
 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																			
COURSE NAME : DIPLOMA IN CIVIL ENGINEERING																			
COURSE CODE : CC																			
DURATION OF COURSE : EIGHT SEMESTERS											WITH EFFECT FROM 2013-14								
SEMESTER : SIXTH											DURATION : 16 WEEKS								
PATTERN : CORRESPONDANCE - SEMESTER											SCHEME : G								
SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17906)		
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)					
								Max	Min	Max	Min	Max	Min	Max	Min				
1	Irrigation Engineering	IEN	17979	07	01	--	03	100	40	--	--	--	--	--	--	--	50		
2	Estimating & Costing	EAC	17980	07	01	22	04	100	40	--	--	25#	10	25@	10	50			
3	Concrete Technology	CTE	17981	07	01	22	03	100	40	--	--	--	--	25@	10			50	
4	Highway Engineering	HEN	17982	07	--	22	03	100	40	--	--	25#	10	25@	10				50
5	Computer Aided Drawing	CAD	17983	--	01	22	--	--	--	50#	20	--	--	25@	10				
Total				28	04	88	--	400	--	50	--	50	--	100	--		50		
TOTAL CONTACT HOURS DURING RESIDENT SESSION: 120 HRS [15 days * 8 hrs per day]																			
Total Marks : 650																			
@ Internal Assessment, # External Assessment, No Theory Examination, * Online Examination.																			
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work.																			
NOTE:																			
1. HOURS MARKED BY * FOR INTERNAL PRACTICAL EXAMINATION TO BE CONDUCTED AT RESSIDENT SESSION.																			
2. ONE TEST OF 25 MARKS TO BE CONDUCTED AT RESIDENT SESSION AND MARKS TO BE SUBMITTED TO GPDL PUNE.																			
3. 240 HOURS FOR SELF STUDY AT HOME.																			
4. ALL PRACTICALS/ORAL EXAMS [EXTERNAL ASSESSMENT INDICATED BY #] TO BE CONDUCTED AT EXAM CENTRE.																			
5. ORAL EXAMINATION [INTERNAL ASSESSMENT @] TO BE CONDUCTED AT EXAM CENTRE.																			
6. INTERNAL ASSESSMENT @ OF TERM WORK WILL BE DONE AT RESIDENT SESSION.																			

 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																	
COURSE NAME : DIPLOMA IN CIVIL ENGINEERING																	
COURSE CODE : CI																	
DURATION OF COURSE : EIGHT SEMESTERS										WITH EFFECT FROM 2013-14							
SEMESTER : SIXTH										DURATION : 16 WEEKS							
PATTERN : PART TIME - SEMESTER										SCHEME : G							
SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17906)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Irrigation Engineering	IEN	17979	03	--	--	03	100	40	--	--	--	--	--	--	--	50
2	Estimating & Costing	EAC	17980	03	--	02	04	100	40	--	--	25#	10	25@	10		
3	Concrete Technology	CTE	17981	03	--	02	03	100	40	--	--	--	--	25@	10		
4	Highway Engineering	HEN	17982	03	--	02	03	100	40	--	--	25#	10	25@	10		
5	Computer Aided Drawing	CAD	17983	--	--	03	--	--	--	50#	10	--	--	25@	10		
Total				12	--	09	--	400	--	50	--	50	--	100	--	50	

Student Contact Hours Per Week: **21 Hrs.**
THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.
Total Marks : **650**
@ Internal Assessment, # External Assessment, No Theory Examination, * Online Examination.
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work.

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : Diploma in Civil Engineering**Course Code : CC / CI****Semester : Sixth****Subject Title : Irrigation Engineering****Subject Code : 17979****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	--	03	100	--	--	--	100

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Agriculture is the main occupation of majority of Indian Population. But Agricultural productivity is very low because of uncertainty of rainfall. Scientifically planned and developed Irrigation systems have been ensuring enhanced productivity of agriculture sector due to assured water supply to crops. There are inherent huge amount water losses in major projects and major projects are complex from the view point of operation, management and maintenance. Medium, minor and micro irrigation schemes have proved to be easier to develop and maintain and are highly efficient also.

The topics on hydrology, rainfall, runoff, yield and maximum flood discharge will be useful for reservoir planning. Information on duty, delta, base period, crop pattern and command area will be used for ascertaining crop water requirement. Various topics on data collection for irrigation project will be useful for irrigation site investigation.

Topics on earthen, gravity dams and spillway will be useful during construction of medium, minor irrigation schemes. The contents on Bandhra Irrigation, Percolation Tank and micro irrigation will be useful, for construction, maintenance of minor irrigation scheme. Topics on Diversion headwork will be useful for efficient and effective planning of barrages and weirs

Topics on canals with their types, canal, CD works and canal maintenance will be guiding factor for deciding canal alignment, location of various CD works, various maintenance parameters for a canal including the prevailing field practices.

Thus the diploma engineer is exposed to understand various factors at the planning, construction, operation, maintenance and repairs of various irrigation schemes. This will further enable a learner to come up as resourceful professional in the area of irrigation engineering. This

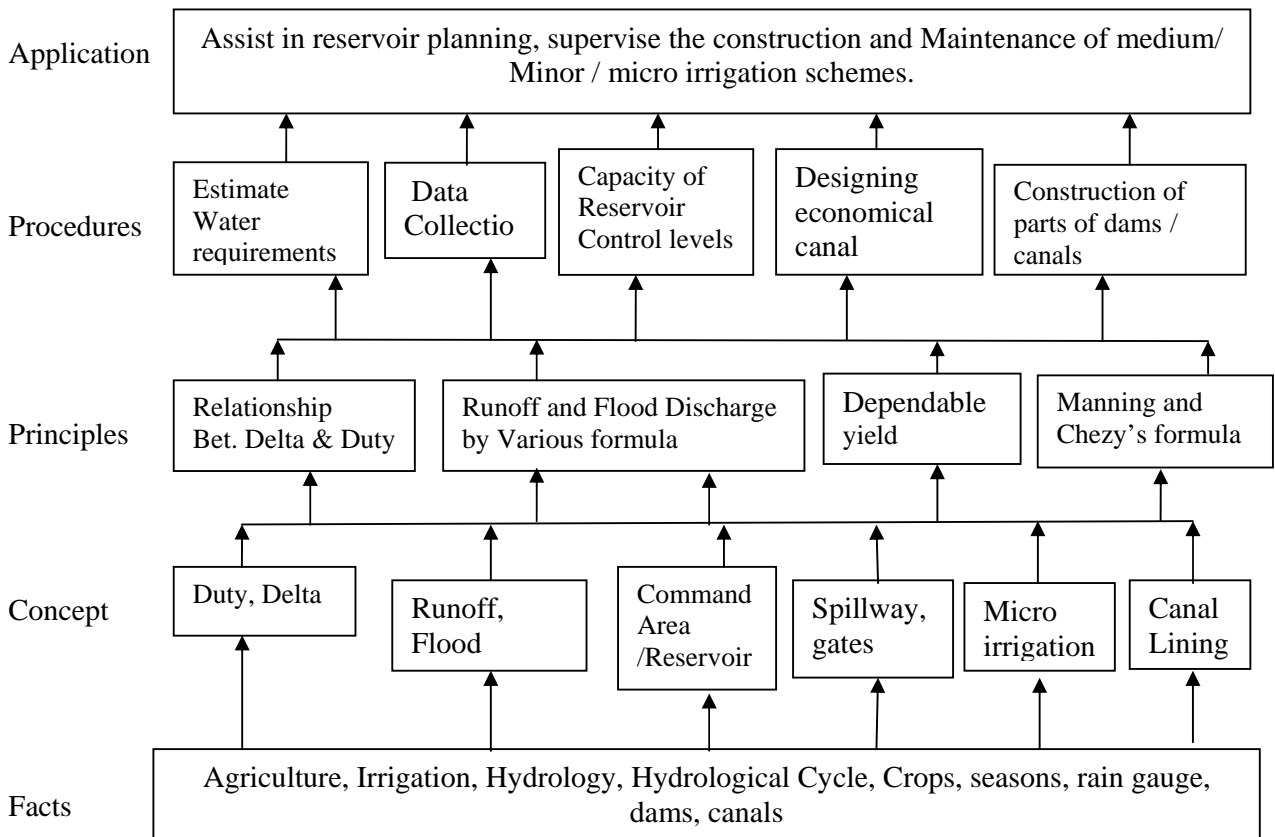
may aim at optimum use of water with minimum loss of water and achieve maximum productivity and yield.

General Objectives:

Students will be able to

1. Appreciate need of Irrigation
2. Understand Water Requirements of a command area
3. Understand aspects of Reservoir Planning.
4. Understand Construction and maintenance of Earthen and Gravity Dams
5. Understand Minor / Micro Irrigation Schemes.
6. Understand Construction and Maintenance of Canals and structures.

Learning Structure:



Theory

Topic and Contents	Hours	Marks
<p>Topic 1. Introduction to Irrigation and Hydrology: Specific Objectives</p> <ul style="list-style-type: none"> ➤ Classify irrigation projects. ➤ Classify irrigation. ➤ Estimate runoff and flood discharge. ➤ Calculate dependable yield from a catchment <p>1.1 Concept of Irrigation, Classification of irrigation on the basis of purpose and administration.</p> <p>1.2 Advantages and ill effects of irrigation, methods of irrigation-such as surface</p> <p>1.3 Concept of hydrology, Hydrologic cycle, Definition of rain fall ,rainfall intensity</p> <p>1.4 Rain Gauge-Symons rain gauge, automatic rain gauge, its construction and functioning average rainfall, methods of calculating average rainfall.</p> <p>1.5 Runoff, Factors affecting Run off, Computation of run off Using Inglis formula, Stranges and Binnie's tables.</p> <p>1.6 Concept of Maximum Flood Discharge (MFD), Computation of Maximum Flood Discharge by Physical indication of past floods and by flood discharge formulae-Inglis and Dicken;s formula. Simple numerical problems.</p> <p>1.7 Yield and Dependable yield of a catchment, determination of dependable yield.</p>	10	12
<p>Topic 2. Water Requirement of Crops And Reservoir Planning: Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Estimate crop water requirement of a command area. ➤ Calculate reservoir capacity to meet the crop water demand of a command area. ➤ Enlist data required to be collected for the planning of a reservoir. ➤ Fix control levels of a reservoir. <p>2.1 (08)</p> <ul style="list-style-type: none"> • Cropping seasons in Maharashtra. • Definition of terms – Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty , relation between duty, delta and base period. • Problems on water requirement and capacity of canal. Modified Penman method .Assessment of irrigation water. <p>2.2 (10)</p> <ul style="list-style-type: none"> • Survey for irrigation project, data collection for irrigation project. area capacity curve, • Silting of reservoir, rate of silting , factors affecting silting , • Fixing Control levels and respective storage in reservoir. Simple numerical problems on Fixing Control levels. 	12	18
<p>Topic 3. Dams And Spillways Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Classify dams. ➤ Describe construction and operation of Earthen and Gravity Dam. ➤ Describe operation of spillway and gates. ➤ List various repairs and maintenance works for an earthen dam. <p>3.1 (12)</p>	14	24

<p>➤ Dam, Types of dams - Earthen dams and Gravity dams (masonry and concrete) Comparison of earthen and gravity dams with respect to foundation, seepage, construction and maintenance</p> <p>➤ Earthen Dams - Components and their function, typical cross section seepage through embankment and foundation seepage control through embankment and foundation. Methods of constructions, types of failure of earthen dams and remedial measures.</p> <p>3.2 (12)</p> <p>➤ Gravity Dams Theoretical and practical profile, typical cross section, drainage gallery, joint in gravity dam, high dam and low dam</p> <p>➤ Spillways-Definition, function, location and components. Emergency and services, ogee spillway and bar type spillway, discharge over spillway. Energy dissipation Spillway with and with out gates, Gates- Radial and Vertical, procedure of maintenance and repairs of the gate (no numerical problems).</p>		
<p>Topic 4. Minor and Micro Irrigation Specific Objectives:</p> <p>➤ Describe construction and operation of Bandhara irrigation and Percolation tanks.</p> <p>➤ Describe construction and operation of Micro/Lift Irrigation systems.</p> <p>➤ Distinguish Bandhara irrigation with Percolation tanks/ Micro irrigation.</p> <p>4.1 Bandhara, construction and working Advantages and disadvantages of bandhara irrigation layout and component parts, solid and open bandhara.</p> <p>4.2 Percolation Tanks – Need, selection of site, construction</p> <p>4.3 Lift irrigation scheme-Components and their functions ,lay out</p> <p>4.4 Drip and Sprinkler Irrigation- Need, components, Layout, operation and Maintenance.</p>	10	16
<p>Topic 5. Diversion Head Works Specific Objectives</p> <p>➤ Describe construction and operation of Weirs.</p> <p>➤ Describe construction and operation of barrage.</p> <p>5.1 Weirs – components parts, types, layout of diversion head works with its components and their function,</p> <p>5.2 Barrages – components and their function. Difference between weir and barrage</p>	08	12
<p>Topic 6. Canals Specific Objectives</p> <p>➤ Classify canals</p> <p>➤ Describe construction of canal.</p> <p>➤ List various repairs and maintenance works for canals.</p> <p>➤ Design a most economical section for the designed discharge.</p> <p>6.1 (10)</p> <ul style="list-style-type: none"> • CANALS – Classification of canals according to alignment and position in the canal network. Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth. Design of most economical canal section. • Canal lining - Purpose, material used and its properties. Advantages of canal lining <p>6.2 (08)</p>	10	18

<ul style="list-style-type: none"> • CD works- Aqueduct , siphon aqueduct, super passage, level crossing • Canal regulators- Head regulator, Cross regulator, Escape, Falls and Oulets. • Canal maintenance. • Water logging- Causes, effects and Measures. 		
Total	64	100

Learning Resources:**1. Book:**

Sr. No	Author	Title	Publisher
1	S. K. Garg	Irrigation and Hydraulic Structure	Khanna Publisher, New Delhi
2	Dr. B.C.Punmia and Dr. B.B. Pande	Irrigation Engineering and Water Power Engineering	Standard Publisher
3	N.N.Basak	Irrigation Engineering	Tata Mcgraw Hill
4	J.G.Dahigaonkar	Text Book of Irrigation Engineering	Wheeler
5	A.M.Maichael	Irrigation Theory and Practice	Dhanpatrai and sons

2. CDs, PPTs Etc.:**3. IS, BIS and International Codes:**

1. IS: 4410-Part-V-1982-Canals
2. IS: 4410- Part-VI-1983-Reservoirs.
Part-VII-1968-Dams.
Part-XVII-1977-Water Requirement of Crops
2. IS: 5477-Part-II,III and IV -1969-71-Storage zones of reservoirs.

4. Websites:

1. www.damsinternational.com
2. www.dams.org
3. www.narmada.org
4. www.guj.nwrws.gujrat.gov.in
5. www.rajirrigation.gov.in
6. www.mahairrigation.gov.in

Course Name : Diploma in Civil Engineering

Course Code : CC/ CI

Semester : Sixth

Subject Title : Estimating and Costing

Subject Code : 17980

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	04	100	--	25#	25@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

In case of long term planning the prospective cost of the construction project is required for the planning of the budget.

Estimating and Costing determines the prospective costs of the construction project in accordance to the plans and specifications for various items of works. Quality of material, type of labour, equipments, tools, transport cost affects the rates of an item of the work. The rates of completed item of the work vary from place to place. However, learner will be able to determine the quantities and cost with reasonable accuracy and in accordance with the standards as per IS: 1200.

The topic on approximate estimate is useful for calculating approximate cost of the building / roads etc. which is further useful for the making budget provisions in the planned works.

The information on detailed estimate based on measurements and the rate of completed item of work is useful in finding comparatively accurate costs of each item of work and total cost of the buildings / roads / structures etc. which is useful for preparation of tender documents and thereafter for the execution of the work.

The rate analysis of an item of work shall help in finding out the rate per unit on the basis of material cost, labour cost, contractors profit and other probable miscellaneous expenditure required for the completed item of the work for actual execution of the works as per lead and lift.

Thus the subject shall strongly help to build professionalism among the learner by providing the knowledge and estimating skills at the project sites along with the use of software's / programmes of estimating which makes learner a perfect professional civil engineer.

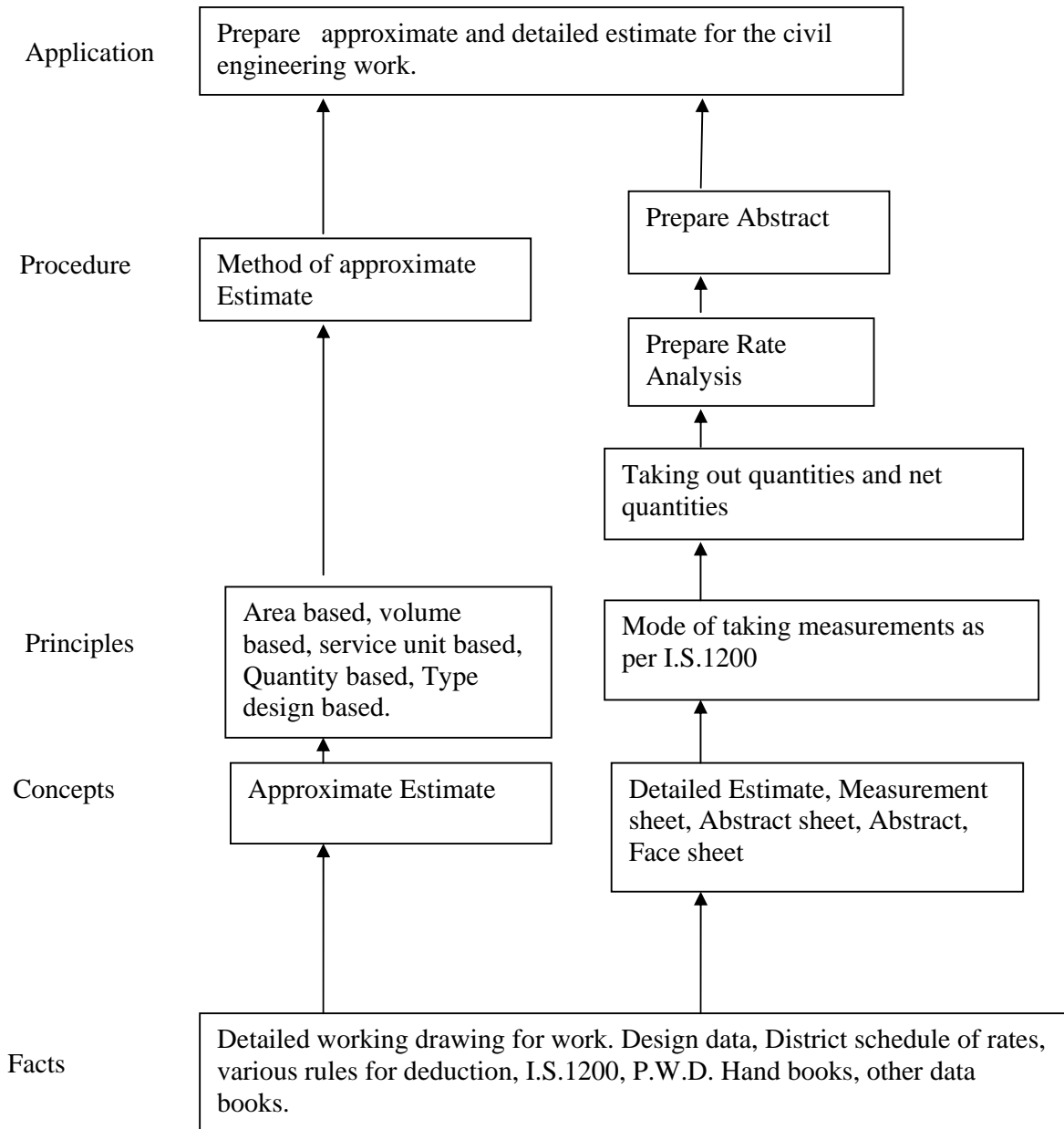
General Objectives:

Student will be able to:

- Understand units and modes of measurements of various items of work.
- Know the method of preparation of approximate estimates of various civil engineering works.

- Apply knowledge of preparation of check list of items of construction, rate analysis for preparation of detailed estimate of various civil engineering works.
- Understand the preparation of bill of quantities by taking measurements of completed item of work and rate of the item
- Apply computer software's to prepare estimate of building works.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
<p>Topic 1. Introduction Specific objectives:</p> <ul style="list-style-type: none"> ➤ Define and state purpose of estimating and costing. ➤ List different methods of approximate estimate. ➤ Collect local rates of materials, labour and equipments along with local terms used. <p>Contents:</p> <ul style="list-style-type: none"> • Estimates- Meaning of the term estimating and costing, purpose of estimating and costing. Types of estimates and their purpose • Approximate estimate- Plinth area rate method, Cubical content method, Service unit method, Typical bay method, Approximate quantity method. • Problems on plinth area rate method and use of service unit method for selection of service units for different types of buildings. • Detailed estimate- Detailed estimate, revised estimate, supplementary estimate, revised and supplementary estimate, repair and maintenance estimate and their uses in practical situation. 	04	08
<p>Topic 2. Mode of measurement and brief specifications Specific objectives:</p> <ul style="list-style-type: none"> ➤ State units and modes of measurement and payments for various items of works. ➤ Apply rules of deductions for openings as per IS 1200. ➤ Use standard formats of measurement sheet, abstract sheet and face sheet. <p>Contents:</p> <ul style="list-style-type: none"> • Units of measurement and desired accuracy as per IS: 1200, Rules of deduction for openings as per IS:1200 for brick work, plastering and pointing. • Sequence of execution and brief description / specification of items of work as per PWD/GOVT. DSR, Standard formats of measurement sheet, Abstract sheet, face sheet. 	06	12
<p>Topic 3. Preparation of estimate Specific objectives:</p> <ul style="list-style-type: none"> ➤ Collect the data regarding cost/Sq.m for various types of buildings as per PWD and local rates. ➤ Prepare approximate estimates of various civil engineering works. ➤ Understand various items of works of different civil engineering structures. ➤ Prepare check list for civil engineering works. ➤ Apply methods of taking out quantities. ➤ Adopt procedure of preparing detailed estimate of RCC framed structures and Load bearing structures. ➤ Prepare bar bending schedule of RCC works. ➤ Apply various methods for earth work computation. ➤ Incorporate various provisions to be made in detailed estimate. 	22	40

Topic and Contents	Hours	Marks
<p>Contents:</p> <p>3.1 Approximate Estimate (16 Marks)</p> <ul style="list-style-type: none"> • Plinth area/carpet area/Super built up area of building by using PWD rates and local rates • Estimates of roads, highway, railways, bridges/culverts, irrigation projects and water supply projects. <p>3.2 Detailed Estimate (12 Marks)</p> <ul style="list-style-type: none"> • Data required for detailed estimate • Steps in preparation of detailed estimate • Preparing check list of RCC framed structure building/roads, listing of approximate % of steel required for various RCC members. • Methods for taking out quantities by Long wall and Short wall method, Centre line method. • Taking out quantities of various items of building (RCC framed structure and Load bearing structure), road work as per PWD method. <p>3.3 (12 Marks)</p> <ul style="list-style-type: none"> • Bar bending schedule and steel quantities calculation for footing, column, beam, slab and chajja. • Earthwork computation-Meaning and methods, calculation of earthwork quantity for roads and canal by average cross sectional area method, mid sectional method, Prismoidal formula method. • Provisions to be made in detailed estimate for contingencies, work charged establishment, centage charges, water supply and sanitary arrangements, internal electrification etc. • Meaning of the terms- Prime cost, Provisional sum, provisional quantities, Day work 		
<p>Topic 4. Rate Analysis</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> ➤ Understand definition, purpose and concept of rate analysis. ➤ Collect local rates of materials, labours and hiring charges of tools and plants with transportation charges. ➤ Understand the concept of lead and lift. ➤ Prepare rate analysis of various items of work. <p>Contents:</p> <p>4.1 (08 Marks)</p> <ul style="list-style-type: none"> • Definition, purpose, importance of rate analysis, factors affecting rate analysis, procedure of rate analysis. • Meaning of term lead, lift, task work, material rate and labour charges, conveyance capacity of different types of vehicle, transportation of materials and charges, categories of labours, their rates, overhead charges, contractors profit, work charge establishment and water charges. <p>4.2 (16 Marks)</p> <ul style="list-style-type: none"> • Preparing rate analysis of different items of work- excavation, PCC, RCC Footing, brick masonry, stone masonry, RCC work (column, beam, lintel, slab etc.), flooring, plastering, DPC, Wood work for doors and windows frames and shutters. 	10	24

Topic and Contents	Hours	Marks
<p>Topic 5. Estimate for Civil Engineering works</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> ➤ Prepare estimate for different civil engineering works ➤ Prepare sample estimate by using computer software / Excel programme. <p>Contents:</p> <ul style="list-style-type: none"> • Preparation of detailed estimate for: 6 to10 users septic tank, and Community well. • Preparation of detailed estimate for a small RCC slab culvert. • Use of computer / software / programmes for detailed estimate preparation of building works. 	06	16
Total	48	100

Practicals:**Skills to be developed****Intellectual Skills:**

1. List various items of work with the units in a civil engineering structures.
2. Calculate quantities of various items of works

Motor Skills:

1. Prepare rate analysis.
3. Prepare detailed estimate of civil engineering structures.

List of Assignments:

1. Understand the importance of estimate & costing, types of estimates of estimate & requirements of an estimator.
2. Read interpret civil Engineering drawings prepare book list (item wise list) for detailed estimation and understand the unit of measurement.
3. Understand brief specifications & collection of market rates for charges for tools & plants.
4. Prepare approximate estimates for various Civil Engineering works.
5. Prepare detailed estimate of buildings part - I Taking Quantities & preparation of the measurement sheet
 - a) Residential building - Load bearing structure
 - b) Community Hall-R.R.C. framed structure.
6. Prepare rate analysis to different items measurements of Civil Engineering works.
7. Prepare detailed estimate of two storeyed (R.C.C.framed) residential building.
8. Calculate quantity by field measurements and prepare bill of quantities for building items.

9. Prepare detailed estimate of new road by taking out quantities of earthwork by midsection or mean area method.
10. Taking out quantities of the earthwork for a road profile of 500m. length by using Excel / any other area method.
11. Prepare detailed estimate of
 - a) Septic tank / community well.
 - b) Slab culvert / pipe culvert.

Learning Resources:**Books:**

Sr. No.	Title	Author	Publisher
01	Estimating and Costing in Civil Engineering	B.N. Dutta	UBS Publishers Distributors Pvt. Ltd., New Delhi
02	Estimating and Costing, Specification and Valuation in Civil Engineering	M. Chakraborti	M. Chakraborti, Kolkata
03	Estimating and Costing	S.C. Rangwala	Charotar Publication, Anand
04	Estimating and Costing	G.S. Birdie	Dhanpat Rai and Sons.
05	Civil Engineering Estimating Vol. 1	B.S.Patil	Orient longman,mumbai
06	Estimating construction costs (fifth edition)	Robert L. Peurifoy Garold D. Oberlender	Tata McGraw Hill Education Private Ltd, New Delhi

1. CDs, PPTs Etc.:

Q.E. PRO software or any equivalent Software

2. IS, BIS and International Codes:

Sr. No.	Title
01	IS-1200- Method of measurement of building and civil engineering works
02	District Schedule of rate of PWD

3. Websites:

- a) www.maharashtra.gov.in
- b) www.mahapwd.com
- c) www.cpwd.com
- d) www.newtonindia.com
- e) www.ensoftindia.com

Course Name : Diploma in Civil Engineering

Course Code : CC / CI

Semester : Sixth

Subject Title : Concrete Technology

Subject Code : 17981

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Plain or reinforced cement concrete is extensively used as a construction material in almost all types of Civil engineering structures like buildings, roads flyovers, dams, bridges and water tanks etc. With advanced construction techniques and use of locally available ingredients of concrete, concrete has become very popular construction material.

The contents on cement and aggregate will be useful in deciding contents and quality of concrete during preparation and placing of concrete in position. Topic on quality control of concrete will be useful in execution of various items of works where concreting is involved. Thus the total contents of the subject will be useful for ensuring the quality of concrete during design preparation, transporting and placing in position for various structures. It will also provide guidelines for effective supervision and quality control of concreting work. With good knowledge of concrete materials namely cement, aggregates, water and admixtures and concreting operation namely selection of materials, mixed design, mixing, placing, compacting and finishing, curing, one can obtain concrete of desired workability and required strength.

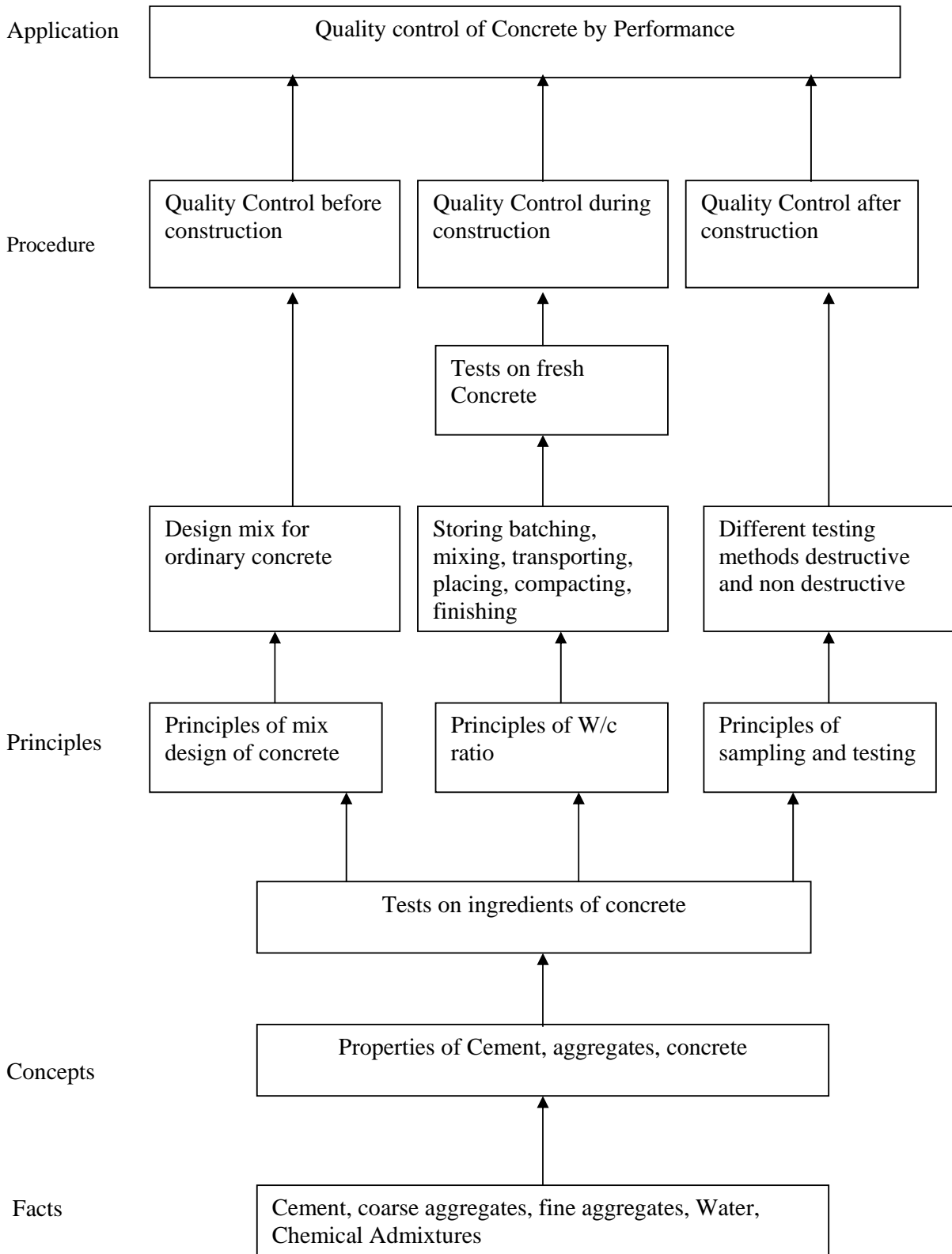
The content of this subject will enable a civil Engineering technician to acquire skills of carrying out various tests on concrete materials and concrete it self along with interpretation of test result.

General Objectives:

Student will be able to -

1. Ensure the quality of ingredients of concrete.
2. Design concrete mix.
3. Understand Techniques of quality control of concrete.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
<p>Topic 1: Cement Specific Objectives:</p> <ul style="list-style-type: none"> • State physical properties and tests of cement. • State use of various types of cement. <p>Contents:</p> <p>1.1 Chemical Constituents of OPC and their effects on properties of OPC, Bogue's compounds and their properties, Hydration of cement. Physical properties of OPC-Fineness, setting, compressive strength and soundness. Different grades of OPC. 33, 43, and 53 with specifications of physical properties as per relevant IS codes. Testing of OPC –field tests and laboratory tests-fineness test, standard consistency test, setting time test, compressive strength test, soundness test. Storage of cement and effect of storage on properties of cement.</p> <p>1.2 Physical properties, I.S. Specifications and field application of following types of cement :- Rapid hardening cement, Low heat cement, Portland pozzolana cement, Sulphate resisting cement, Blast furnace slag cement, White cement.</p>	06	12
<p>Topics 2: Aggregates Specific Objectives:</p> <ul style="list-style-type: none"> • List and describe different properties of Aggregates. • Carry out various Tests on the Aggregates of concrete. <p>Contents:</p> <p>2.1: 04 Marks Requirement of Good Aggregate. Classification of Aggregate according to source, Size and Shape.</p> <p>2.2: Properties of fine aggregates : 08 Marks Concept of size, specific gravity, bulk density, water Absorption and Bulking. Determination of fineness modulus and grading zone of Sand by sieve analysis, determination of silt content in sand and their specification as per IS 383. Determination of Bulking of sand. Concept of crushed Sand.</p> <p>2.3 Properties of coarse aggregates: 08 Marks Concept of size, shape, surface texture, water absorption, soundness, specific gravity and bulk density Determination of fineness modulus of coarse aggregate by sieve analysis, grading of Coarse Aggregates. Determination of crushing value, impact value and abrasion value of coarse aggregate with specification.</p>	10	20
<p>Topics 3: Concrete Specific Objectives:</p> <ul style="list-style-type: none"> • Describe properties of concrete. • Carry out various tests on concrete. <p>Contents:</p> <p>3.1 Introduction to concrete - 08 Marks Definition of concrete, necessity of supervision for concreting operation, different grades of concrete (ordinary Concrete, standard concrete and high strength concrete as per provisions of IS 456- 2000. Water cement ratio:- Definition of w/c ratio, Duff Abraham w/c law,</p>	12	24

<p>significance of w/c ratio, selection of w/c ratio for different grades of concrete prepared from different grades of OPC as per graphs specified in IS 10262 -1982, maximum w/c ratio for different grades of concrete for different exposure conditions.</p> <p>3.2 Properties of fresh and Hardened concrete.....08 Marks Definition of workability, factors affecting workability of Concrete. Determination of workability of concrete by slump cone test, compaction factor test. Range values of workability requirement for different types of concrete works. Segregation, bleeding. Definition of compressive strength, durability and Impermeability of concrete. Factor affecting compressive strength, durability and Impermeability of concrete.</p> <p>3.3 Concrete Mix Design and Testing of Concrete...08 Marks Objectives of mix design, list of different method of mix design, study of mix design procedure by I.S. method as per I.S. 10262-1982 (Only procedural steps) Testing of concrete:-Significance of testing, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results Non- destructive testing of concrete:- Importance of NDT, methods of NDT - rebound hammer test and ultrasonic pulse velocity test, working principle of rebound hammer and factor affecting the rebound index, specification for deciding the quality of concrete by Ultrasonic pulse velocity as per I.S. 13311 (part 1 and 2). Determination of compressive strength of concrete by rebound hammer test as per I.S. 13311, determination of Quality of concrete by ultrasonic pulse velocity test.</p>		
<p>Topics 4: Quality Control of Concrete Specific Objectives:</p> <ul style="list-style-type: none"> Describe various concrete operations. <p>Contents:</p> <p>4.1: Concreting Operation.....16 Marks Batching- Definition and Types of Batching. Mixing- Types of Mixing and Types of mixers. Form work : Form work for concreting, different types of form works for members like beams, slabs, Columns, materials used for form work, requirement of good form work. Stripping time for removal of form works per IS 456-2000 provision for different structural members. Transportation: Modes of transportation of concrete, precautions to be taken during transportation. Placing: placing of concrete in form work, precautions to be taken while placing of concrete. Compaction of concrete: methods of compaction, care to be taken during compaction. Finishing of concrete: purpose of finishing, types of Finishing. Curing of concrete: definition of curing, necessity of curing, different methods of curing and their application</p> <p>4.2: Waterproofing and Joints of concrete:.....08 Marks Waterproofing: Importance and need of waterproofing, methods of Waterproofing and materials used for waterproofing. Joints in concrete construction: Types of joints, joining old and new concrete, methods of joining, Materials used for filling joints.</p>	<p>12</p>	<p>24</p>

<p>Topics 5: Chemical Admixture in concrete, Special Concrete and, Extreme weather concreting</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> • State the uses of admixture in concrete. • Describe special concrete. <p>Contents:</p> <p>5.1: Chemical admixture in concrete:..... 08 Marks Purpose of using admixtures, Properties, and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixture, air entraining admixture and super plasticizers.</p> <p>5.2: Special Concretes:- 08 Marks Properties, Advantages and Limitation of the following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete, Self compacting concrete, Light weight concrete.</p> <p>5.3: Extreme weather concreting: 04 Marks Effect of cold weather and hot weather on Concrete, precautions to be taken while concreting in hot and cold Weather condition.</p>	08	20
Total	48	100

Practicals:**Skills to be developed:****Intellectual Skills:**

1. Analyze the given data
2. Select proper method for analysis
3. Interpret the results

Motor Skills:

1. Measure the quantities accurately
2. Handle instruments properly

Term work shall consist of

List of Practicals:

1. Determine fineness of cement preferably by Blaine's air permeability apparatus Or by sieving.
2. Determine standard consistency, initial and final setting times of OPC.
3. Determine compressive strength of ordinary Portland cement.
4. Determine silt content in sand by volume and bulking of sand.
5. Determine bulk density and water absorption of fine and coarse aggregates.
6. Determine Fineness modulus of fine and coarse aggregate by sieve analysis.
7. Determine aggregate impact value.
8. Determine aggregate abrasion value.

Mini Project:

Determination of design mix proportion by mass for M 20 grade of concrete using I.S. Method for given data (such as grading zone of sand, proportion of 20 mm and 12.5 mm metals, specific gravities of cement, sand and aggregate, water absorption of sand and aggregate, compacting factor and exposure condition).

Learning Resources:

- **Books:**

Sr. No.	Author	Title	Publisher
1	M. S. Shetty	Concrete Technology	S. Chand Publication
2	M. L. Gambhir	Concrete Technology	Tata Mc-Graw. Hill Publishing Co. Ltd. New Delhi
3	A. M. Neville and J. J. Brooks	Concrete Technology	Pearson Education Pvt. Ltd. New Delhi
4	A.R. Santhakumar	Concrete Technology	Oxford University Press.
5	A. M. Neville	Properties of Concrete	Pearson Education Pvt. Ltd. New Delhi

- **CDs, PPTs Etc.:**

CD or PPT of above experiments developed by NITTTR and NPTEL (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the conductance of above experiments.

- **IS, BIS and International Codes:**

1. I.S.4031- (Part 1 to Part 6) Indian standard method of physical tests for hydraulic Cement, BIS, New Delhi.

I.S. 4031 (Part 1) - 1996 Part 1 - Determination of fineness by dry sieving.

I.S. 4031 (Part 2) - 1999 Part 2 - Determination of fineness by air permeability Method.

I.S. 4031 (part 3) - 1988 (reaffirmed 2000) Part 3– Determination of soundness

I.S. 4031 (part 4) - 1988 (reaffirmed 1995)

Part 4 - Determination of consistency of standard cement paste.

I.S.4031 (part 5) - 1988, (reaffirmed 2000) Part 5 - Determination of initial and final setting times

I.S: 4031 (part 6) - 1988, (reaffirmed 2000) Part 6 - Determination of Compressive strength of hydraulic cement other than masonry cement

2. I.S: 2386 (part i to part vi) – 1963 Indian standard methods of test for aggregate for Concrete. BIS, New Delhi.

Part i - Particle size and shape. (Reaffirmed 1997)

Part ii - Estimation of deleterious materials and organic impurities. (Reaffirmed 2002)

Part iii - Specific gravity, density, voids, absorption and bulking. (Reaffirmed 1997)

Part iv - Mechanical properties (reaffirmed 1997)

Part v - Soundness. (Reaffirmed 1997)

Part vi - Measuring mortar making properties of fine aggregate. (Reaffirmed 2002)

3. I.S: 383 - 1970 Indian standard specification for coarse and fine aggregates from Natural sources for concrete. B.I.S., New Delhi.
4. I.S: 1911 - 1959 (reaffirmed) Indian Standard methods of sampling and analysis of concrete), B.I.S., New Delhi.
5. I.S: 456 - 2000 Indian standard, plain and reinforced concrete – code of practice. (fourth revision), B.I.S., New Delhi.
6. I.S: 516 - 1959 Indian standard methods of tests for strength of concrete (xii reprint December 1987), B.I.S., New Delhi.
7. I.S.: 8112- 1989 Indian standard - 43 grade ordinary portland cement Specification
8. I.S: 12269 - 1987 (reaffirmed 1999) Indian standard specification for 53 grade O.P.C..
9. I.S: 9103 - 1999 Indian standard – concrete admixtures specification
10. I.S.: 455- 1989 (reaffirmed 1995) - Indian standard – Portland slag cement specification
11. I.S.: 1489 (part 1) 1991 - Portland - Pozzolana Cement – specification part 1 fly ash based
12. I.S.: 7861 (part 1) 1975 (reaffirmed 1997) - Indian standard of practice for extreme weather concreting part 1 recommended practice for hot weather concreting
13. I.S.: 7861 (part 2) - 1981 (reaffirmed 1997) - Indian standard of practice For extreme weather concreting part 2 - recommended practice for cold weather concreting
13. I.S : 8041 - 1990 - Indian standard - rapid hardening Portland Cement specification BIS- New Delhi
14. I.S: 12330 - 1988 (reaffirmed 1995) - Indian standard specification for sulphate resisting Portland cement
15. I.S. : 12600 - 1989 (reaffirmed 1995) - Portland cement, low heat Specification
16. I.S. : 10262 - 1982 Indian standard recommended guidelines for concrete mix Design
17. Sp 23 handbook on concrete mixes (based on Indian standards)
18. I.S. 13311 (part-1 and 2) - 1992 methods of non-destructive testing of concrete. part-1 ultrasonic pulse velocity, part-2 rebound hammer.

Course Name : Diploma in Civil Engineering

Course Code : CC / CI

Semester : Sixth

Subject Title : Highway Engineering

Subject Code : 17982

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	25#	25@	150

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

Today's civil Engineering. Diploma Technician has to work on various civil Engineering. Projects like multistoried buildings, Industrial buildings, Roads, Water Supply, Sanitary Schemes & also on Various Irrigation Structures like Dams, Percolation tanks, Bridges etc. Infrastructural facility like Roads plays a major role in the development of the country.

Road is the important largest and basic mode of Transportation in India. Road Transportation is the most effective and economical means of Transportation. A large scope in Design, Construction and maintenance of Road is present in our country.

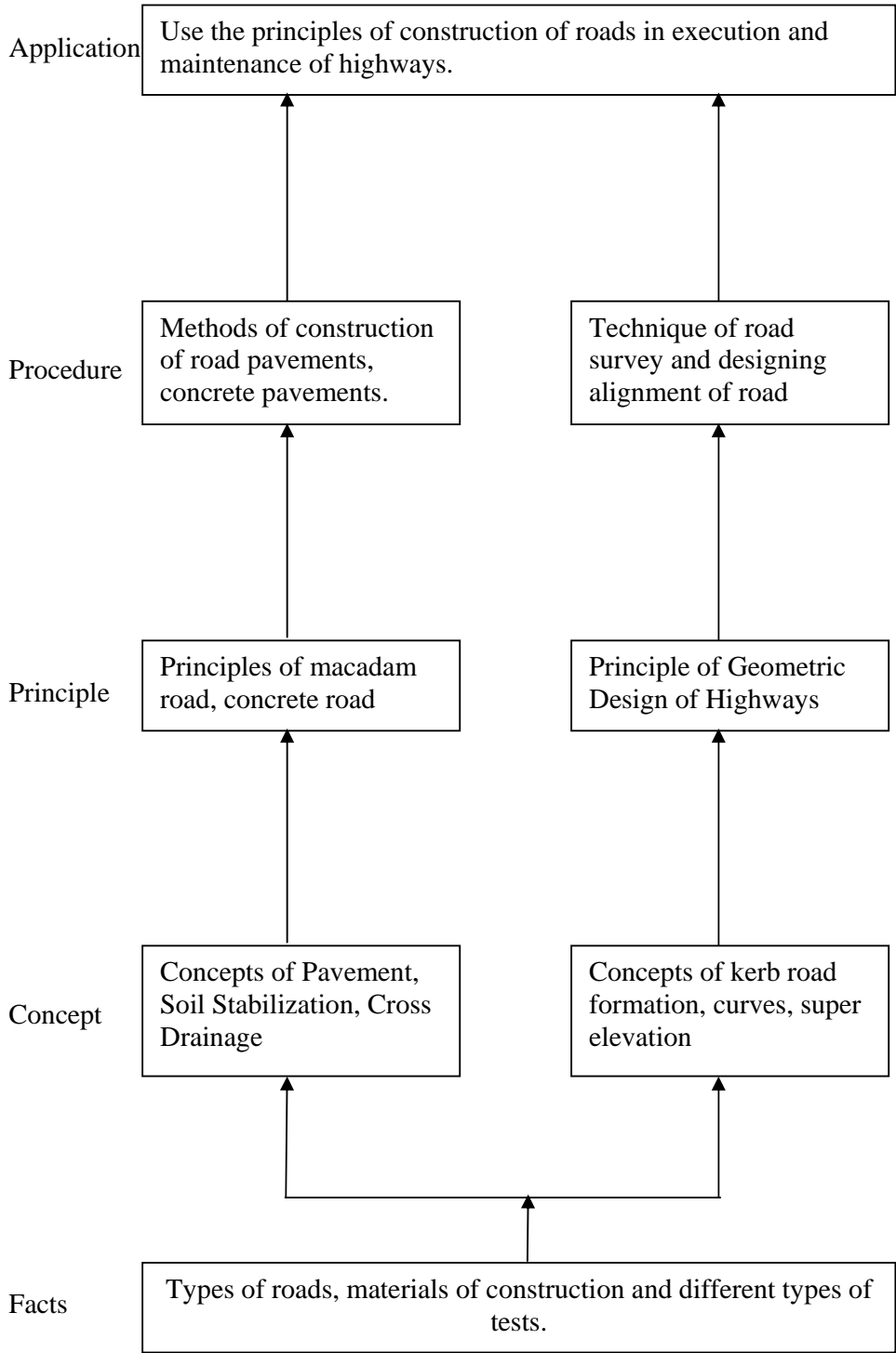
Diploma Engineering students have large scope in jobs as well as different Construction activities in Road Construction. This project gives the knowledge and skills required to carry out the survey, investigation, planning, design, construction and maintenance works related to Road Constructions.

General Objective:

Student should be able to:

- 1) Know the importance and classification of Road.
- 2) Understand the types of Surveys and Investigation for location of new Roads.
- 3) Understand the different methods of Road Construction.
- 4) Apply the Equipments used in Road Constructions.

Learning Structure:



Theory

Topic and Contents	Hours	Marks
<p>Topic 01: Importance and Classification of Roads.</p> <p>Specific Objectives :</p> <ul style="list-style-type: none"> ➤ State the importance of Transportation. ➤ List classification of Roads. <p>Contents :</p> <ul style="list-style-type: none"> • Importance of Transportation. • Different Modes of Transportation. • Classification of Roads. • Characteristics of Road Transport. 	02	04
<p>Topic 02: Investigation of Road Project</p> <p>Specific Objectives :</p> <ul style="list-style-type: none"> ➤ Describe types of surveys ➤ Draw L section & C/S of roads. <p>Contents :</p> <ul style="list-style-type: none"> • Reconnaissance survey preliminary survey and location survey for road project. • Fixing the alignment of road, factors affecting road alignment. • 'L' section & cross section of roads. • Drawing required for road project. • Keymap, Index map, Preliminary survey plan, detailed location survey plan, 'L' section & C/s of C.D. works, Land acquisition plan. 	02	08
<p>Topic 03: Geometric design of Roads.</p> <p>Specific Objectives :</p> <ul style="list-style-type: none"> ➤ State the maximum and minimum I.R.C. specification for Camber, Kerbs, Gradient, Slight distance, Super elevation. ➤ Sketch standard cross section of Highway in cutting and embankment. <p>Contents :</p> <ul style="list-style-type: none"> • Camber- definition, types, IRC specification. • Kerbs, road margin, road formation, right of way. • Design speed- IRC specifications. • Gradient- Definition, types of IRC specifications. • Slight distance- Definition, types, IRC specifications. • Super elevation- Definition, minimum & maximum values of super elevation methods of providing super elevation. • Sketching of standards cross-sections of national highway in embankment & cutting. • Simple numerical problems on camber, side distance & superelevation. 	12	24
<p>Topic 04: Construction of Roads</p> <p>Specific Objectives :</p> <ul style="list-style-type: none"> ➤ List the different materials used in road construction. ➤ Describe the construction of earthen roads, soil stabilized roads, water bound macadam roads, bituminous roads & concrete roads. <p>Contents :</p> <ul style="list-style-type: none"> • Types pf road materials - soil, aggregates, bitumen, cement concrete. • Pavement- objective, structures and functions of pavement 	12	24

<p>components, types of pavements rigid and flexible</p> <ul style="list-style-type: none"> • Construction of earthen roads, general terms used, borrow pits, spoil bank lead & lift, balancing of earth work, construction procedure. • Soil stabilized roads- necessity, methods of soil stabilization. • Water bound macadam roads- materials used, size & grading of materials used, construction procedure including precautions rolling. • Construction- bitumen asphalt, emulsion, cutback tar, common grades, adopted for construction. • Types of bituminous surface, prime coat, tack coat, seal coat, surface dressing, procedure of construction , full grout , semi grout • Cement concrete pavements- Method of Construction ,Construction joints, joint filling, joint sealer. 		
<p>Topic 05: Traffic Engineering Specific Objectives :</p> <ul style="list-style-type: none"> ➤ Define the traffic density, traffic capacity and traffic volume. ➤ State the traffic control devices. <p>Contents :</p> <ul style="list-style-type: none"> • Traffic Engg. Definition, Traffic characteristics. • PUC, Traffic density, traffic capacity. • Traffic volume study- objects and uses, counting of Traffic volumes, PCU. • Traffic control devices – road • Signs, Marking, Signals, Traffic Island and its types - Divisional, Channelizing, Pedestrian, Rotary. 	04	08
<p>Topic 06 : Hill Roads Specific Objectives :</p> <ul style="list-style-type: none"> ➤ Describe the procedure for the alignment and geometric of hill roads. ➤ Sketch the drainage structures in hill roads. <p>Contents :</p> <ul style="list-style-type: none"> • Alignment survey for hill roads. • Geometric of hill road - width, formation, camber construction of hill roads. • Drainage structures in hill roads, side drains, catch water. • Land Sides- causes and prevention. 	02	08
<p>Topic 07: Drainage and maintenance of roads. Specific Objectives :</p> <ul style="list-style-type: none"> ➤ State the purpose of road drainage. ➤ State the importance and repairs of roads. <p>Contents :</p> <ul style="list-style-type: none"> • Purpose of high drainage. • Surface drainage system in urban roads, cross drainage. • Sub-Surface drainage- Longitudinal drains and cross drains. • Necessity of maintenance of roads. • Classification of maintenance operation – routine and periodic maintenance, special repairs and resurfacing. • Maintenance of W.B.M., bituminous and cement concrete roads. 	04	08
<p>Topic 08 : Earth Moving Equipments & High way Machineries Specific Objectives :</p> <ul style="list-style-type: none"> ➤ List the different types of Excavating Equipments ➤ State the use and Working of Compacting Equipments. <p>Contents :</p>	10	16

<ul style="list-style-type: none"> • Excavating Equipments: Bulldozers, Scrappers, Graders, Power Showels, JCB. • Use and Working of Excavating Equipments. • Compacting Equipments : Rollers, Plain Rollers, Sheep Tooted Roller, Vibratory Roller, Pneumatic Rollers • Use of Compacting Equipments. • Hot Mix Bitumen Plant : Bitumen Road Paver 		
Total	48	100

List of Assignments:

1. Road project for a road of minimum 1.0 km. length having at least one shall cross drainage work.
 - 1.1 Site selection.
 - 1.2 Reconnaissance survey.
 - 1.3 Fixing the alignment.
 - 1.4 Detailed profile survey along the alignment and cross section of road and CD Work.
 - 1.5 Prepare computer/ pencil finished drawing of longitudinal section and typical cross sections of the road in cutting and filling.
 - 1.6 Prepare computer / pencil finished drawing of proposed typical CD work /culvert.
2. Visit to a road under construction / constructed to study the construction of (a) WBM road (b) flexible pavement (c) Rigid pavement roads for observing the type of construction and construction equipments.
3. Preparing drawing of detailed cross sections of (a) Major district road, (b) State highway (c) National highway, (d) Express highway in cutting and banking showing details and dimensions with proper scale (Any Two)
4. Traffic volume study and its preparation of an important road interaction in your city.
5. Visit to a W.B.M./ Bituminous/Concrete road for observing the different types of defects in roads. Prepare a visit report. Which should consist of (a) List of various defects observed (b) Suggestions regarding the possible remedial measure.
6. Test on Bitumen: Penetration, Ductility, Softening point, Flash and Fire point.
7. Test on Soil: CBR Test Calculation of pavement thickness using design charts provided by IRC & California Highway department.
8. Visits to Road Construction site for studying different equipments like JCB , Power shovel, Excavators, Dozers, Rollers.

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher Address
01	Khanna & Justo	Highway Engineering	Khanna Publication
02	L.R.Kadiyali	Traffic Engineering	----
03	N.L.Arora, S.P. Luthara	Transportation Engineering	I.P.H. New Delhi

04	Vazarani & Chandola	Transportation Engineering	Khanna Publication
05	Biridi & Ahuja.	Road, Highway, Bridges	S.B.H. New Delhi
06	Kamala.	Transportation Engineering	T.M.H. New Delhi
07	---	DATA Book of P.W.D.	----

1. **IS / International Codes:** IRC 36-1970, IRC 16-1965, IRC 20 - 1966.

2. **CDS and PPTS:** Search for google.

Mahindra heavy earthmoving equipments

BEML heavy earthmoving equipments

COSMOS Construction equipments

UNIVERSAL Construction equipments

Course Name : Diploma in Civil Engineering

Course Code : CC / CI

Semester : Sixth

Subject Title : Computer Aided Drawing

Subject Code : 17983

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	50#	--	25@	75

Rationale:

Drawing is a language of engineers and in the era computers, engineers prepare most accurate and descent presentation of plans to satisfy the clients. It has become the practice to prepare the drawing with the help of computer. This not only saves time, but also provides scope for immediate improvements, changes in the drawings. From the aesthetic point of view also the drawings give better presentations. Therefore, use of computer software's (Auto Cad, Felix Cad, Auto Civil) will enable Civil Engineers to prepare quality drawing in shortest possible time. Hence, it becomes mandatory for the students of Diploma in Civil Engineering to possess drafting skills with the help of software.

General Objectives:

The students will be able to –

- 1) Use different CAD commands for drawing
- 2) Prepare line plans with CAD Software
- 3) Prepare Submission drawing/ working drawing of buildings.

To develop following skills:

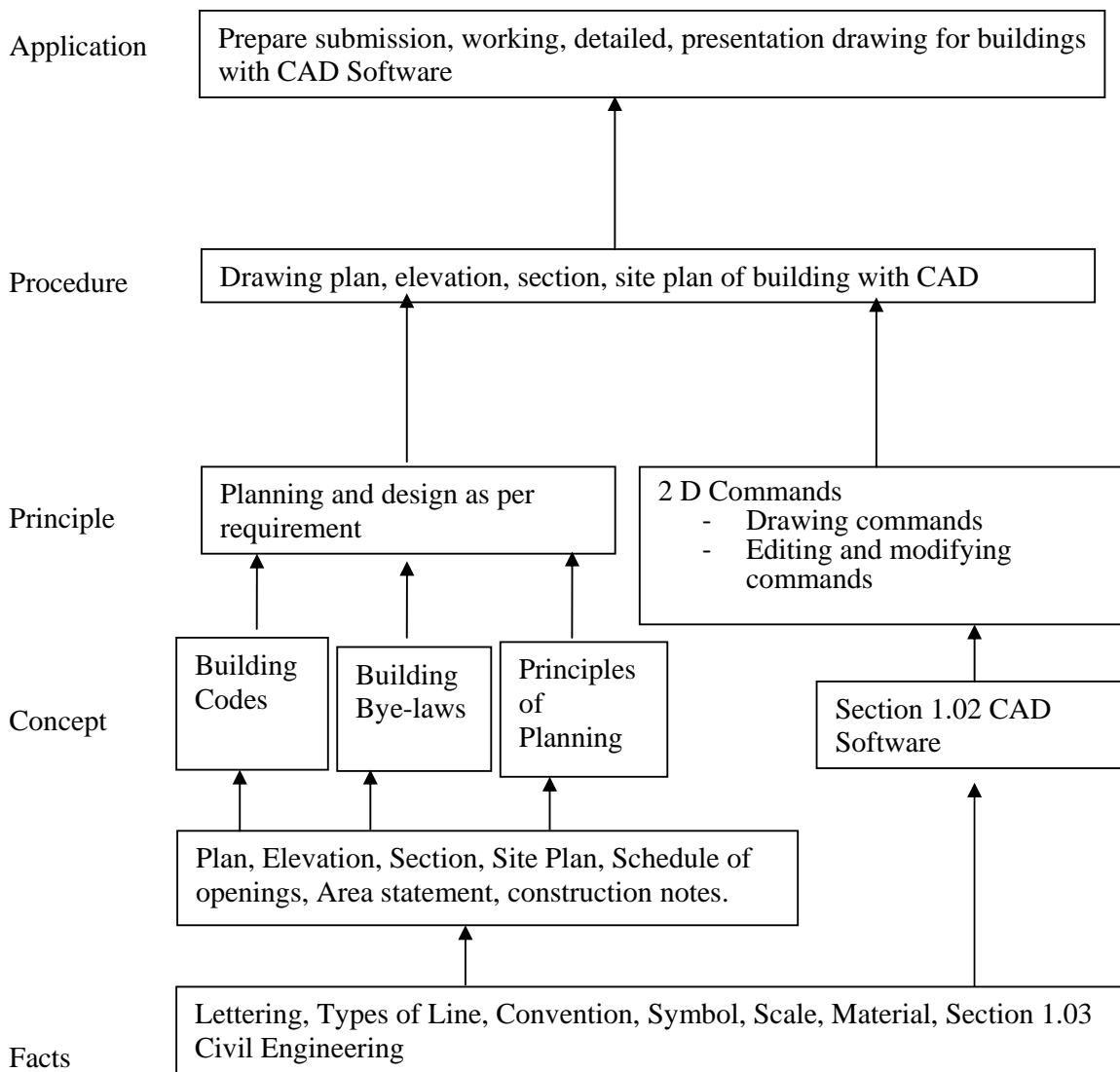
Intellectual Skills:

- Read and interpret building drawing
- Plan residential and public building as per requirement

Motor Skills:

- Prepare line plan for residential and public building
- Draw developed plan, elevation, section, site plan, foundation plan,
- Prepare schedule of openings, area statement

Learning Structure:



Theory:

Topic and Contents	Hours
Topic 1. FUNDAMENTAL OF CAD <ul style="list-style-type: none"> • CAD Software – Meaning, various CAD software's available in market, Advantages of CAD • Starting up of Cad, CAD Window, Toolbar, Drop down menu, Drop down menu, Introduction of starting Auto Cad Screen. • CAD fundamental, coordinate system in CAD. Absolute, Relative, Polar, Spherical, Cylindrical coordinate system, filters, Use of function key in AUTOCAD. 	08
Topic 2. CAD COMMANDS <ul style="list-style-type: none"> • WCS icon, UCS icon, coordinates, drawing limits , grid, snap, ortho features • Drawing commands- line circle, arc, polyline, multiline, construction line, sp line, ellipse, polygon, rectangle, table, block, text. • Editing commands – copy, move, offset, fillet, chamfer, trim, stretch, lengthen, extend, rotate, mirror, array etc. • Working with hatches, fills, dimensioning, text etc. • Important commands in insert menu, format menu, tools and dimensions. 	16
Topic3. SUBMISSION AND WORKING DRAWING <ul style="list-style-type: none"> • Preparation of line plan, detailed plan, developed plan, section, site plan, area statement • Procedure for printing drawings. 	36
Topic 4. INTRODUCTION TO 3D DRAWING <ul style="list-style-type: none"> • Preliminary commands required for 3D. 	04
Total	64

LIST OF PRACTICALS (TERM WORK) / ASSIGNMENTS:**Submission print on A 4 size paper**

1. Draw a line plan of given residential building**08 Hrs.**
2. Draw line plan of given public building**12 Hrs.**
3. Drawing symbols of construction materials /components such as stone, brick, glass, partition, wall doors and windows.**04 Hrs.**
4. Prepare working and detailed drawing for any two items, such as foundation plan, plan of Stair such as straight, dog legged, open Newel. **08 Hrs.**
5. Submission drawing, to the scale 1:100, of single storeyed Load Bearing Residential Building (2BHKD) with Flat Roof and staircase showing developed plan, elevation, section passing through Stair **or** w.c. and Bath, site plan (1:200), area statement, schedule of openings , construction notes show enlarged section with details **16 Hrs.**

(Print on A 4 size paper: Developed Plan, Elevation and Section on one page and remaining drawing on other page)

6. Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHKD with attached toilet to 1 bedroom showing the position of European type WC pan) showing developed plan, elevation, section passing through staircase, site plan (1:200), foundation plan (1:50), area statement, schedule of openings. (Also Show the place for Washing machine, WHB, Pooja, store etc. Also show bed position, Dining table with chairs, sofa, wardrobe etc. 12 Hrs.

(Print on A 4 size paper: Developed Plan, Elevation and Section on one page and remaining drawing on other page)

7. Submission of soft copy of above drawing files on CD and Hard copy on A4 size paper..... 04 Hrs.

List of Equipment

S.No	Name of Equipments	Quantity
1	Personal Computer's with latest version, TFT monitor 17 inches and Window based operating system with networking	20
2	Printer	02
3	Software's : AUTOCAD	01 for 20 users

Learning Resources:

1. Books:

Sr. No.	Title	Author	Publisher
1	AUTOCAD	David Frey	BPB Publication New Delhi
2	Introduction To Auto Cad 2012	Nighat Yasmin	SDC Publication.
3	AUTOCAD	Shyam & Titkoo	--
4	Auto Cad 2010 Instructor	James Leach	Tata McGraw Hill
5	Auto CAD and its Applications- Basics 2010	Terence M. Shumaker David A. Madsen David P. Madsen	Goodheart- Willcox (Duplicate of GOODW)

2. CDs, PPTs Etc.:

SOFTWARE REQUIRED: Latest version of Auto-CAD, Build master, interior Designer, 3D- Max Studio.

3. Websites: www.zwsoft.com/cad