pattern on which the Scheme/Project may be prepared	
3.4	Sources of finance - Bank, govt., and other financial institutions.	
3.5	Selection of site for factory	
3.6	Factors of selection	
3.7	N.O.C. from different authorities, e.g., Pollution Control Board, Factories Directorate etc.	
3.8	Trade License.	

4.0 SYSTEM OF DISTRIBUTION **1**

4.1 Wholesale Trade
4.2 Retail trade

5.0 SALES ORGANISATION **3**

5.1 Market survey, marketing trends, knowledge of competitors, product selection & its basis .
5.2 Sales promotion
5.3 Advertisement
5.4 Public relations and selling skills

6.0 PRICING THE PRODUCT **1**

6.1 Basic guidelines

7.0 INTRODUCTION TO IMPORT AND EXPORT **6**

7.1 Procedures for export
7.2 Procedures for import
7.3 Technical collaboration – international trade
7.4 Business insurance
7.5 Rail and road transport
7.6 Forwarding formalities, FOR, FOB, CIF, etc.

8.0 BUSINESS ENQUIRIES **4**

8.1 Enquiries: From SISI, DIC, SFC Dept. of Industrial Development Banks.
8.2 Offers and Quotations
8.3 Orders

9.0 PROJECT REPORT **6**

9.1 Project Report on feasibility studies for small scale industries, proposal for finances from bank and other financial institutions for establishing new industries and its extension, obtaining License enlistment as suppliers, different vetting organizations for Techno Economic feasibility report.
Breakeven analysis, Breakeven point.

10.0 ENVIRONMENT LEGISLATION **2**

10.1 Air Pollution Act
10.2 Water Pollution Act
10.3 Smoke Nuisance Control Act
10.4 ISO: 14000, OSHA

SUGGESTED LEARNING RESOURCES:

Reference Books:

1. Entrepreneurship Development
   Prepared by CTSC Manila Publishers by Tata Mc Graw Hill Publishing Co. Ltd.
2. Small Enterprise Management Published by ISTE, Mysore
3. Motivation Published by ISTE, Mysore
4. S.S.M. in Environmental Engineering Published by ISTE, Mysore
5. Entrepreneurship New Venture Creations, Holt, Prentice Hall, India.
6. Essence of TQM by John Bank
7. Rathore, B.S. and J.S. Saini(ed), A Handbook of Entrepreneurship – Panchkula : Aapga, 1997
8. Jose Pauletal, Entrepreneurship Development, Mumbai : Himalaya Publishing House, 1996
9. Khanka, S.S., Entrepreneurship Development, New Delhi : S. Chand and Co., 2001
10. Nagarazan, R.S. and A.A. Arivalagar, TQM New Delhi : New Age International Publishers, 2005
11. Bhatia, R.C., Marketing Communication and Advertising, New Delhi : Galgotia Publishing Co., 2003

12 Sinha, J.C., and V.N. Mugali : A Textbook of Commerce, New Delhi : R. Chand and Co., 1994

PRINCIPLES OF MANAGEMENT

L	T	P		
3	0	0		**Curri. Ref. No. G305**
Total Contact hrs.:			**Total marks: 100**	**Theory:**
Theory: 45				End Term Exam: 75
Tutorial :0				P.A.: 25
Practical : 0				
Credit: 3				

RATIONALE

Management is the integrated component of all areas of technological courses as recognized across the world. Technicians or supervisors coming out of the system hence need to study the basics components of the management relevant to them. Principals of management will enable them to apply basic knowledge of management in their field of work. Keeping with this in mind necessary content details of the course on Principles of Management has been developed. With the assumption that, it will develop some management foundation to the diploma students.

DETAIL COURSE CONTENT

THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
FRAMEWORK OF MANAGEMENT	**8**
1.1 Nature of management	
1.2 Development of management thoughts	
1.3 Management and process skills	
2.0 PLANNING	**9**
2.1 Fundamentals of planning	
2.2 Planning premises and forecasting	
2.3 Decision making	
2.4 Mission and objective	
3.0 ORGANIZING	**10**
3.1 Fundamentals of organizing	

3.2 Design of organization structure

3.3 Forms of organization structure

3.4 Power and authority

3.5 Authority relationship

4.0 STAFFING **8**

4.1 Fundamentals of staffing

4.2 HR planning

4.3 Recruitment and selection

4.4 Training and development

4.5 Performance appraisal

5.0 DIRECTING **6**

5.1 Fundamentals of directing

5.2 Operational control techniques

5.3 Overall control technique

6.0 TOTAL QUALITY MANAGEMENT 4

6.1 Concepts and definitions

6.2 Sages of quality gurus and their contributions

6.3 Basic tools of TQM

SUGGESTED LEARNING RESOURCES:

Reference books:

1. Principles of management, by: T.Ramasamy (Himalya publishing house)
2. Management by: S. P. Robins
3. Management principles by: Anil Bhat and Arya Kumar
4. Principles and practice of management by LM Prasad
5. Principles of management by LM Prasad
6. Essentials of Management / Joseph L. Massie / Prentice-Hall of India

ORGANIZATIONAL BEHAVIOUR

L	T	P	Curri. Ref. No.:G306
3	0	0	

Total Contact hrs.:
Theory: 45
Tutorial :0
Practical: 0
Credit: 3

Total marks: 100

Theory:
End Term Exam: 75
P.A.: 25

RATIONALE

Knowledge in behavioural principles in an organization is an important requirement because concepts such as work motivation, behavioural patterns of individuals as also those of group of individuals etc are intimately related to it. Organizational Behavioural principles, its scopes, applicability etc. are therefore important to know by the students irrespective of the branch of specialization. Based of the above facts following content details of the subject on Organizational Behaviour has been suggested.

DETAIL COURSE CONTENT

THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
1.0 ORGANIZATION:	**8**
Concept and Definition	
Structures (line, staff, functional divisional, matrix)	
2.0 MOTIVATION :	**10**
Principles of Motivation	
Aspects of Motivation	
Job motivation	
Theories of motivation (Maslow, Herzberg, Theory of X&Y of Mc. Gregar)	
3.0 DEVELOPING GOOD WORK HABITS:	**10**
Principles of habit formation	
Attitude and values	

Personality-

- Concepts

- Theories

- Personality and Behaviour

4.0 ORGANIZATIONAL CULTURE: 8

Concepts and its importance

Determinants of organizational culture

Rules & regulations

5.0 TEAM BUILDING: 9

Concepts
Team and Group

Formation of Team building

SUGGESTED LEARNING RESOURCES:

Reference Books:

1. Organisational Behaviour — An introductory Text – Huezynski A. & Bucheman C. (Prentice Hall of India)
2. Image of Organisation — Morgan G. (Sage)
3. Understanding Management — Linstoand S. (Sage)
4. Organizational Behaviour — Robbins (Prentice Hall of India)
5. Understanding and Managing – Organizational Behavior — George & Jones
6. Organisational Behaviour, L.M. PRASAD, New Delhi, Sultan Chand & Sons
7. Essentials of Management — Koontz (Tata McGraw Hill)

ENVIRONMENTAL EDUCATION

L	T	P	**Curri. Ref. No. G307**
3	0	0	

Total Contact hrs.: **Total marks: 100** **Theory:**
Theory: 45 End Term Exam: 75
Tutorial : 0 P.A.: 25
Practical : 0
Credit: 3

RATIONALE

Management of Environmental Degradation as also its control using innovative technologies is of prime importance in the times we are living in. Since the days of the famed Rio Summit (1992) awareness about degradation of environment we live in an its management through participation of one and all has literally blossomed into a full fledged movement of universal importance. Technically qualified people, such as the Diploma Engineers, should not only be aware about new technologies to combat environmental degradation at their disposal but also various aspects of environment, ecology, bio-diversity, management, and legislation so that they can perform their jobs with a wider perspective and informed citizens. This course can be taken by all diploma students irrespective of their specializations.

DETAILED COURSE CONTENT

THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
1.0 INTRODUCTION	**2**
1.1 Introduction 1.2 Environment and its components 1.3 Environment in India 1.4 Public Awareness	
2.0 ECOLOGICAL ASPECTS OF ENVIRONMENT	**8**
2.1 Ecology • Eco-system • Factors affecting Eco-system 2.2 Bio-geochemical cycles • Hydrological cycle • Carbon cycle • Oxygen cycle • Nitrogen cycle • Phosphorous cycle • Sulphur cycle 2.3 Bio-diversity 2.4 Bio-diversity Index	

3.0 NATURAL RESOURCES 5

3.1 Definition of Natural Resources
3.2 Types of Natural Resources
3.3 Quality of life
3.4 Population & Environment
3.5 Water Resources
- Sources of Water

3.6 Water Demand
3.7 Forest as Natural Resource
- Forest and Environment
- Deforestation
- Afforestation
- Forest Conservation, its methods

3.8 Land
- Uses and abuses of waste and wet land

4.0 GLOBAL ENVIRONMENTAL ISSUES 9

4.1 Introduction
4.2 Major Global Environmental Problems
4.3 Acid Rain
- Effects of Acid Rain

4.4 Depletion of Ozone Layer
- Effects of Ozone Layer Depletion

4.5 Measures against Global Warming
4.6 Green House Effect

5.0 ENVIRONMENTAL POLLUTION 9

5.1 Introduction
5.2 Water Pollution
- Characteristics of domestic waste water
- Principles of water treatment
- Water treatment plant (for few industries only- unit operations & unit processes - names only)

5.3 Air Pollution
- Types of air pollutants
- Sources of Air Pollution
- Effects of Air Pollutants

5.4 Noise Pollution
- Places of noise pollution
- Effect of noise pollution

6.0 CLEAN TECHNOLOGY 6

6.1 Introduction to Clean Technologies
6.2 Types of Energy Sources
- Conventional Energy sources

- Non-conventional sources of Energy

6.3 Types of Pesticides
6.4 Integrated Pest Management

7.0 ENVIRONMENTAL LEGISLATION 3

7.1 Introduction to Environmental Legislation
7.2 Introduction to Environmental Laws

8.0 ENVIRONMENTAL IMPACT ASSESSMENT 3

8.1 Introduction to Environmental Impact Assessment
8.2 Environmental Management (elements of ISO 14001)
8.3 Environmental ethics

SUGGESTED IMPLEMENTATION STRATEGIES:

The teachers are expected to teach the students as per the prescribed subject content. This subject does not have any practical but will have only demonstration and field visit as stated. The students will have to prepare report of the site visit.

SUGGESTED LEARNING RESOURCES:

(a) Reference Books:

S. No.	Title	Author, Publisher, Edition & Year
1.	Environmental Engineering	Pandya & Carny, Tata McGraw Hill, New Delhi
2.	Introduction to Environmental Engineering and Science	Gilbert M. Masters Tata McGraw Hill, New Delhi
3.	Waste Water Engineering – Treatment, Disposal & Reuse	Metcalf & Eddy Tata McGraw Hill, New Delhi
4.	Environmental Engineering	Peavy, TMH International New York
5.	Study / training materials, references, reports etc. developed by Central Pollution Control Board, New Delhi as also State Pollution Control Boards	Central Pollution Control Board Postal Address: Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032, INDIA Tel.: 91-11-22307233 Fax: 91-11-22304948 e-mail: ccb.cpcb@nic.in
6.	Environmental Science	Aluwalia & Malhotra, Ane Books Pvt. Ltd, New Delhi
7.	Text Book of Environment & Ecology	Sing, Sing & Malaviya, Acme Learning, New Delhi
8.	Environmental Science & Ethics	Sing, Malaviya &Sing , Acme Learning, New Delhi
9.	Environmental Chemistry	Samir K. Banerji, Prentice Hall of India, New Delhi

(b) Others:

1. Text book mentioned in the references
2. Lab Manuals
3. OHP Transparencies
4. Video film on Environment

SUGGESTED LIST OF DEMONSTRATIONS/FIELD VISIT

- pH value of water sample.
- Hardness of water
- Calcium hardness
- Total Hardness
- Residual Chlorine to a given sample of water
- Turbidity
- B.O.D.
- C.O.D.

Visits: Following visits shall be arranged by the teachers during the semester:

- Water Treatment Plant
- Sewage Treatment Plant
- Maintenance work of water supply mains and sewage system

Name of the course : IRRIGATION ENGINEERING	
Course code: CE511	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 0 hrs/week	End Semester Theory Exam:75 Marks
Credit : 3	PA Practical : 00 Marks

Rationale:

Many diploma holders in civil engineering supervise the construction or perform the maintenance of canals, head-works, river training works, cross drainage works, regulatory and other works. Some of diploma holders are also engaged for preventing water logging and irrigation by tube-wells. For a state which does not have a major Irrigation System the subject can be offered as an elective one so that an willing student can plan his carrier in Irrigation Engineering.

Course Objective :-

Module/Unit	After completion of the course, students will be able to:
1.	Identify the scope and necessity of irrigation
2.	Describe the different term related to irrigation
3.	Describe the methods of irrigation
4	Compute the rain fall and runoff
5	Demonstrate the cause and effect and measurement of flood
6	Identify the different types of head works

Pre-Requisite :-

Contents (Theory)		Hrs	Marks
UNIT- I	**1.0 INTRODUCTION:** 1.1 Definition of irrigation 1.2 Types, sources and necessity of irrigation 1.3 History of development of irrigation in India, including National Water Policy	1	5
UNIT - III	**2.0 RAIN FALL AND RUN OFF** 2.1 Definition of rainfall and run-off. Catchment area, relationship, Dicken's and Ryve's formulae 2.2 Concepts of Hydrograph and hyetograph, Computation of average rainfall by different methods 2.3 Computation of run-off and factors affecting run-off 2.4 Types of rain gauges - Automatic and non-automatic	4	10

UNIT - III	**3.0 WATER REQUIREMENT OF CROPS** 3.1 Definition of crop season 3.2 Duty, Delta and Base Period, their relationship 3.3 Types of soil, soil fertility, crop rotation, season and names of Kharif and Rabi crops 3.4 Definition- Gross command area, culturable command area, Intensity of Irrigation, Irrigable area 3.5 Water requirement of different crops in Sikkim and their classification according to season	5	15
UNIT - IV	**4.0 GROUND WATER AND WELLS:** 4.1 Ground water resources 4.2 Types of wells - shallow and deep well, aquifer types, ground water flow, construction of open wells and tube-wells 4.3 Yield of an open tube-well and problems 4.4 Methods of lifting water - Manual and mechanical Devices (names)	3	6
UNIT - V	**5.0 CANAL IRRIGATION:** 5.1 Classification of canals according to their alignment 5.2 Different parts of irrigation canals and their functions 5.3 Sketches of different canal cross-sections 5.5 Design of irrigation canals - Chezy's formula, Mannings formula, Kennedy's and Lacey's silt theories and equations, comparison of above two silt theories, critical velocity ratio 5.6 Various types of canal lining - Advantages and disadvantages	10	6
UNIT - VI	**6.0 DIVERSION HEAD WORKS** 6.1 Definition, necessity & objectives 6.2 Layout of a diversion head works and function of each parts 6.3 Difference between weir and barrage	2	5
UNIT - VII	**7.0 REGULATORY AND CROSS DRAINAGE WORKS:** 7.1 Functions of regulatory works 7.2 Cross and head regulators 7.3 Definition- Canal falls, canal escapes, Energy dissipaters 7.4 Functions of the following types: aqueduct, siphon, super-passage, level crossing, inlet and outlet 7.5 Constructional detail of the above	4	5
UNIT - VIII	**8.0 FLOOD CONTROL:** 8.1 Definition, cause and effects of flood 8.2 Flood control measures- Structural and non- structural 8.3 Flood forecasting- network and various methods 8.4 Dam: Classification: Earthen, masonry and concrete dams 8.5 Earthen dams - types, necessity, advantages of earthen dams, materials used in construction, drainage problem, causes of failure and protection against failures 8.6 Masonry and concrete dams: Forces acting on the dam, stresses developed at the base, solution of numerical problems 8.7 Labeled cross section of gravity dam and Spillways	10	12

	8.8 Stories of few important dams- Bhakra, Nalgal, Nagarjuna sagar, Hirakund dam 8.9 River training works- Objectives, different types, guide bank, spurs, groynes, pitching, revetment, rip-rap.		
UNIT - IX	**9.0 WATER LOGGING AND DRAINAGE:** 9.1 Definition, causes and ill effects of water lodging. 9.2 Preventive measures and remedies 9.2 Land drainage- methods of drainage, surface and sub-surface drains and their layout	1	5
UNIT - X	**10.0 TUBE WELL IRRIGATION:** 10.1 Introduction, advantages & disadvantages of tube well irrigation over canal irrigation 10.2 Tube-wells, explanation of terms water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers 10.3 Types of tube-wells and their choice-cavity, strainer and slotted type 10.4 Method of construction-- boring, installation of well assembly, development of well, pump selection, installation and maintenance 10.5 Piped Water Irrigation, Design of Pipelines and losses.	2	6
	Class test	3	
Total		45 hrs	75

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Basak, N.N	Irrigation Engineering		Tata Mc-Graw Hill
Garg, Santosh Kumar	Irrigation Engineering and Hydraulics		Khanna Publishers, Delhi
Purnima, BC and Pande Brij Bansi Lal	Irrigation and Water Power Engineering		Standard Publishers Distributors, Delhi
G.L Asawa	Irrigation Engineering		Willey eastern limited

Name of the course : GEO-TECHNICAL ENGINEERING – II	
Course code: CE507	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 1 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 0 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical : 00 Marks

Rationale:

The knowledge and skills of Geo-Technical Engineering is very important subject of Civil Engineering. Practical works in Geo-Technical Engineering are equally important.
The theory together with practices of this subject will definitely help the Practicing Civil Engineers in Civil Engineering Construction Works, specially in the design and construction of building foundation.

Course Objective :- Geo-technical Engineering II aims at imparting basic knowledge on Earth Pressure Theories, slope stability, soil exploration, bearing capacity and settlement analysis of shallow foundations, deep foundations and introduction to soil improvement and stabilization techniques.

Module/Unit	After completion of the course, students will be able to:
1.	Demonstrate the basic knowledge of Earth Pressure Theories, slope stability, soil exploration, bearing capacity
2.	Measure the slope protection
3.	Analyse the settlement of shallow and deep foundation
4	Introduce to different soil improvement technique
5	Introduce to different soil stabilization technique
6	

Pre-Requisite :-

Contents (Theory)		Hrs	Marks
UNIT- I	**1.0 EARTH PRESSURE THEORIES** 1.1 Rankine & Coloumb's Earth Pressure theories 1.2 Determination of Earth Pressure on retaining wall by applying Rankine's Theory, simple problems 1.3 Stability of retaining walls: Fundamental consideration (no derivation)	6	5
UNIT - II	**2.0 BEARING CAPACITY OF SOIL** 2.1 Concept of bearing capacity, ultimate bearing capacity, net ultimate bearing capacity, factor of safety, safe bearing capacity and allowable bearing pressure 2.2 Terzaghi's analysis and assumptions made and formula		12

	2.3 Effect of water table on bearing capacity 2.4 Determination of bearing capacity for different foundation (isolated and strip foundation only on homogeneous soil deposits) as per IS code method 2.5 Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS:1888& IS:2131 2.6 Typical values of bearing capacity from building code IS:1904		
UNIT - III	**3.0 STABILITY OF SLOPES** 3.1 Introduction, definition and types of slope 3.2 Slope protection measures	4	6
UNIT - IV	**4.0 SHALLOW FOUNDATIONS** 4.1 Types and definition 4.2 Bearing capacity analysis of isolated shallow foundation by Terzaghi's and IS code method (IS 6403-1981) 4.3 Settlement computation: Immediate and consolidation settlement 4.4 Estimation of settlements for cohesionless soils 4.4.1 Schmertmann's method 4.4.2 Semi- empirical method of settlement analysis – a. plate load test b. static cone penetration test c. Settlement from SPT (numerical problems) 4.5 Estimation of settlement for cohesive soils 4.5.1 Thin clay layer sandwiched between thick sand layers – numerical problems 4.5.2 Clay layer resting on cohesionless soil or rock – numerical problems	12	18
UNIT - V	**5.0 SOIL EXPLORATION & SITE INVESTIGATION** 5.1 Necessity of site investigation & sub-soil exploration. 5.2 Types of exploration – general, detailed. Method of site exploration open excavation & boring 5.3 Undisturbed and disturbed samples, sampling and samplers 5.4 Standard penetration test, plate load test (demonstration of tests) 4.5 Format for soil report of a residential project	5	12
UNIT - V	**5.0 DEEP FOUNDATION** 5.1 Definition, classification and suitability: Pile foundation, Pier, Well foundation 5.2 Determination of pile capacity by IS code method (IS-2911) 5.3 Components of well foundation, Forces acting on well foundation.	7	12

	5.4 Construction of well foundations - Sinking of wells - Tilting and shifting of wells - Rectification of tilts and shifts		
UNIT - V	**6.0 INTRODUCTION TO GROUND IMPROVEMENT & SOIL STABILIZATION TECHNIQUES** 6.1 Need for ground improvement and classification of ground improvement techniques 6.2 Different methods: Pre loading, sand drains, stone columns, vibro flotation, grouting, earth reinforcement, drop hammer, dynamic consolidation, vibro compaction and stabilization by using admixtures (applicability and fundamental considerations only), in-situ ground treatment for slopes. 6.3 Applications, functions and types of geotextiles and geo-synthetics 6.4 Concept of soil stabilization, necessity of soil stabilization 6.5 Different methods of soil stabilization – Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization & fly-ash stabilization	8	10
	CLASS TESTS	3	
	Total	45 hrs	75

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
B. M. Das	Principles of Foundati Engineering		Thomson
P.P Raj	Soil Mechanics & Foundation Engineering		Pearson
B. C. Punmia, Ashok Jain & Arun Jain	Soil Mechanics & Foundations		Laxmi Publication
VNS Murthy	Soil Mechanics & Foundation Engineering		CBS P3ublishers
	Relevant IS Codes: IS 6403, IS 8009, IS 1892, IS 2911		Bureau of Indian Standards

ELECTIVE SUBJECTS

Name of the course : EARTHQUAKE RESISTANT DESIGN& CONSTRUCTION	
Course code: CE601	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 1 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 0 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical : 00 Marks

Rationale:

The subject Earthquake Resistant Design and Construction is very important in the present day's context. This is particularly relevant for earthquake prone areas like Northeastern part of India. So it is felt that a course to cover these aspects of Civil Engineering should be mandatory in the diploma curriculum also.

Module/Unit	After completion of the course, students will be able to:
1.	Demonstrate the cause and effect of earthquake
2.	Demonstrate the different configuration of structure
3.	Deign and detail the earthquake resistant of structure as per Indian standard
4	Use the concrete band, ties and reinforcement in masonry structure
5	Demonstrate the use of timber in earthquake resistant design
6	

Pre-Requisite :-

Contents (Theory)		Hrs	Marks in %
UNIT- I	**1.0 INTRODUCTION** 1.1 Introduction to earthquakes, causes of earthquakes 1.2 Brief history of major earthquakes in the past	5	5
UNIT- II	**2.0 STRUCTURAL CONFIGURATION** 2.1 Advantages of regular,simple and symmetrical configurations over irregular ones 2.2 Use of separation joints (IS:4326)	6	10

UNIT - III	**3.0 USE OF CONCRETE BANDS, TIES AND REINFORCEMENTS IN MASONRY CONSTRUCTION (IS:4326- 2013)** 3.1 Masonry construction with rectangular masonry units- Wall, mortar, masonry bond and seismic strengthening arrangement	5	10
UNIT - IV	1.0 **USE OF TIMBER IN EARTHQUAKE RESISTANT DESIGN (IS:4326)** 1.1 Connection of column with foundation 1.2 Types of framing- Stud wall construction, Brick nogged timber frame construction 4.3 General discussions with jointing	4	6
UNIT - V	**5.0 INTRODUCTION TO IS: 1893 – 2002 (PART 1)** 5.1 Magnitude and Intensity of earthquakes 5.2 Seismic zoning 5.3 Definition of terms related to earthquake engineering ordinary and special moment resistant frames, shear wall, separation sections, centre of mass, centre of rigidity, ductility, storey drift. 5.4 General principles of earthquake resistant design, MCE, DBE	10	17
UNIT - VI	**6.0 DETAILED DISCUSSIONS ON DUCTILE DETAILING OF RC STRUCTURES AS PER IS: 13920-2016** 6.1 General specifications of beam- Detailing of longitudinal and transverse reinforcement (no design or derivation), Location of splices 6.2 General specifications of columns- Detailing of longitudinal and transverse reinforcements including special confining reinforcement	12	22
	Class Test	3	
Total		60 hrs	75

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Jai Krishna & Jain	Elements of Earthquake Engineering		South Asian Publishers Private Limited
Agarwal & Shrikhande	Earthquake Resistant Design of Structures		PHI
S.K. Duggal	Earthquake Resistant Design of Structures		Oxford University Press

Prasad	Fundamentals of Soil Dynamics and Earthquake Engineering		PHI Learning
Kramer	Geotechnical Earthquake Engineering		Pearson
C. V. R. Murthy	Earthquake tips		Publication of Nicee
	Publications of nicee		IIT Kanpur
	Relevant IS Codes: 1893, 4326, 13920		
	Website: www.nicee.org		

Name of the course : ENVIRONMENTAL ENGINEERING	
Course code: CE602	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 1 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 0 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical : 00 Marks

Rationale:

The construction activities taken up by the technical personnel, civil engineering technicians in particular, are responsible for the environmental degradation. The civil engineers are also responsible for adopting the remedial measures. As such, a civil engineering diploma holder should have adequate knowledge about the types of pollution caused by various construction activities for adopting preventive and remedial measures. They should be also be aware of the various environmental laws for effective control of environmental pollution.

Module/Unit	After completion of the course, students will be able to:
1.	explain the different aspects of environmental engineering
2.	relate the various components of ecosystem
3.	identify the sources and effects of environmental pollution
4	analyze the polluted water, air and soil by using appropriate sampling method
5	describe the role of various agencies in environmental pollution and the environmental laws.

Pre-Requisite :-

Contents (Theory)		Hrs	Marks
UNIT- I	**1.0 INTRODUCTION** 1.1 Definition of environment and components of Environment and related terms 1.2 Aims & objectives of environmental engineering 1.3 Impact of population growth, industrialization & urbanization and energy growth on environment 1.4 Current issues of environmental concern like-Global warming, Acid rain, Ozone depletion-features, causes and impacts on living being	7	8
UNIT - II	2.0 **ECOLOGY:** 2.1 Concepts of ecosystem and its component 2.2 Energy flow through an ecosystem 2.3 Biochemical cycles-C,N,P 2.4 Interrelationships between communities in an ecosystem Sustainable development	8	10
UNIT - III	3.0 **ENVIRONMENTAL POLLUTION:** 3.1 Definition of terms, parameters of pollution, types of pollution 3.2 Water Pollution- Types of pollutants & their characteristics, Sources of pollutants, effects of water pollution, standards for industrial effluents, remedial measures for control 3.3 Air Pollution- Types of pollutants & their characteristics Sources of pollutants, effects of pollutants on human, plants & vegetation, structures etc, permissible limits as per Indian and International standard, remedial measures for control 3.4 Noise Pollution-definition and measure of noise, types, Sources of pollution, effects of noise pollution, prevention & control measures 3.5 Land Pollution- Causes, Effects of Pesticides & fertilizers used in agricultural practice, impacts of blasting & open cast mining, degradation due to deforestation and due to natural disaster like land subsidence, case studies on mining; blasting and deforestation, soil pollution management-land conservation and land reclamation	15	17
UNIT - IV	**4.0 POLLUTION SURVEY:** 4.1 Planning survey, sampling, locations, criterion, equipment, and techniques for water & air pollution survey 4.2 Analysis of water and air pollutants-principles & methods	10	10
UNIT - V	**5.0 SOLID WASTE MANAGEMENT:** 5.1 Definition of related terms and purpose 5.2 Sources of solid wastes, characteristics of wastes-urban & rural communities, sampling methods 5.3 Storage & collection- storage methods, frequency of collection, methods of collection, comparison 5.4 Disposal of solid wastes- principles, description of process, planning, operation, maintenance & suitability of different methods of disposal- sanitary land fill, composting,	10	15

	incineration, recycle of the waste		
UNIT - VI	6.0 **ENVIRONMENTAL MANAGEMENT:** 6.1 Environmental legislation- salient features of different environmental protection acts in India 6.2 Roles of pollution control boards, local bodies and citizens in environmental pollution management 6.3 Environmental impact assessment- requirements and definition of related terms, method of assessment Environmental ethics	10	15
	CLASS TEST	3	
Total		60 hrs	75

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
N.N Basak	Environmental Engineering		
A.K.Chatterjee	Environmental Engineering		
Peavy, et.al.	A Text Book of Environmental Engineering		
Chanlett	Environmental Protection		
Odum	Fundamentals of Ecology		
APHA	Standard Methods for Examination of Water and Waste Water		

Name of the course : ADVANCED TRANSPORTATION ENGINEERING

Course code: CE605	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 10 Marks
Tutorial: 1 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 0 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical : 00 Marks

Rationale:

Many diploma holders in civil engineering supervise the construction or perform the maintenance of canals, head-works, river training works, cross drainage works, regulatory and other works. Some of diploma holders are also engaged for preventing water logging and irrigation by tube-wells. For a state which does not have a major Irrigation System the subject can be offered as an elective one so that an willing student can plan his carrier in Irrigation Engineering.

Course Objective :-

Module/Unit	After completion of the course, students will be able to:
1.	Identify the different types of railways and their elements and functions
2.	Identify the different types gauges, connections and maintenance of railways
3.	Supervise the construction of tunnel
4	Maintain the tunnel for use of safety purposes
5	Identify the different type bridge and their function
6	Identify the culverts and their uses

Pre-Requisite :-

Contents (Theory)		Hrs	Marks
UNIT- I	RAILWAYS 1.1 Introduction: 1.2 Railway terminology 1.3 Advantages of railways 1.4 Classification of Indian Railways 1.5 Permanent way	20	30

	1.5.1 Definition and components of a permanent way 1.5.2Concept of gauge, different gauges prevalent in India , suitability of these gauges under different conditions 1.6 Track materials 1.6.1 Rails 1.6.2 Functions and requirement of rails 1.6.3 Types of rail sections, length of rail 1.6.4 Rail joints – types, requirement of an ideal joint 1.6.7 Purpose of welding of rails & its advantages 1.6.7 Creep – definition, cause & prevention 1.7 Sleepers 1.7.1 Definition, functions & requirements of sleepers 1.7.2 Classification of sleepers 1.7.3 Advantages & disadvantages of different types of sleepers 1.8 Ballast 1.8.1 Functions & requirements of ballast 1.8.2 Materials for ballast 1.9 Fixtures & fastening 1.9.1 Connection of rails to rail-fishplate, fish bolts 1.9.2 Connection of rails to sleepers 2.0 Geometric for Broad gauge 2.0.1 Typical cross-sections of single & double broad gauge railway track in cutting and embankment 2.0.2 Permanent & temporary land width 2.0.3 Gradients for drainage 2..04 Super-elevation – necessity & limiting values 2.1 Points and Crossings 2.1.1 Definition, necessity of points & crossings 2.1.2 Types of points & crossings with tie diagrams 2.2 Signaling systems		
UNIT - II	TUNNELS a. Introduction: b. Definition of tunnels c. Necessity of tunnels d. Functions of tunnels e. Advantages & disadvantages of tunnels 2.0 Tunnel surveying 2.1 Factors affecting alignment & grade of a tunnel 2.2 Method of location of centre line of tunnel on the Ground 2.3 Method of transferring the centre line of tunnel to inside of tunnel 3.0 Size & Shape of Tunnel 3.1 Factors affecting the size of tunnels 3.2 Typical sectional views of tunnels for (a) a National Highway (b) a single & double broad gauge railway Track	10	20

	4.0 Construction of tunnels 4.1 Methods of tunneling in rocks 4.2 Operations involved in tunneling in rocks 4.3 Methods of tunneling in soft soil 4.4 Safety precautions to be adopted in tunneling 4.5 Maintenance of tunnels 4.6 Drilling equipment- drills and drills carrying equipment, Types of explosives used in tunneling. Maintenance of tunnels 5.0 Ventilation of tunnels 5.1 Necessity of ventilation 5.2 Shafts - purpose, classification, location 5.3 Methods of dust control 6.0 Tunnel Lining 6.1 Necessity of lining 6.2 Functions of lining 6.3 Types of lining 6.4 Operations involved in lining of tunnels 7.0 Drainage of tunnels 7.1 Necessity of drainage 7.2 Methods of drainage		
UNIT - III	BRIDGES 1.0 Introduction: 1.1 Definitions 1.2 Components of a bridge 1.3 Classification of bridges 1.4 Requirements of an ideal bridge 2.0 Bridge Site investigation, hydrology & planning 2.1 Selection of bridge site 2.2 Bridge alignments 2.3 Determination of flood discharge 2.4 Waterway & economic span 2.5 Afflux, clearance & free board 2.6 Collection of bridge design data & sub surface investigation 3.0 Bridge foundation 3.1 Scan depth, minimum depth of foundation 3.2 Types of bridge, foundations - spread foundation pile foundation - pile driving, well foundation - sinking of wells, caisson foundation 3.3 Coffer dams 4.0 Bridge substructure and approaches 4.1 Piers & types - forces acting & design principles 4.2 Abutments, types - forces acting & design principles 4.3 Wing walls, types and their stability 4.4 Approaches	15	25

	5.1 Permanent bridges 5.1 Masonry bridges 5.2 Steel bridges – classification, brief description with sketches - plated girder bridges, truss bridges, steel bridges, rigid frame steel bridges, cable stayed bridges, continuous steel bridges, suspension bridges 5.3 Concrete bridges - classification, brief description with sketches - slab & girder bridges, balanced cantilever bridges, continuous bridges, anch bridges, rigid frame bridges, pre-stressed concrete bridges. 5.4 IRC bridge loading 6.0 Culverts & causeways 6.1 Types of culverts - brief description 6.2 Types of causeways - brief description 6.3 Bridge details 6.4 Joints in bridges - description with sketches 7.0 Railings		
	Class test	3	
Total		45 hrs	75

Text /Reference Books:

Author's Name	Titles of the Book	Edition	Name of the Publisher
N.L. Arora, S.P.Luthara	Transportation Engineering		I.P.H. New Delhi
N.L. Arora, S.P.Luthara	Transportation Engineering		I.P.H. New Delhi
S.C. Saxena	A Text Book of Railway Engineering		Dhanpatrai& sons
S.P. Bindra	Principles and Practice of Bridge Engineering		Dhanpat rai & sons
S.C. Saxena	Tunnel Engineering		Dhanpatrai & sons

Name of the course : LOW COST CONSTRUCTION TECHNOLOGY	
Course code: CE606	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 3 hrs/week	Class test: 15 Marks
Tutorial: 1 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks
Practical : 0 hrs/week	End Semester Theory Exam:75 Marks
Credit : 4	PA Practical : 00 Marks

Rationale:

It is essential that the students should have knowledge of various components of some advance aspects of construction technology in details. Nowadays the construction activities is undergoing lots of changes /developments due to internal and globalised market demands of quality and faster completion of project works using modern techniques, use of modern and waste materials, and through mechanized construction. Today we require high capacity machines with better output and greater efficiency to make construction process less stressful**.** Therefore, the diploma student should learn the subject advanced construction technology thoroughly which is very important for them.

Course Objective :-

Module/Unit	After completion of the course, students will be able to:
1.	Report the important operations of construction activities such as new techniques , machines and equipment are used
2.	Describe important aspects , operations and safety points pertaining to: Deep Excavations' Pile foundations , Coffer Dams, Caissons, Drilling and Blasting
3.	Describe equipment and tackles used , problems encountered and their solutions in erection of steel structures
4	Discuss purpose, types, materials, design issues, and erection of temporary structures for construction activities**.**

Pre-Requisite :-

Contents (Theory)		Hrs	Marks in %
UNIT- I	**1.0 EXCAVATION AND RELATED EQUIPMENT** 1.1 Shallow and deep excavation. 1.2 Dewatering situations, necessity and method of dewatering. 1.3 Excavations machinery: power shovel, drag line, calm shell, scoop, trenching equipment. 1.4 Earth moving vehicles and machinery: tractors, boulders, graders, scrapers, rippers, pump, pile driving, drilling	5	6

	equipment, grouting and guniting equipment.		
UNIT - III	**2.0 ERECTION OF STEEL STRUCTURES** 2.1 Formwork: requirement, tolerances, footing forms, column forms, wall forms, beam and slab forms, other types of forms, removal of forms. 2.2 Roof truss: Erection problems building/ industrial component, equipment and tackles used for erecting these. 2.3 plate girder launching a portion of bridge girder, large span lattice girder	10	15
UNIT - III	**3.0 DRILLING AND BLASTING** 3.1 Drilling: types, drilling requirement. 3.2 Selecting the drilling pattern for blasting. 3.3 Effect of air pressure on drilling operation. 3.4 Mud slurry in drilling. 3.5 Factors affecting the selection of drilling method and equipment blasting. 3.6 Explosives for blasting	5	14
UNIT - III	**4.0 COFFER DAMS AND CAISSONS** 4.1 Coffer dams: types, requirements, selection criteria, leakage points and leakage prevention in coffer dams. 4.2 caissons: materials used, sinking loading of caissons.	2	10
UNIT - IV	**PILE FOUNDATION** 5.1 Pile foundation, types 5.2 sheet piles 5.3 Selection of type of piles 5.4 Pile driving methods 5.5 Settlement and failure of piles 5.6 Under reamed piles including method construction	7	10
UNIT - V	**6.0 VENTILATION** 6.1 Purpose of ventilation 6.2 Essential factors necessitating ventilation 6.3 methods of ventilation 6.4 Natural ventilation 6.5 mechanical ventilation 6.6 Air-Conditioning	5	4
UNIT- VII	**7.0 ACOUSTICS, SOUND INSULATION AND NOISE CONTROL** 7.1 Sound insulating materials 7.2 optimum time of reverberation	7	4

UNIT-VIII	**8.0 PREFABRICATED CONSTRUCTION** 8.1 Materials of construction 8.2 Modular co-ordination, architectural treatment and finishes 8.3 Components of prefabricated construction 8.4 Types of prefabricated components 8.5 Types of prefabricated systems 8.6 precast walls 8.7 Precast floors 8.8 Joints, joining techniques	16	10
	Class Test	3	
Total		60 hrs	75

Text /Reference Books:

Name of Authors	Titles of the Book	Edition	Name of the Publisher
B. C. Punmia	Building construction		
S. K Sharma	A text book of building construction		S.Chand
Tony Brjan, Wiley	Construction Technology		
Dr. Jha & S.K. Sinha	Building construction		

Name of the course : PROJECT	
Course code: CE517	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 100**
	PA and End Examination Scheme
Theory : 0 hrs/week	Class test: 0 Marks
Tutorial: 0 hrs/week	Sessional: 50 Marks
Practical : 10 hrs/week	Viva voice: 50 Marks
Credit : 5	

Rationale: The diploma-holders in Civil Engineering, many a times , are involved with project work in design and drawing offices. The major works involve making survey, drawing plan and sections, collection of data , organization and analysis of data, estimation and elementary design of structures or their components. They are also expected to have some knowledge of actual practice in construction work. The course " Project and Industrial visits" should therefore be very important to the diploma students of Civil Engineering to make them professionally sound and valuable

Course Objective :-

Module/Unit	After completion of the course, students will be able to:
1.	Apply knowledge gained in different subjects through solving real life problems in Civil Engineering Apply he ideas of the state of art of construction practices through industrial visits
2.	Apply the ideas of the state of art of construction practices through industrial visits
3.	Develop self-confidence for working in Civil Engineering projects
4	Prepare necessary drawings, estimates and project reports

Pre-Requisite :-

	Students should have entire knowledge of civil engineering.

Contents		Hrs	Marks
UNIT- I	Selection of groups	3	
UNIT - II	Development of project topics and conduct reconnaissance survey	10	
UNIT - III	Collection of data, required survey work, Preparation of synopsis and selection of project	15	
UNIT - IV	Management and construction procedure,	20	
UNIT – V	Scheduling of planning, Preparation of designing and drawing in detail	25	
UNIT - VI	Estimation of the project	20	

UNIT - VII	Execution of the project	30	
UNIT - VIII	Documentation and final presentation	27	
Total		150	100

Practical :-

S.No	Skills to be developed
1	Intellectual skills-. 1) Decide and collect data for projects. 2) Read and interpret the drawing, data. 3) Design the components. 4) Apply the principles rules regulations and byelaws.
2	Motor skills- 1) Plan for different phases of a task. 2) Prepare drawings for project. 3) Use of computer for drawing, networking. 4) Work in a group for a given task.
3	Social skills- 1. Development of ethics. 2. Will learn to work with peer as group. 3. Able to keep safe and amicable working environment

Name of the course : PROFESSIONAL PRACTICES- V	
Course code: CE516	**Semester : Sixth**
Teaching Scheme	**Maximum Marks : 50**
	PA and End Examination Scheme
Theory : 0 hrs/week	Class test: 0 Marks
Tutorial: 0 hrs/week	
Practical : 4 hrs/week	End Semester Theory Exam:00 Marks
Credit : 2	PA Practical : 50 Marks

Rationale:

This course is designed to provide the students with the knowledge and skills of undertaking supervision work in Civil engineering construction and management. It will also enable them to carry out survey work by using Total Station

Course Objective :-

Module/Unit	After completion of the course, students will be able to
1.0	Explain the organization of an engineering department
2.	Classify work into different categories and execute them
3.	Explain the various stages of accounting procedure during execution of works using standard measurement books and master roll
4	Handle Total Station and carryout survey work using Total Station

Pre-Requisite :- Professional Practice IV & Surveying

	Contents (Theory)	Hrs	Marks
UNIT I	**1.0 Organization of engineering department** 1.1 Permanent establishment 1.2 Duties and responsibilities of subordinate engineers		
UNIT II	**2.0 Works** 2.1 Classification of work-original, major, minor, petty, repair work, annual repair, special repair, quadrantal repair 2.2 Method of execution of works through the contractors, departmentally, contract and agreement, work order.		
UNIT III	**3.0 Account of works** 3.1 Explanation of various terms Administrative approval, technical sanction, contingency budget, tender, preparation of notice inviting tender, receiving of quotations, earnest money, security deposit, advance payment, on account payment, intermediate payment, final payment, running bill, final, regular and temporary establishment, cash, major & subhead of account, temporary advance, issue rate, storage, supervision charges, suspense account, debit, credit, book transfer, sub-voucher and related accounts vouchers 3.2 Measurement book use & maintenance, procedure of making entries of measurement of work and supply of materials, labour employed, standard measurement books and common		

	irregularity 3.3Muster Roll: Its preparation & use for pay and wages		
UNIT IV	**4.0 TOTAL STATION AND ITS APPLICATION** 4.1 Use of total station- 4.2 Control survey, topographic survey, Land, Boundary or cadastral survey, Route survey. 4.3 Detail Survey and Profile Levelling; Calculation of Area and Volume 4.4 Engineering Surveys: Setting out of Curves – Horizontal: Simple, Compound, Reverse and Transition, Vertical	30	
UNIT V	**5.0 AERIAL SURVEY AND REMOTE SENSING & GIS** 5.1 Aerial Survey Introductions, definition, Aerial photograph 5.2 Remote Sensing – Introduction, Electro-Magnetic Energy, Remote sensing system-Passive system , Active system, Applications – mineral, land use / Land cover, Natural Hazards and Environmental engineering system.		
	TOTAL:	60	**50**

Practical :-	
S.No	**Skills to be developed**
1.	**Intellectual skills-** Labour management and capacity to execute work
2.	**Motor skills-** 2. Handing Total Station for conducting Survey
3	**Social skills-** 1. Will learn to work with peer as group 2. Able to communicate with teachers and peers to clarify doubts.

TEXT / REFERENCE

Name of Authors	Titles of the Book	Name of the Publisher
Gopi	Advanced Surveying: Total Station, GIS and Remote Sensing	Pearson Education India
A. M. Chandra	Higher Surveying	New Age International
Gahlot P.S. and Dhir, B.M.;	Construction Planning and Management	Wiley Eastern Limited, New Delhi
Harpal Singh	Construction Management and Accounts	Tata Mc.Graw Hill, New Delhi
Srinath L.S	PERT & CPM Principles and Applications	East West Press, New Delhi
S.C. Dixit	Text Book of PWD Account	