GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN CIVIL ENGINEERING

TEACHING SCHEME (w. e. f Jan' 12)

SEMESTER- VI

SR. NO	SUB. CODE	SUBJECT	TEACHING SCHEME (HOURS)			CREDITS
			THEORY	TUTORIAL	PRACTICAL	
1	**2360601**	Design of Steel Structure	3	0	0	3
2	**2360602**	Practice in Design of Steel Structure	0	0	2	2
3	**2360603**	Advanced Construction Technology	2	0	0	2
4	**2360604**	Advanced Construction Technology Practice	0	0	2	2
5	**2360605**	Project : II	0	0	12	12
6	**2360606**	Concrete Technology	2	0	2	4
7		Elective	2	0	0	2
8		Elective Practice	0	0	2	2
		TOTAL	**9**	**0**	**20**	**29**

Select ANY ONE from the following subjects

Sr. No.	Sub. Code	Elective
1	**2360607**	Environmental Engineering
2	**2360609**	Advanced Transportation Engineering
3	**2360611**	Hydrology and Watershed Management
4	**2360613**	Advanced R.C.C. Structure
5	**2360615**	Computer Aided Structural Design and Drafting
6	**2360617**	Computer Aided Drafting and Programming Technologies

Select ANY ONE from the following subjects

Sr. No.	Sub. Code	Elective Practices
1	**2360608**	Environmental Engineering Practice
2	**2360610**	Advanced Transportation Engineering Practice
3	**2360612**	Hydrology and Watershed Management Practice
4	**2360614**	Advanced R.C.C. Structure Practice
5	**2360616**	Computer Aided structural Design and Drafting Practice
6	**2360618**	Computer Aided Drafting and Programming Technologies Practice

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Design of Steel Structures**
Subject Code: **2360601**

Sr. No.	Course Content	Hrs.
1.	**Introduction to IS: 800 – 2007** **1. 1** Structural steel and properties of structural steel **1. 2** Limit state design **1. 3** Limit state of strength **1. 4** Limit state of serviceability. **1. 5** Action (loads) **1. 6** Design strength **1. 7** Partial safety factor for materials **1. 8** Loads, Load combination and partial safety factors for loads. **1. 9** Maximum effective slenderness ratio	4
2.	**Bolted and Welded Connections** **2. 1** Riveted connection **2. 2** Bolted connection **2. 3** Classification of bolts **2. 4** Explain terms: Pitch of bolts, gauge distance, edge distance, end distance tacking fasteners. **2. 5** IS: 800 – 2007 Provisions for clearance for holes, spacing, edge and end distance, tacking fasteners. **2. 6** Type of bolted joints and failures of bolted joint. **2. 7** Design strength of bolt and efficiency of joints. **2. 8** Design of bolted joint for truss members **2. 9** Advantages and disadvantages of welded joints. **2. 10** Type of welded joints. **2. 11** Explain terms: Size of weld, throat, thickness, effective length, design stresses. **2. 12** Design of fillet welds for truss members	5
3.	**Tension member** **3. 1** Standard Sections used as a tension member **3. 2** Design Strength of a tension member -Design Strength due to yielding of grows section -Design Strength due to rupture of critical section -Design Strength due to block shear **3. 3** Find design strength of members **3. 4** Design of tension members for angle sections	5

4.	**Compression member** **4. 1** Slandered sections used as compression member **4. 2** Buckling class of cross section **4. 3** Effective length and slenderness ratio **4. 4** Design compressive stress and strength **4. 5** Find design strength of strut **4. 6** Design of strut **4. 7** Design of simple column and built up column **4. 8** Design of lacings **4. 9** Design of battens	**10**
5.	**Column Base** **5. 1** Types of column base **5. 2** Design of slab base **5. 3** Sketch of gusseted base	**4**
6.	**Beam :** **6. 1** Classification of cross section **6. 2** Laterally supported beam -Strength of beam in flexure- -Strength of beam in shear -Deflection limits **6. 3** Design of laterally supported beam -Simply supported beams with UDL over entire spam -Simply supported beam with central point load -Simply supported beam with UDL on entire spam along with central point load	**4**
7.	**Roof Truss:** **7. 1** Types of roof truss **7. 2** Elements of roof truss **7. 3** Load on roof truss 1) Dead load 2) Impose load 3) Wind load 4) Load combinations **7. 4** Find load per panel point for DL, LL, WL **7. 5** Find Member forces of truss graphically **7. 6** Design each member of truss and check for reversal of stress **7. 7** Design of joints **7. 8** Design of purlin	**10**

IS Codes:

1) IS 800-2007: Code of practices for General construction in steel
2) IS 875-1987 Part –I to III
3) SP: 6(1) - Steel structural hand book

Reference Books:

1) Design of steel structural — By S.S.Bhavikatti
2) Limit state design of steel structures — By Dr. V. L. Shal and Veena Gore
3) Design of steel structures — By N. Subhramaniam

GUJARAT TECHNOLOGICAL UNIVERSITY
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SEMESTER- VI

Subject Name: **Practice in Design of Steel Structure**
Subject Code: **2360602**

NOTE:-
Following are the minimum experiences required, but the college can do more experiences if possible.

Sr. No.	Course Content	Hrs.
1	**Forces in roof truss member** 1. 1 Calculate dead load, Live load and wind load per panel point of roof truss 1. 2 Draw space and vector diagram for unit DL/LL and unit WL. 1. 3 Find out member force in roof truss 1. 4 Find out load combination 1. 5 Draw a sheet of A-2 size Showing space and vector diagram for DL/LL and WL and force table.	5
2	**Detail of joints of roof truss** 2. 1 Design of member and joints 2. 2 Design of Purlin 2. 3 Draw a sheet of A-2 size containing detail of roof truss.	5
3	**Example of tension member** 3. 1 Solve at least 3 Problem for tension member with bolted connection. 3. 2 Solve at least 3 problems for tension member with welded connection.	2
4	**Example of compression member** 4. 1 Solve at least 3 problems for design of truss. 4. 2 Solve at least 3 problem for design of simple column 4. 3 Solve At least 2 problem for design of built-up column	5
5	**Compound column and column footing** 5. 1 Design of lacing 5. 2 Design of battening 5. 3 Design of sabbase 5. 4 Draw a sheet of A-2 size showing drawing of lacing, battening and slab base.	5
6	**Example of beam:** 6. 1 Solve at least 5 problems for design of laterally supported beam.	2
7	**Miscellaneous sketches:** 7. 1 Different types of roof truss 7. 2 Roof truss elements 7. 3 Beam to beam framed connection at same level (Bolted and welded)	4

	7. 4 Beam to beam at different level (Bolted and welded) 7. 5 Beam to column un stiffened seated connection (Bolted and welded) 7. 6 Beam to column stiffened seated connection(Bolted and welded) 7. 7 Double lacing system 7. 8 Gusseted base foundation	

Notes:

1) Term work report shall consists of design calculation of each design calculation mention IS clauses when and where required.
2) Practical examination is to be defended (along with term work) in front of external and internal
3) Practical examination shall consist of oral (viva) and sketching.

Reference Books:

1) IS: 800-2007
2) IS: 875-1987 Part I, II and III
3) SP: 6 (1) -Structural Steel handwork
4) Design of steel structures - By S.S. Bhavikatti
5) Limit Design of steel Structures- By Dr. V.L. Shah & Veena Gaur
6) Design of steel structures- by N Subramanian

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Advanced Construction Technology**
Subject Code: **2360603**

1. RATIONALE

Advanced Construction Technology is an essential course to all civil engineering students. The civil engineering technicians should know the advanced methods and technologies of construction, plants and equipment used in construction etc. Lateral forces-their effects resistive systems are covered in this course with special maintenance techniques. Scope for seminar is included to strengthen the teaching learning process. Selection of seminar shall be made from the magazines related to civil engineering based on the relevant topics of advance construction technology.

2. OBJECTIVES:

The student should be able to:

1. Understand the new technologies used in construction field.
2. Understand the use of different types of tools, plants and equipment used in construction industry.
3. Understand the effective layouts of equipment significance of time scheduling and Resource balancing.
4. Understand the phenomenon of earthquake engineering, its effects & design considerations etc.
5. Understand the special methods of maintenance, pre maintenance, suitable measures etc.
6. Develop the ability to prepare reports, seminars etc.

Sr. No.	Course Content	Hrs.
1	**Introduction and modern materials of construction** **1.1 Understand the scope of learning the course Advanced Construction Technology.** 1.1.1 State the advanced types of civil Engineering structures I Multistoried building II Chimney III Elevated reservoir IV Dams and retaining walls V Bridges and Hydraulic structures. VI Industrial structures VII Marine and offshore structures. VIII Tall structures 1.1.2 Introduction of the effect of lateral forces on buildings. i Wind ii Water iii Earthquake 1.1.3 Special techniques used in erection of steel structures & temporary structures 1.1.4 Special repair techniques. 1.1.5 Admixtures of concrete, Use of waste products and industrial by-products in	2

	concrete making, Thermal insulation and acoustic absorption materials,	
2	**PLANTS AND EQUIPMENT USED IN CONSTRUCTION** **2.1 a. Earthmoving machineries** b. Handling equipment c. Hoisting equipment d. Conveying equipment e. Pumping equipment f. Compacting equipment g. Pile driving equipment h. Plants for Grouting, Guniting i. Drilling equipment j. Hot mix plant k. Concrete and mixing plant **2.2 Factors affecting the selection of equipment.** Depending on various parameters. **2.3 Equipment for excavation** Power shovel Dragline Clamshell Scoop Trenching machine Wheel mounted belt loaders. **2.4 Earthmoving equipment** Tractors Bulldozers Graders Scrapers Rippers **2.5 Hauling equipment** Trucks Wagon Dumpers Cable ways Aerial Tramways **2.6 Hoisting equipment** Derrick – Pole Gin – Pole Crane Power driven scotch derrick crane Hand operated crane Locomotive crane Gantry crane Tower crane Shear leg Lattice Girder Winches Blocks/Jacks Elevators. Ladders	**2**

2.7 Conveying equipment

Belt conveyors
Buckets
Chutes
Buggies

2.8 Pumping equipment

Water pumps
Concrete pumps

2.9 Compacting equipment

2.9.1 Rollers (Earth compaction)
Smooth surface roller
Sheep foot roller
Grid roller
Pneumatic roller
Tamping roller
Vibrating roller
Vibrating plates
Vibratory compactors

2.9.2 Vibrators for Concrete consolidation
Internal vibrator
Surface vibrator
Platform vibrator
Form vibrator

2.10 Equipment used for Production of Aggregate.

2.10.1 List the equipment used
I Crusher
a. Jaw crusher
b. Gyratory crusher
c. Roll crusher
d. Cone crusher
II Rod & Ball mill
III Screens
IV Log washer

2.10.2 Machineries and equipments used for bituminous road.

2.11 Machineries used for construction of Asphalt road.

I Batch type hot mix plant
II Pavers
2.11.1 Explain in brief working of above machineries.
2.11.2 Draw line diagram of batch-type hot-mix plant and label component parts
2.11.3 Machineries and equipment used for Large concrete work.

2.12 Machineries and equipment used for concrete works

1. Central mixing plant.
2. Transit mixer agitating for ready mixed concrete.
3. Hoist
4. Tower crane
5. Chutes
6. Belt conveying
7. Pumps
8. Vibrators
9. Chilling plant and cooling of concrete.
10. Cable ways

	2.12.1 Sketch line diagram / flow diagram showing operations performed in constructing a large concrete project. 2.13 Dredging equipment 2.14 Element of cost for machineries and equipment used in construction.	
3	**DEEP EXCAVATION** **3.1 Shallow and deep excavation** 3.1.1 Define shallow excavation. 3.1.2 Define Deep excavation. Give Examples. 3.1.3 Differentiate shallow and deep excavations. **3.2 Predict problems likely to occur in excavation** 3.2.1 Explain necessity of timbering in trenches. 3.2.2 Label the component parts of timbering on a sketch. 3.2.3 State the precautions to be taken during timbering. **3.3 Significances of dewatering** 3.3.1 Define dewatering 3.3.2 State the reasons for dewatering 3.3.3. Give the conditions to the students for deciding the requirements for dewatering. 3.3.4 Explain how dewatering is done in different situations like: i) Deep excavation ii) Water logged area iii) Docks iv) Pile foundation 3.3.5 State the methods of dewatering Single and multistage dewatering Well point system of dewatering 3.3.6 Explain the procedures/methods of dewatering in different situations like i. Construction of drain ii. Construction of deep well iii. Freezing iv. Chemical consolidation system (Grouting system). v. Well point vi. Electro-osmosis	**2**
4	**CONSTRUCTION OF PILE FOUNDATION** **4.1 Use of piles in foundation** 4.1.1 Define shallow and deep foundation as per I. S. specifications 4.1.2 Distinguish between shallow and deep foundation with respect to design. 4.1.3 State the situations where deep foundations are must. **4.2 Types of piles.** 4.2.1 State the function of different types of pile like - load bearing - Friction - Sheet piles etc 4.2.2 Classify piles with respect to Materials like timber, steel, concrete pre cast – cast in situ, composite etc. 4.2.3 State the factors influencing the selection of piles. 4.2.4 List pile accessories used in construction	**2**

	4.3 Importance of pile foundation in foundation designs. **4.4**.Explain the methods of pile driving **4.5 Enumerate causes of settlement of piles.** - Negative friction - Pulling out of piles **4.6 Construction of under reamed piles** 4.6.1 Decide the dimensions of under reamed piles i. diameter of pile ii. Depth of pile iii. size of under reamed bulb iv. minimum reinforcement v . spacing of pile 4.6.2 Empirical equation used for ultimate bearing capacity of under reamed piles 4.6.3 Know method of testing for under reamed piles. **4.7 Loss in energy due to impact and other than impact Load barring capacity of pile foundation:** Equations & tests (Gravity loading and reaction loading) 4.7.1 Resistance and loss in energy 4.8 Discuss the losses due to several factors like impact etc. Well foundation Island method for well sinking	
5	**COFFER DAMS** **5.1 The necessity of cofferdam** 5.1.1 Define cofferdam **5.2 Sketch types of cofferdam** 5.2.1 Explain with suitable sketches types of cofferdam like. I Earthen cofferdam ii Rock fill cofferdam iii Cellular cofferdam iv Single walled cofferdam V Double walled cofferdam 5.2.2 Discuss utility of above cofferdams in different situations **5.3 Force acting on cofferdam** 5.3.1 List forces considered in the design of cofferdams like: A. Water pressure B. Self weight C. Silt pressure D. Uplift pressure. 5.3.2 Seepage of water below cofferdam **5.4 Discuss the economic height of cofferdam** 5.4.1 Explain in your own words concept of satisfactory height with respect to normal flood level.	**2**
6	**CAISSONS** **6.1 Meaning of the term caisson** 6.1.1 Define caissons 6.1.2 Distinguish caisson with pile foundation 6.1.3 Distinguish between caisson and cofferdam **6.2 Uses of caissons** 6.2.1 State the use of caisson in following situations i . Bridge pier	**2**

	ii Marine structure iii. Hydro power station **6.3 Classify type of caissons** 6.3.1 State the type of caissons as I . Open caissons ii . Closed or Box caissons iii . Pneumatic caissons 6.3.2 Explain with sketches types of caissons and label the component parts 6.3.3. Select suitable caissons for given different situations **6.4 Driving process for caissons** 6.4.1 Explain procedure of driving i. Open caissons ii. Box caissons iii. Pneumatic caissons. 6.4.2 Problem likely to occur to the persons working in pneumatic caisson I. Caisson sickness II.Caisson's diseases. Tilting of caissons and its restoration.	
7	**DRILLING AND BLASTING** **7.1 Define drilling operation** 7.1.1 Explain necessity of drilling for the purpose of blasting & other uses in hard rock or in earth. **7.2** Terminology used for drilling **7.3** Factors affecting the selection of drilling method & equipment. **7.4 Types of drilling – Inclined, Horizontal & Vertical.** 7.4.1 Heading – Full/ partial face heading and banding **7.5 Necessity of selecting the drilling pattern for blasting** 7.5.1 Explain how the size of the hole depends upon A .The type and size of drill used B. Depth of hole C .Type of rock D. Maximum size of rock required. 7.5.2 Discuss the economy of drilling hole 7.5.3 Factors helping in analyzing the drilling operations 1 Quantity required m of length 2 Explain in kg / m^3 of rock 3 Explain in kg/m of hole **7.6** Effect of air pressure on drilling operation **7.7** Analyze factors affecting the optimum drilling pressure **7.8** Use of bentonite /mud slurry in drilling **7.9** Define blasting **7.10 Terminology used for blasting** 7.10.1 Enlist the explosives a. Dynamite b. Ammonium nitrate explosive c. Slurry d. ANFO or AN/FO e. RDX **7.11 Define terms like -** i. Dynamite ii. Blasting caps	**2**

	iii. Prime line iv. Safety fuse v. Stemming vi. Blast hole vii. Primer viii. Prime detonator **7.12 Explain explosive process** 7.12.1 Packing of blast in hole & plugging with mud rods 7.12.2 Types of blasting – sequential and simultaneous blasting 7.12.3 Detection of misfire/ miss blast holes 7.12.4 Draw a sketch of blast hob & enlist part /material **7.13 General precautions required for blasting** I. Safety measures II. Do & Don't observed etc. **7.14** Necessity of storing explosives properly **7.15** Give salient features of a magazine building **7.16** Effect of air pressure on drilling. 7.16.1 Know the effect of increased air pressure on maintenance and repairs of drills. **7.17** Building demolition using explosives.	
8	**TEMPORARY STRUCTURES** **8.1 Explain form work** 8.1.1 Materials used in form work 8.1.2 State advantages of steel form work 8.1.3 Advantages of timber forms 8.1.4 Requirements of a good form work 8.1.5 Loads on form work 8.1.6 Guiding points to the design of form work **8.2 Column form work** 8.2.1 Sketch the column form work & label the parts - Shuttering - Side yokes - Wedges **8.3 Slab & beam formwork** 8.3.1 Sketch the formwork for R.C.C. beam & label the parts. 8.3.2 Design formwork for the beam & slab floor from given data. **8.4 Sketch slip formwork** 8.4.1 Sketch & label components of slip from work 8.4.2 State advantages of slip form work **8.5 Explain necessity of hanging form works and trestles** 8.5.1 Sketch A. Crib B. A trestle 8.5.2 Importance of use of crib in maintenance of external surfaces of buildings. 8.5.3 Use of trestles in internal work like: i. Painting ii. Electrification iii. Maintenance **8.6 Form work for domes and arches.** 8.6.1 Sketch formwork for domes	**2**

	i. Solid ii. Suspended **8.7** Scaffolding & shoring **8.8** Cantilever method of Pre-stressed concrete bridge construction.	
9	**ERECTION OF STEEL STRUCTURES** **9.1 Problems faced in erecting steel structure** 9.1.1 State the problems in the cases like: i. Roof truss ii. Building / Industrial components. iii. Plate girder iv. Launching a portion of bridge girder v. Large span lattice girder. **9.2 Equipment & tackles used for erecting steel structure** 9.2.1 List the equipment used. 9.2.2 Select appropriate equipment for erecting steel structure for given situation. 9.2.3 Explain with neat sketch the detailed procedure for i. Erection of roof truss ii. Erection of building components iii. Launching a portion of steel bridge. iv. Erection of plate girder. v. Erection of large span lattice girder vi. Erection of chimney vii. Erection of overhead tank.	**2**
10	**EARTHQUAKE ENGINEERING** **10.1** General Principles of Planning of building relates to Earthquake **10.2** Points affecting the selection of materials. **10.3** Design consideration for buildings. **10.4** General construction consideration. **10.5** Framed structures. **10.6 Geometrical layout - Shape and orientation of buildings** 10.6.1 Distribution of loads. 10.6.2 Wall panels. 10.6.3 Opening in walls. 10.6.4 Requirements for wall beams etc. **10.7 Unframed building.** 10.7.1 Minimum thickness of walls. 10.7.2 Reinforcing bends. 10.7.3 Height of walls. **10.8** Opening in walls. **10.9** Partition walls. **10.10** Load Bearing walls. **10.11** Miscellaneous **10.12** Foundation for Earthquake structures **10.13** Anchoring of buildings and massive structures	**2**

11	**SPECIAL MAINTENANCE TO BUILDINGS** **11.1 Philosophy of failures.** 11.1.1 Impact of failure. 11.1.2 Failures in ancient times. 11.1.3 Recent failures. 11.1.4 Accountability and liability. 11.1.5 Factors affecting failures. - Structural system - Performance observations - New concepts and materials. - Costing and lowest bids. 11.1.6 Traumatic effects of failure. **11.2 Format & check list for investigations data collection and reporting.** - Structural parameters. - Building monitoring format. - Reporting failures and performance. - Compilation by Architect & Engineer 11.2.1 Damage assessment. **11.3 Selection of construction chemicals during restoration.** 11.3.1 Factors affecting selection. 11.3.2 Common terms. 11.3.3. Application characteristics. 11.3.4 Properties of adhesive. 11.3.5 Types of adhesives. 11.3.6 Method of applications. **11.4 Specifications for important items of work.** - Sealing of cracks by injection of epoxy resins. - Sealing of Honey-combed and segregation areas with cement grouting. - Repairing concrete with epoxy mortar. - Repairing brick work with epoxy mortar. - Sealing of cracks in brick masonry by epoxy mortar / cement mortar. - Repairing of concrete with cement mortar / concrete troweling. - R.C.C. Jacketing. - Repairing of reinforced cement concrete - Repairing of settled Ground floor by Grouting. - Grouting method for controlling dampness in walls. **11.5 Failure during restoration of structures.** 11.5.1 Problems of failed structures. 11.5.2 Balance during restoration. - Propping. - Bond contribution for balance. - Observation around opening. - Cracks in masonry 11.5.3 Repairs to balconies. 11.5.4 Problems and solution for load bearing walls. 11.5.5 Replacement of building elements. 11.5.6 **11.6** Case studies. **11.7** Demolition of buildings-methods and care to be taken off. Underpinning – suitable methods and precautions	**2**

12	**BUILDING SERVICES AND COMPONENTS** 1. Lifts and escalators. 2. Classification 3. Types of lifts 4. Lift codes and rules 5. Types of lift controls 6. Types of lift operations 7. Structural provisions 8. Strength considerations 9. Lift pit 10. Fire safety 11. Pits and overheads 12. Elevators 13. Accidents and safety precautions 14. Fire fighting services 15. Classification of fire 16. Grades of fire Hazards 17. Classification of building and building material according to fire. 18. Codes and local municipal rules & regulations 19. Modes of fire and fire fighting. 20. First aid. 21. Provision in building from fire safety measures (IS 1641) 22. Internal fire hydrants in multi strayed buildings (IS 3844) 23. Fire fighting requirements as per national building code. 24. Fire detection. 25. Fire alarm system. 26. Acoustics and integrated services 27. Noise, Noise control, and noise in buildings. 28. Effective absorption co-efficient 29. Reverberation time 30. False ceiling, design, construction and types – materials suitably used. 31. Provisions is building for air conditioning like plant room, AHLP rooms cooling 32. Towers. 33. Types of air conditioning units. 34. Concepts, applications & advantages of thermal insulation.	**2**

Reference Books:

1 Building construction S.P. ARORA & S.P. BINDRA
2 Building Construction Engineering GURCHARANSINGH
3. Construction, planning equipment & methods. ROBERT L. PEURIFOY WILLIAM B. LEDBETTER
4. Building Construction SUSHIL KUMAR
5. Learning from failures R.N. RAIKAR
6. Durable structure through planning for preventive measures R.N. RAIKAR
7. Diagnosis and Treatment structure in Distress R.N. RAIKAR
8. Building structures JAMES ABROSE.
9. Standard handbook of civil engg. Gurcharansingh
10. Building construction B.C. Punmia

11. Building construction S.C. Rangwala
12. Civil Engineering Practice (I,II,III) Kaushik, Asawa & Ahuja
13. Services in Building Complex V.K.Jain
14 Civil Engineering Construction Antill & Ryan
15 Pile Foundations Tomlinson
16 Dharatikamp & Navnirman Manviya Technology Forum (In Gujarati) Earthquake special
Relevant IS codes/Building codes, NBC.

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Advance Construction Technology Practice**
Subject Code: **2360604**

Ex. No.	Description of the Experiment	Total Hr.
1	**(A) SKETCH** (1) (a) Sketch at least five transporting equipment and prepare salient features of it. (b) Sketch at least three excavating equipment and prepare salient features of it. (c) Sketch any three compacting equipment (d) Sketch any three hoisting equipment & label it. (2) (a) Timbering for different situations / types of soil & depth. (b) Dewatering methods for different cases. i Well point system. ii Electro-osmosis. (c) Different types of piles with their features. i Friction pile & load bearing pile. ii Under reamed pile. (3) (a) Different types of cofferdams. (b) Pneumatic caisson. (c) Slip form work. (Tall structures) (d) Slab – beam form work. (e) Column form work.	Home Work
2	**(B) FIELD VISITS :** **(Visit & Report)** (a) Visit to the crusher site. Draw layout & prepare brief report. (b) Visit to the hot mix plant. Prepare brief report. (c) Visit to construction site where cement concreting is done for 10 hrs per day. Studying layout of equipment used. Resource balancing, Time scheduling etc (d) Visit to a site where heavy equipments are in use.	**8**
3	**(C) CASE STUDIES** (any three) Based on special maintenance.	**6**
4	**(D) SEMINAR : (Cover all most all topics of Theory subject)** Topic of Seminar shall be given to a group of three to five students. The students are required to submit & present / defend the Seminar in presence of students & teachers.	**14**

Term Works:

1. Term work should also include certification by subject teachers and counter signed by HOD.
2. Incorporate appropriate field visit with concerned report to enforce the Advanced Construction Technology.
3. Practical examination is to be defended (along with term work) in front of External and Internal examiners .
4. Practical examination will include followings:

Viva

Explanation of Sketches, Seminar, Field Visit, and Case Study

Reference Books:

1. Building construction S.P. ARORA & S.P. BINDRA
2. Building Construction Engineering GURCHARANSINGH
3. Construction, planning equipment & methods. ROBERT L. PEURIFOY WILLIAM B.LEDBETTER
4. Building Construction SUSHIL KUMAR
5. Learning from failures R.N. RAIKAR
6. Durable structure through planning for preventive measures R.N. RAIKAR
7. Diagnosis and Treatment structure in Distress R.N. RAIKAR
8. Building structures JAMES ABROSE.
9. Standard handbook of civil engg. Gurcharansingh
10. Building construction B.C. Punmia
11. Building construction S.C. Rangwala
12. Civil Engineering Practice (I,II,III) Kaushik, Asawa & Ahuja
13. Services in Building Complex V.K.Jain
14. Civil Engineering Construction Antill & Ryan
15. Pile Foundations Tomlinson
16. Dharatikamp & Navnirman Manviya Technology Forum (In Gujarati) Earthquake special, Relevant IS codes/Building codes, NBC.

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SEMESTER- VI

Subject Name: **Project: II**
Subject Code: **2360605**

Rationale:

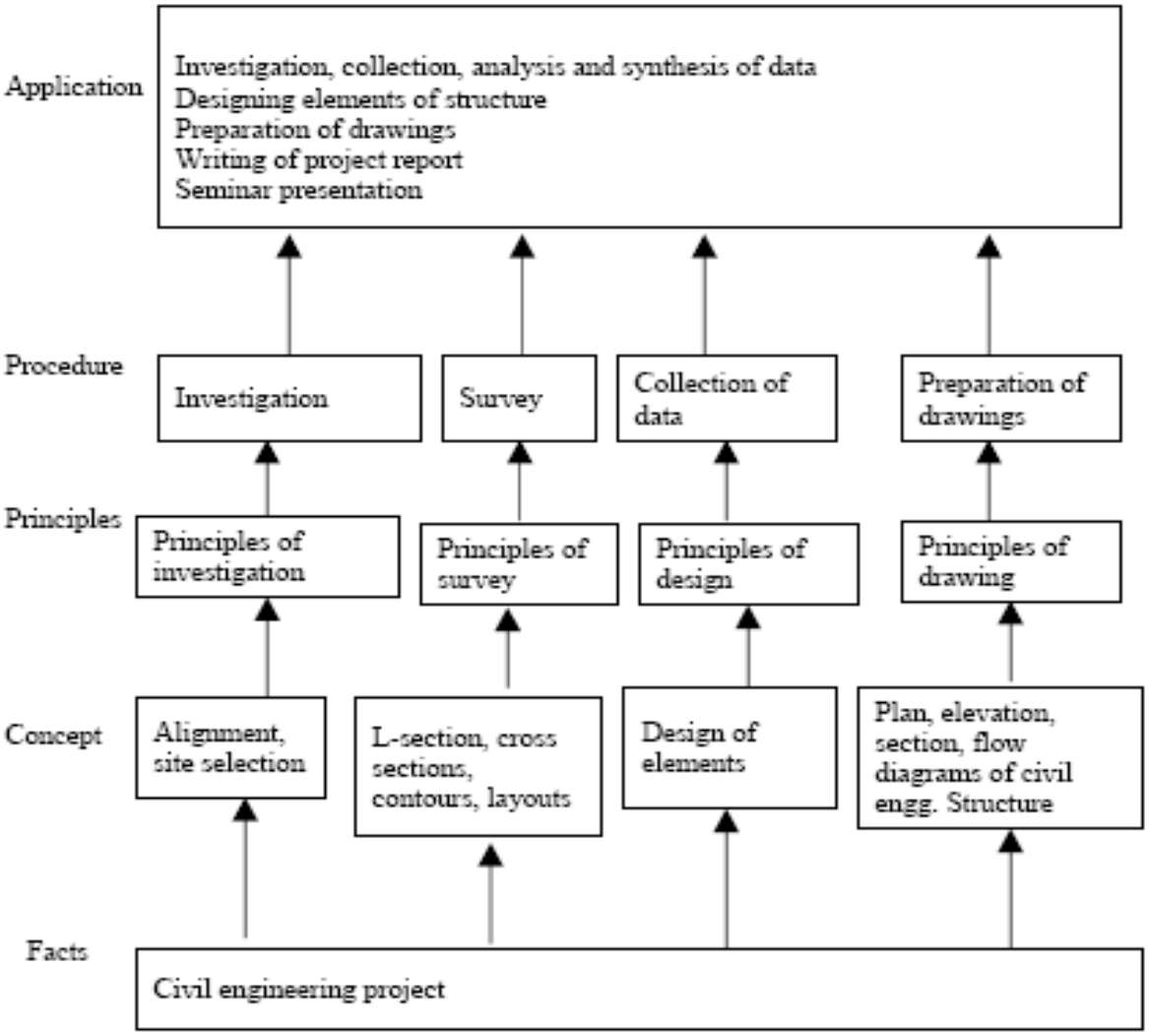
- A Civil Engineer is concerned with the basic needs of living beings such as shelter, water and environment. He has to supervise the construction of buildings and structures for irrigation, transportation, water supply and sanitary system etc.
- Apart from supervising construction and maintenance of civil engineering works a diploma technician has to carry out survey, collect, analyze and synthesize the data. He has also to refer handbooks, I.S.Codes and design the small structures on the basis of knowledge of different subjects. Due to changing scenario the role of diploma technician is becoming more prominent and has to acquire professional abilities and develop confidence to face civil engineering problems.
- This subject is intended to apply civil engineering principles, rules and regulations to solve a real life problem and to provide a feasible solution. For this he will collect data through survey work and contacting various resources and prepare drawings and write a detailed project report.
- The project and seminar activities will provide students the exposure to handle real life problems and their solutions and prepare him to enter in the world of work.

Objectives:

Students will be able to:

1) Collect the information for a given project.
2) Apply principles, theorems and bye-laws in the project planning and design.
3) Interpret and analyze the data.
4) Develop professional abilities such as persuasion, confidence, perseverance and communication skill.
5) Develop presentation skill.
6) Enhance creative thinking.

Learning Structure:



Notes: 1. The batch of students for the project shall be limited to 4 to 6 students.
2. The Seminar topic shall be selected individually.

Project:

Skills to be developed:
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.

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.

List of Projects:

Following is the list /areas of suggested civil engineering projects to be undertaken by a group of 6 to 10 students. Every group must be assigned different project, which can be selected from any core civil engineering system like Building construction system, Transportation engineering system, Irrigation engineering system, Public health engineering system. A topic for project can also be selected on recent development in civil engineering.

Extra Guidance to Students:

Every group must be provided the extra guidance form Faculties available in the department with their concerned expertise in the related topic. Head of Department should see that every teaching faculty and their specialize knowledge should percolate to the students. These Lecturers will support and guide the students like Mentor. This has nothing to do with work load.

The project report shall be in the following format:

1. Topic and objectives
2. Selection of Site / Place
3. Collection of data, required survey work and Leveling
4. Management and construction procedure
5. Resources scheduling and networking
6. Design details, and analysis
7. Required drawing set
8. Utility to society if any
9. Conclusion

Learning Resources:

1) Civil Engineering Hand Books / Reference books.

2) Civil Engineering Magazines

3) Relevant IS / International codes.

4) PWD Handbooks

5) Material / Machinery / Product Catalogue.

Project work must be as per 5th semester Diploma Project: I title.

Seminar: Each group of students must be assigned the topic of project on which they will be working on, and they will have to present their work time by time in front of other groups. Two hours / week are purely dedicated to seminar only.

Term Work Shall consist of detailed project report in above format.

Separate drawing sheets covering details of the project shall also be prepared.

The project work format must be in less quantum of work but must cover all aspects of project and so that each student gets total exposure to the project work assigned.

1. Project report should also include certification by subject teachers and counter signed by HOD.
2. Incorporate appropriate report and detailed drawing and analysis, to enforce the Diploma Civil Engineering Project.
3. Practical examination is to be defended (along with term work) in front of External and Internal examiners.
4. Practical examination will include followings:

Viva

Explanation of Project Report, Seminar, Field survey, Detail drawings etc...

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Concrete Technology**
Subject Code: **2360606**

Sr. No.	Course Content	Total Hr.
1	**MATERIALS FOR CONCRETE** **1. 1** Importance of cement in preparation of concrete **1. 2** Manufacture of cement **1. 3** Chemical compound of Ordinary Portland cement **1. 4** Bougue's compounds and its functions **1. 5** Types of cement and its uses **1. 6** Physical properties of cement and its I.S. requirements **1. 7** Various tests on cement ,its importance and I.S. requirements **1. 8** Role of aggregates in concrete **1. 9** Classifications of aggregate on the basis of its size, shape, texture and weight **1. 10** Various tests on aggregates, its importance and I.S. requirements for Fine and Coarse aggregates **1. 11** Grading of aggregates **1. 12** Requirements of quality of water in concrete	**4**
2	**ADMIXURES** **2. 1** Define Admixtures and its benefits **2. 2** Types of admixtures **2. 3** Accelerator and Retarder **2. 4** Plasticizer and super Plasticizer **2. 5** Water proofing and Air entraining admixture etc.	**2**
3	**FRESH CONCRETE** **3. 1** Define fresh concrete and its properties **3. 2** Importance of workability **3. 3** Define harshness, Segregation and bleeding **3. 4** Factors affecting workability **3. 5** Methods of measurement of workability **3. 6** Explain relation between workability and strength of concrete **3. 7** Use of admixtures to improve the workability of concrete **3. 8** State the methods of mixing of concrete **3. 9** Methods of mixing of concrete **3. 10** Methods of transportation & placing of concrete **3. 11** Methods of compaction of concrete and its suitability **3. 12** Factors affecting compaction **3. 13** Define curing and its importance **3. 14** Methods of curing and its suitability **3. 15** Effect of curing on strength development of concrete **3. 16** Precaution to be taken for a joint while placing the concrete	**6**

4	**HARDENED CONCRETE** **4. 1** Define the hardened concrete and state its importance (like strength , durability ,impermeability and economy) **4. 2** Tests for hardened concrete (comp. Tensile , Flexure and bond) **4. 3** IS procedure for compressive strength test on concrete **4. 4** Factors affecting the compressive strength of concrete (Size of mould , Grading of aggregates, W/C ratio , age, curing ,rate of loading , temperature , C/A ratio) **4. 5** Importance of grading of aggregate in compressive strength of concrete **4. 6** Effect of temperature on comp. Strength of concrete **4. 7** Creep of concrete and state its effect on concrete **4. 8** Factors affecting the creep of concrete **4. 9** I .S. requirements for acceptance criteria of concrete **4. 10** Mean strength and standard deviation **4. 11** Examine the acceptability of concrete from given statistical data for cube strength of concrete **4. 12** Various methods for Non destructive test of hardened concrete **4. 13** Importance of Non destructive testing **4. 14** Durability of concrete, its importance and factors affecting durability **4. 15** Importance of impermeability of concrete **4. 16** Factors affecting impermeability **4. 17** Factors affecting the economy of concrete **4. 18** Explain how size of aggregate affect the economy of concrete	**8**
5	**CONCRETE MIX DESIGN** **5. 1** Factors affecting quality of concrete. **5. 2** Advantages of Quality control. **5. 3** Concrete mix design and its importance. **5. 4** Nominal mix and Design mix. **5. 5** Factors affecting concrete mix design. **5. 6** Different methods of mix design and its suitability. **5. 7** I.S. method to design a concrete mix. **5. 8** Example of Mix design as per I.S. method	**2**
6	**SPECIAL CONCRETE &CONCRETING TECHNIQUES** **6. 1** Light weight concrete **6. 2** Plum concrete **6. 3** Fibre reinforced concrete **6. 4** Polymer concrete **6. 5** High density concrete **6. 6** No fines concrete **6. 7** Ferro cement **6. 8** Fly ash concrete **6. 9** Ready mix concrete **6. 10** Pumped concrete	**2**
7	**PREVENTION &REPAIR TECHNIQUES FOR CRACKS** **7. 1** Deterioration of concrete and corrosion of reinforcement **7. 2** Types of deteriorations and its effects **7. 3** Prevention of concrete deterioration **7. 4** Effect of corrosion of reinforcement in concrete and remedial **7. 5** Types ,causes and remedies of concrete cracks before hardening	**2**

	7. 6 Types ,causes and remedies of concrete cracks after hardening **7. 7** Prevention of cracks **7. 8** Materials for repair of cracks **7. 9** Methods used for repair of cracked concrete	
8	**MODERN TREND AND RESEARCH DEVLOPMENT IN CONCRETE TECHNOLOGY** **8. 1** Familiarize students with latest research and development in the field of concrete technology **8. 2** List the journals available in the library, its publishers, Editors and place of publications. **8. 3** Name the various authorities in the field of concrete technology and their field of specialization. **8. 4** Prepare synopsis of at least one research paper on concrete during the course from various journals	**2**

Note:

Following are the minimum Experiences required but Institute can do more experiences, if possible

LABORATORY EXPERIENCES:

A. List of Experiments: Hrs. 28

1. Compressive strength of cement
2. Soundness test of cement
3. Grading of fine and coarse aggregate
4. Flakiness index and Elongation index of aggregate
5. Aggregate Crushing value test
6. Aggregate Impact value test
7. Measurement of workability test (Slump, Compaction factor)
8. Effect of water/cement ratio on compressive strength of concrete

Note:

Term work report of regular student should focus on original efforts of student and it should not be distance learning manual Photocopies etc.

B. DEMONSTRATION:

Demonstrate the Non destructive tests of concrete. It can also be demonstrated Using video cassette.

C. PROJECT:

1. Concrete Mix Design as per I.S. Method
2. Effect of Admixtures on workability and strength of concrete
3. Determination of flexural and compressive strength of Fiber reinforced concrete

D. SEMINAR:

Seminar topic as be given by teacher. Prepare and present seminar individually.

E. FIELD VISIT:

Arrange field visit to cement factory and Ready Mix concrete plant and prepare a report which is part of term work.

Reference Books:

No.	TITLE	AUTHOR	PUBLISER
1	Concrete Technology	M.S. Shetty	S.Chand & Co. Ltd.
2	Concrete Technology	M.L.Gamhir	Tata McGraw Hill Ltd.
3	Properties of Concrete	A.M. Neville	Pitman
4	Concrete Technology	P.Kumar Mehta	I.C.I, Monterio
5	Concrete Technology	Dr. K.T. Krishna swami	Dhanpatrai & sons
6	Concrete Technology	R.S.Vaashney	Oxford &IBH Publishing Co,Bombay
7	Concrete Technology	A.R. Shantakumar	Oxford hill press London
8	Design of concrete Mixes		Road Research Lab. London
9	Lab. Manual for concrete	P.D.Kulkarni &L.N. Mittal	T.T.T.I Chandigarh

LIST OF RECOMMENDED I.S. PUBLICATIONS:

I.S. 269	Specifications for O.P.C
IS.12269	Specifications for O.P.C.53 Grade
I.S. 383	Specifications for coarse and fine aggregates
I.S. 516	Method of tests for strength of concrete
I.S. 2386 Part I to VIII	Method of tests for aggregate for concrete
I.S.456	Code of practice for plain and R.C.C
I.S. 2340	Method of sampling of aggregates for concrete
Sp 23	Handbook for concrete Mix design
I.S.4031	Methods of physical tests on Hydraulic cement
I.S. 13311	Methods of non destructive testing of concrete
I.S. 1199	Method of sampling and analysis of concrete
I.S. 10262	Recommended guidelines for concrete mix design

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN CIVIL ENGINEERING

SEMESTER- VI

Subject Name: **Environmental Engineering (Elective)**
Subject Code: **2360607**

Sr. No.	Course Content	Total Hr.
1	**Quality of Water & Wastewater:** 1.1 Quality of water and wastewater 1.2 Wholesome water 1.3 Impurity of water 1.4 Characteristics of water 1.5 Examination of water 1.6 Standards of potable water quality 1.7 Characteristics of sewage 1.8 Examination of sewage 1.9 Standards of quality of treated water and wastewater	2
2	**Screening and Skimming:** 2.1 Purpose of screenings 2.2 Flow equalization 2.3 Types of bar racks and screens 2.4 Disposal of screenings 2.5 Removal of oil, grease etc. 2.6 Floatation 2.7 Skimming tank 2.8 Disposal of skimming	2
3	**Sedimentation:** 3.1 Introduction 3.2 Principles of Sedimentation and Stokes' law applied to fluids 3.3 Characteristics of the settleable solids 3.4 Classification of sedimentation tanks for water and waste water 3.5 Factors influencing sedimentation 3.6 Deciding size of sedimentation tank for water and wastewater 3.7 Standard design loading 3.8 Detention period 3.9 Coagulation – Purpose, Principle 3.10 Types of coagulants and its suitability 3.11Determination of optimum coagulation dose. 3.12 Feeding of Coagulant and feeding devices 3.13 Flocculation and flocculation tanks and design criteria of Flocculator 3.14 Clarifiers, its types and design criteria. 3.15 Settling efficiency of particles 3.16 Grit removal	4

4	**Filtration:** 4.1 Theory of filtration 4.2 Mechanism for particle size 4.3 Hydraulics of filters 4.4 Types of filters and their flow direction 4.5 Filter clogging 4.6 Filter washing 4.7 Break through 4.8 Deciding size of filter unit 4.9 Advances in filtration	**2**
5	**Softening:** 5.1 Chemical precipitation 5.2 Water and wastewater softening 5.3 Estimation of dose of chemical 5.4 Methods of softening -Lime-soda method, Ion-exchange method etc.	**2**
6	**Desalination:** 6.1 Methods of removal of dissolved solids 6.2 Solar distillation gadgets and plants, Direct freezing, Reverse Osmosis, Electrolysis	**2**
7	**Disinfection:** 7.1 Introduction 7.2 Methods of disinfection 7.3 Chlorination – Chlorine dose, Chlorine demand, Application of chlorine 7.4 Use of various forms of chlorine, Break through chlorination 7.5 Removal of colour	**2**
8	**Sludge Dewatering and Disposal:** 8.1 Sources of sludge 8.2 Estimation of bulk density of sludge 8.3 Estimation of rate of filtration 8.4 Principles of dewatering 8.5 Methods of dewatering and suitability 8.6 Thickening of sludge 8.7 Chemical conditioning 8.8 Elutriation of sludge 8.9 Vacuum and pressure filtration 8.10 Sludge lagging	**4**
9	**Solid Waste Management:** 9.1Defination and Sources of Solid Waste. 9.2 Composition and of Solid Waste and its Determination. 9.3 Impact of Solid Waste on Environment. 9.4 S.W.M. Rules and Its Important. 9.5 Waste Protection. 9.6 Waste reduction Programme. 9.7 Waste Audit.	**2**
10	**Bio-Chemical Waste:** 10.1Introduction & Definition. 10.2 General & Hazardous Waste.	**2**

	10.3 Infectious Waste. 10.4 Categorization & Composition of Bio-chemical Waste. 10.5 Colour Coding. 10.6 Direct & Indirect hazards. 10.7 Collection & Handling of Waste.	

Reference Books:

1. Text book of water supply and sanitary Engg - S K Hussain
2. Water supply and sanitary Engg - G S Birdi.
3. A text book of water supply - V N Gharpure
4. A text book of sanitary Engg, - V N Gharpure
5. Water supply and sanitary Engg - Vazirani and Chandola
6. Water Engineering Treatment, Disposal - WasteReuse Metcalf and Eddy
7. Water supply and Sewerage - E W Steel and Terence J McGhee

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Environmental Engineering Practice (Elective Practice)**
Subject Code: **2360608**

Sr. No.	Name of Exercise	Total Hr.
1	**Quality of Water & Wastewater –** Demonstration of various tests related with Physical properties of water and wastewater.	2
2	**Quantity of Water & Wastewater –** Tutorials based on estimation of quantity of water and waste water.	2
3	Screening And Skimming Study of different types of screens, their sketches	2
4	Tutorial on Sedimentation.	2
5	Filtration Study of various types of filters for water and wastewater.	2
6	Softening Study of various methods of water softening	2
7	Desalination Study of process of desalination.	2
8	Disinfection Study of various methods of disinfections of water and wastewater.	2
9	Sludge Dewatering And Disposal -Tutorials based on estimation of generation of Sludge and study of method of sludge disposal.	2
10	Technical site visit and preparation of visit report	4

Term Work:

1. Term work should also include certification by subject teachers and counter signed by HOD.
2. Incorporate appropriate field visit with concerned report, sketches and case study to enforce knowledge of Environmental Engineering.
3. Practical examination is to be defended (along with term work) in front of External and Internal examiners .
4. Practical examination will include followings:

Viva

Explanation of sketches, seminar, field visit, and case study

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN CIVIL ENGINEERING

SEMESTER: VI

Subject Name: Advanced Transportation Engineering (Elective)
Subject Code: 2360609

Sr. No	Course Content	Hours 28
(A)	**Traffic Engineering**	
1	**Introduction:** 1.1 Explain elements of traffic engineering. 1.2 Elements of traffic and traffic flow. 1.3 Relation between the q , k and s 1.4 Fundamental diagram of traffic s 1.5 State the linear relationship between speed and concentration.	**2 hr**
2	**Traffic Studies** 2.1 Necessity of traffic studies. 2.2 Origin and destiny survey (O.D. Survey). 2.3 Volume Study. 2.4 Explain travel time and delay study. 2.5 Accidents studies. 2.6 Parking studies. 2.7 Traffic signal design studies.	**4 hr**
3	**Measure for operation of Traffic** 3.1 Legislation and enforcement, measures. 3.2 Scope of traffic measurement measures. 3.3 Parking Regulation.	**2 hr**
(B)	**Airport Engineering**	
1	**Introduction :** 1.1 Modern aircrafts air port in India. 1.2 Explanation of working of (Fuselage, Wings, Engines, Airscrew of jet propulsion, 4 control {Elevator, Rudder, Ailerons, Flaps}, Landing gear.	**2 hr**
2	**Aircraft characteristics:** 2.1 Significance and importance of aircraft characteristics. 2.2 Explanation of (Type of propulsion, Size of Aircraft, Weights of Aircraft.) 2.3 Capacity of aircraft. 2.4 Speed characteristics. 2.5 Turning radius 2.6 Fuel spillage 2.7 Heat blast and noise	**2 hr**

	2.8 Aircraft circling radius 2.9 Weight on gear system.	
3	**Planning for Airport:** 3.1 Airport in regional planning. 3.2 Airport in city planning. 3.3 Elements of airport planning. 3.4 Facilities of passengers and baggage. 3.5 Airport Capacity.	**2 hr**
4	**Design criteria for Runway, Taxiway, and Apron:** 4.1 Necessity. 4.2 Explain wind rose diagram. 4.3 Geometric design of runway and taxiway. 4.4 Classification of apron according to use	**2 hr**
5	**Air traffic control:** 5.1 Wind and Landing Direction 5.2 Necessity of airport lighting and marking 5.3 airport Traffic control system. 5.4 VFR, IFR	**2 hr**
(B)	**Docks and Harbor Engineering**	
1	**Introduction :** 1.1 The growth of Port. 1.2 Elements of V harbors. 1.3 Design consideration for Ocean structures. 1.4 Port administration.	**1 hr**
2	**Natural phenomenon:** 2.1 Wind. 2.2 Tide. 2.3 Current.	**2 hr**
3	**Harbor planning & site investigations:** 3.1 Types of harbor. 3.2 Choice of site for harbor. 3.3 Master plan for port planning. 3.4 Hydrographic and Topographic Survey.	**1 hr**
4	**Berthing structure:** 4.1General aspect of selection and design. 4.2 Piers, wharfs, Quarry, walls, and, jetties. 4.3 Dolphins, Trestles, moles, and Moving Accessories.	**1 hr**
5	**Fenders and Moorings:** 5.1 Necessities for fenders. 5.2 Energy absorbed by fenders during berthing. 5.3 Types of fender system.	**1 hr**

	5.4 Mooring system.	
6	**Navigational Aids:** 6.1 necessities for navigational aids. 6.2Buoys, Beacon, Light ship, Range light, Radar reflectors.	**1 hr**
7	**Costal Erosion and Protection:** 7.1 The coastal zones and beach profile. 7.2 Coastal protection works. 7.3 Berth nominshment.	**1 hr**
8	**Cargo Storage Facilities:** 8.1 Transit Shed. 8.2 Purpose, area of transit shed required, diversion of transit shed. 8.3 Water houses 8.4 Open storage, cold storage building, Port administration building.	**1 hr**

References Books:

1. Traffic engineering and Transportation Planning — L.R. Kandyali
2. Traffic Engineering. — S.C.Saxena
3. Airport engineering — Arora and Khanna
4. Airport Engineering — Dr. N.K.Vaswani
5. Docks and Harbor Engineering — S.Sitaram
6. Docks and Harbor Engineering — S.C. Rangwala
7. Docks and Harbor Engineering — Oza & Oza

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN CIVIL ENGINEERING

SEMESTER: VI

Subject Name: Advanced Transportation Engineering Practice
(Elective Practice)
Subject Code: 2360610

Sr. No.	NAME OF EXERCISE	Total 28 hrs
1	1. Spot speed survey 2. Delay study 3. Origin and Destination survey	6 hrs
2	Parking studies :	2 hrs
3	Traffic signal design study : Sketches	Home work
4	Characteristics of aircraft	2 hrs
5	Types of runway and taxiway : Visit to nearby Airport	2 hrs
6	Analysis of " Wind rose Diagram"	2 hrs
7	Traffic control aids : sketches	2 hrs
8	Berthing structures Visit to nearby port / harbour	2 hrs
9	Navigational aids : Sketches	2 hrs
10	Seminar : Between 4 to 6 students (Different topics)	8 hrs

References Books:

1. Traffic engineering and Transportation Planning	**L.R. Kandyali**
2. Traffic Engineering.	**S.C.Saxena**
3. Airport engineering	**Arora and Khanna**
4. Airport Engineering	**Dr. N.K.Vaswani**
5. Docks and Harbor Engineering	**S.Sitaram**
6. Docks and Harbor Engineering	**S.C. Rangwala**
7. Docks and Harbor Engineering	**Oza & Oza**

Term Works:

1. Term work should also include certification by subject teachers and counter signed by HOD.

2. Incorporate appropriate field visit with concerned report, sketches seminar to enforce the knowledge of Advance Transportation Engineering.

3. Practical examination is to be defended (along with term work) in front of External and Internal examiners .

4. Practical examination will include followings:

Viva

Explanation of Sketches, Seminar, Field Visit.

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER: VI

Subject Name: Hydrology and Watershed Management (Elective)
Subject Code: 2360611

Rationale:

Since 1996, Government of India has issued guideline for the Implementation of area development programme adopting watershed approach. Watershed approach aims at restoration of ecological balance preserving environment and stabilising the income of village community both farmers, asset less and landless agricultural labour.

The importance of watershed development cannot be underestimated. On one hand is the need to increase food productivity and hence productivity from soil and the other increasing soil erosion and depleting water availability.

Water is almost a dual edge sword, in the form of rain, if allowed to fall and flow unabated and unchecked, it can enhance erosion. If instead it can be captured, allowed percolation time, it can deplete reservoir and solve soil erosion to a certain extent. It thus makes sense to adopt soil and water conservation method together through watershed management and development. Watershed management discusses the impact of watershed on people, the need for people participation and how this can be achieved and most considerably provide a format for watershed planning.

The subject Watershed Management aims to attempt development of watershed in the Indian context and particularly considering the need of Gujarat state. It aims at actual identifying ideal water harvesting and soil conservation structure situated to a particular topography.

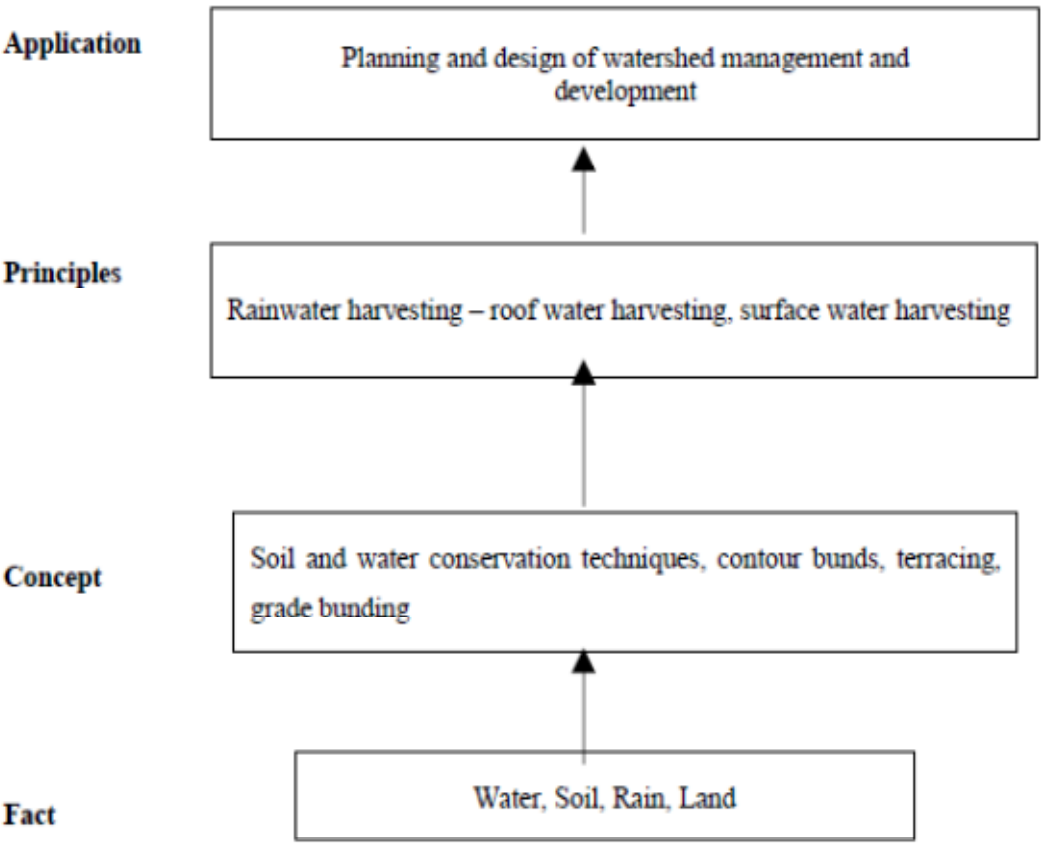
The input to the subject is the knowledge of Survey and Geotechnical engineering which helps in deciding the stability of topography and soil for successful implementation of watershed, hydrology for parameter associated with rainfall and runoff.

Objectives:

The students will be able to:

1. Apply integrated approach to watershed hydrology.
2. Apply techniques of soil and water conservation in watershed management.
3. Use rainwater-harvesting techniques.
4. Identify water harvesting structure.
5. Use peoples participation in local watershed management and development.

Learning Structure:



Sr. No	Course Content	Hours 28
1	**Introduction to Watershed Hydrology** **(Unused land + Economy+ Local people's Participation)** 1.1 Hydrology and water resources in Gujarat state. 1.2 Precipitation and Rainfall Analysis , Precipitation and interception, Evapotranspiration and soil storage, 1.3 Infiltration and Evaporation , Surface runoff, and stream flow, Groundwater system, Land use hydrological impacts , Urban hydrology 1.4 Introduction to Meteorology (meteorology) 1.5 Definition of watershed, concept of watershed, definition of watershed management, need of watershed management 1.6 Characteristics of watershed, objectives of watershed management, benefits of watershed development 1.7 Causes and effects of degradation 1.8 Integrated multi disciplinary approach for watershed, steps in watershed management. 1.9 Ill effects of urbanisation on watershed management	**2 hrs**
2	**Soil and Water Conservation** 2.1 Soil erosion- definition of erosion, problems of erosion, types of soil erosion. 2.2 Land classification for watershed management 2.3 Soil conservation, need of soil conservation, soil conservation technology. 2.4 Engineering measures for erosion control such as contour cultivation, contour bunding, graded bunding, bench terracing, trenching, construction of grade stabilisation structure, retention of detention reservoirs, agronomical measures (names only) 2.5 Contour bunds, design of contour bunds, drainage of excessive water to protect contour bunds, maintenance of contour bund. 2.6 Graded bunding, design of graded bunding, alignment and construction, maintenance, advantages and limitations of graded bunding. 2.7 Bench terracing, types, design. 2.8 Grassed waterways, shape, planning, construction and vegetation, maintenance, diversion drains. Control of gullies and their reclamation for various land Use.	**8 hrs**
3	**Water Harvesting** 3.1 Definition, need of rainwater harvesting, advantages of rainwater harvesting,. Techniques of rainwater harvesting roof water harvesting and surface water harvesting (definition) 3.2 Traditional methods of rainwater harvesting in Gujarat state. 3.3 Roof water harvesting- techniques as storage and ground water recharge, components- catchment, coarse mesh, gutters, conduits, first flushing, filters, storage facilities, recharge structures.	**6 hrs**

4	**Water Harvesting Structures** 4.1 Types of watershed structures- such as small weir, Gully plugging, Khet talavadi , weir, percolation tank, jalbandh, farm pond and check dam. 4.2 Details of watershed structure with neat sketch. Design Considerations of water shed projects. 4.3 Ground water dykes or sub surface dykes.	**6 hrs**
5	**Biomass Management** 5.1 Major intervention areas for biomass management are indicated below; • Eco-preservation • Biomass Regeneration • Forest Management & Conservation • Plant Protection & Social Forestry • Increased Productivity of Animals • Income & Employment Generation Activities • Coordination of Health & Sanitation 5.2 Awareness of Bio Mass Energy and its conservation 5.3 Good practices for crop/cattle farming ; Cleaner production	**4 hrs**
6	**Socio Economic Aspects:** 6.1 People's awareness, participation and response. 6.2 State integrated approach. 6.3 Sustainable society for economical upliftment. 6.4 Economics of watershed project.	**2 hrs**

References Books:

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	V. V. Dhruvanarayana G. Sastry, U. S. Patnaik	Watershed management	Indian Council for Agricultural Research, Krishi Anusandhan Bhawan, Pusa, New Delhi
02	J. V. S. Murty	Watershed management in India	Wiley Estern Ltd.
03	Raj Vir Singh	Watershed planning and management	Yash publishing House,
04	--	Field manual on watershed management	Central Research Institute For Dry Land Agriculture, Hydrabad- 500659
05	E. M. Tideman	Watershed management	Omega Scientific Publications, New Delhi
06	N. D. Mani	Watershed management	Saujanya Books, 165-E, Kamla Nagar, Delhi-110007
07	Robert J. Reimold	Watershed management : practice, policies and coordination	BOSS International US ISBN0070522995

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER: VI

Subject Name: **Hydrology and Watershed Management Practice (Elective Practice)**
Subject Code: **2360612**

Experiment No.	Description of the Experiment	Hours 28
1	**(A) SKETCH** (a) Sketch on watershed hydrology b) Soil water conservation methods c) Water Harvesting and roof harvesting . d) Water harvesting Structures e) Typical layout of water shed Project. f) Biomass plant	**Home Work**
2	**(B) FIELD VISITS : (Visit & Report)** (a) Visit to the soil conservation Project. (b) Visit to a watershed project near by area. (c) Visit to a building with roof harvesting facilities. (d) Visit to weir or check dam. (e) Visit to biomass Energy Plant.	**8**
3	**(C) CASE STUDIES (One case study)** (a) Case study of watershed project in nearby location. (b) Water harvesting structure. (c) Preparation of complete water shed management plan for small area identified from topography sheet.	**6**
4	**(D) SEMINAR : (Cover all most all topics of Theory subject)** Topic of Seminar shall be given to a group of three to five students. The students are required to submit & present / defend the Seminar in presence of fellow students & teachers.	**14**

Term Work
1. Term work should also include certification by subject teachers and counter signed by HOD.
2. Incorporate appropriate field visit with concerned Report to enforce the watershed management .
3. Practical examination is to be defended (along with term work) in front of External and Internal examiners .
4. Practical examination will include followings:

Viva
Explanation of Sketches , Seminar , Field Visit , and Case Study .

References Books:

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	V. V. Dhruvanarayana G. Sastry, U. S. Patnaik	Watershed management	Indian Council for Agricultural Research, Krishi Anusandhan Bhawan, Pusa, New Delhi
02	J. V. S. Murty	Watershed management in India	Wiley Estern Ltd.
03	Raj Vir Singh	Watershed planning and management	Yash publishing House,
04	--	Field manual on watershed management	Central Research Institute For Dry Land Agriculture, Hydrabad- 500659
05	E. M. Tideman	Watershed management	Omega Scientific Publications, New Delhi
06	N. D. Mani	Watershed management	Saujanya Books, 165-E, Kamla Nagar, Delhi-110007
07	Robert J. Reimold	Watershed management : practice, policies and coordination	BOSS International US ISBN0070522995

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Advanced R.C.C .Structure (Elective)**
Subject Code: **2360613**

Sr. No.	Course Content	Total Hr.
1	**DESIGN OF FLAT SLABS:** 1. 1 Design Methods. 1. 2 Elements of flat slab. 1. 3 Direct design method. 1. 4 Distribution of moments. 1. 5 Design of flat slab	6
2	**DESIGN OF CONTINUOUS BEAMS** 2. 1 Load transformation from slab to beam. 2. 2 Design of continuous beam using IS – 456. 2. 3 Design of continuous beam using analysis by M.D method. 2. 4 Redistribution of moments.	6
3	**DESIGN OF ECCENTRIC LOADED COLUMN** 3. 1 Classification of columns with respect to loads 3. 2 Analysis of uni-axial loaded rectangular column. 3. 3 Pu- Mu curvature. 3. 4 Design of uni-axial and bi-axial loaded columns.	6
4	**DESIGN OF FOOTING** 4. 1 Various types of combined footing. 4. 2 Design of Rectangular combined footing. 4. 3 Design of Trapezoidal combined footing 4. 4 Design of slab-beam type combined footing	8
5	**WIND AND EARTHQUAKE FORCES:** 5. 1 Lateral forces on a R.C.C frame due to wind, IS-875 – III. 5. 2 Terminology related to Earthquake forces like – Lump mass , seismic zone, seismic coefficients , Importance of the Structures, damping factor. 5. 3 Calculations of lateral forces on R.C.C frame due to Earthquake using IS-1893, by seismic coefficient method.	4

6	**CANTILEVER RETAINING WALLS.** 6. 1 Types of retaining wall. 6. 2 Active & passive earth pressure and its coefficients. 6. 3 Design of cantilever retaining wall.	**6**
7	**WATER TANK RESTING ON GROUND** 7. 1 Classification of water tanks. 7. 2 Differentiate water tank with respect to behavior when tanks are below, on and above G.L. 7. 3 IS-3370 provisions for water retaining structures for permissible stresses in materials , method of design , Construction joints. 7. 4 Design of circular and rectangular water tank with flexible and Stiff joint	**6**

Reference Books:

1) Limit state design of R.C.C structures - Dr. Shah & Karve
2) R.C.C Design - Vol- I & II - H J Shah
3) Advance reinforced concrete design - Vergis
4) Limit state design of R.C.C structures - Dr. A K Jain
5) Relevant IS codes

i. I.S 456-2000
ii. I.S 875 Part I to V
iii. I.S 1893
iv. I.S 3370

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GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Advanced R.C.C .Structure Practice (Elective Practice)**
Subject Code: **2360614**

Note:
Following are the minimum experiences required but the institute can do more experiences if possible.

Sr. No.	Course Content	Hrs.
1	Design of flat slab and Draw A-2 size drawing sheet	4
2	Design of continuous beam (Two Problems)	4
3	Design of eccentric loaded column (Two Problems)	2
4	Design of combined footings and Draw A-2 Size drawing sheet for combined footing (Two problems)	6
5	Calculate wind load and earthquake forces for RCC frame (Two Problems)	4
6	Design of cantilever retaining wall. Design of water tank resting on ground Draw A-2 Size sheet showing retaining wall and Water tank	4
7	Sketches Slab type combined footing – trapezoidal Counter fort retaining wall Circular Slab Intz water tank Raft foundation Pile foundation	4
	TOTAL	28

Field Visit: Arrange at least two field visit related to above topics.

Notes:

1. Term work report shall consists of design calculation of each design and, mention IS clauses when and where required
2. Practical examination is to be defended (along with term work) in front of external and internal examiner.
3. Practical examination shall consist of oral (viva) and sketching.

Reference Books:

1. Limit state of R.C.C. Structures - Dr. Shah & Karve
2. R.C.C. Design – Vol 1 & 2 - H.J. Shah
3. Advance reinforced concrete design - Vergis
4. Limit State design of R.C.C Structures – Dr. A.K. Jain
5. Relevant IS Codes

- I.S. 456 – 2000
- I.S. 875 – Part I to V
- I.S. 1893, IS 3370
- Design Aids to I.S. 456 –SP-16

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN CIVIL ENGINEERING

SEMESTER- VI

Subject Name: **Computer Aided Structural Design and Drafting (Elective)**

Subject Code: **2360615**

Sr. No.	Course Content	Hrs.
1	**Introduction to C^{++} Programming** 1. 1 Brief history of C^{++} 1. 2 Object oriented programming I. Paradigm II. Basic Concepts III. Benefits IV. Languages 1. 3 Structure of C^{++} Programming	2
2	**Tokens, Expressions & Control Structure** 2. 1 Define token and type of token 2. 2 Variables & constants I. Define Variables II. Type & size of variable III. The typed keyword IV. Character & numbers, printing characters V. Type of constant 2. 3 Expressions & operators I. Assignment statements II. Expressions III. Mathematical Operators IV. Relational operators V. Logical operators VI. Precedence VII. Conditional operators 2. 4 Statements & looping I. Cin statement II. Cout Statement III. If statement IV. If… else statement V. Looping > While loop > Do while loop > For loop VI. Switch statement	4

3	**Function in C^{++} Programming** 3. 1 Functions – inline, static, virtual & friend 3. 2 Object of function 3. 3 Declaring & defining function 3. 4 Execution of function 3. 5 Parameter passing techniques 3. 6 Function statement and arguments	**4**
4	**Classes and objects** 4. 1 **Classes and array** i. Classes and members ii. Private Vs Public classes iii. Implementing class function members iv. Constructors and destructors v. One dimensional array 4. 2 **Objects** i. Memory allocation ii. Arrays of objects iii. Objects as function arguments	**4**
5	**Simple programs using C^{++} programming** 5. 1 summation of simple series 5. 2 To find out factorial of given number 5. 3 To find out area various shape (Circle, Rectangle, Triangle) 5. 4 Conversion of unit 5. 5 To find Max & Min of given three nos. 5. 6 Arrange the given nos. in ascending or descending order 5. 7 To calculate the average 5. 8 To solve the quadratic equation 5. 9 To find out output of given equation	**4**
6	**Application of C++ in Structural analysis and design** 6. 1 Programs for (Give formula wherever required) I. Slope & deflection of S.S. and cantilever beam under entire UDL or central or free end point load II. Find crippling load by Euler's formula III. S.F. & B.M. at specific interval for S.S. Beam subjected to entire UDL IV. Calculation of principal stresses V. Analysis of Tension member (Single equal or unequal) VI. Analysis of strut (Angle section with user input area & $r^{\underline{min}}$) VII. S.S. Steel beam analysis VIII. Analysis of steel column (Single ISHB section) IX. Calculation of XU max/ d X. Calculation for Mulim XI. Calculation of Pt lim XII. Design of singly reinforced beam XIII. Analysis of doubly reinforced beam	**8**

	XIV. Analysis of T-beam XV. Design of axially loaded short R.C.C. column	
7	**Advance computer aided drafting** 7. 1 Recall AutoCAD 2D commands 7. 2 Study of AutoCAD commands OSNAP, DTEXT, LAYER, ZOOM, WBLOCK, INSERT, DIM with Dimvar (dimasz, dimtxt, dimclr, dimalt, dimblk, dimexe,dimtad, dimtoh) PLOT, APERTURE, EXPLODE, EXTEND, STRECTH, AREA, SCALE	**6**
8	**3-D Computer aided drafting** 8. 1 Study of AutoCAD commands like , ELEVATION, THICKNESS, VPOINT, CHANGE, HIDE,VPORTS, SOLID, TABSURF, REVSURF, RULESURF, UCS,USCION, 3DFACE, 3-D OBJECTS, EXTRUDE, 3-D VIEWS,SHADING, RENDERING.	**10**
	TOTAL	**42**

Reference Books:

1. Mastering in AutoCAD by George Ommura.
2. Reference Manual of AutoCAD by Autodesk
3. AutoCAD 3D – by Geoge Head.
4. Object oriented programming with C^{++} by Balaguruswami.
5. Let us C^{++} by Yashwant Kanetkar.
6. Object oriented Programming in Turbo C^{++} by Robert Lafore
7. C^{++} Programming – by Schaum Series.

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER- VI

Subject Name: **Computer Aided Structural Design and Drafting Practice (Elective Practice)**
Subject Code: **2360616**

Note:
Following are the minimum experiences required but the institute can do more experiences if possible.

Sr. No.	Course Content	Hrs.
1	Recall 2D editing tools of AutoCAD Prepare two views showing reinforcement details of the following using AutoCAD (1) Singly Reinforced beam (2) Doubly Reinforced beam (3) Simply supported one way slab (4) Column and column footing	4
2	Draw Plan, Elevation and section of small residential building	2
3	Practice on 3D commands and draw different 3D models of the following (1) 3D view of steps (2) 3D view a small residential building (3) 3D view of column footing	6
4	Prepare C^{++} simple programs (minimum 4) as per topic No-5 of CASADD Theory	4
5	Prepare at least eight programs of structural Analysis and design as per topic No.-6 of CASADD theory	8
6	Application of Structural design software Practice of at least two problems analysis and two problems of design of R.C.C. structural elements using software.	4
	TOTAL	28

Note:
1) Printing/ plotting of the programs, input and output of the given exercises and attach as a teamwork report.
2) (Practical examination is to be defined in front of external & internal examiner.

Reference Books:

1. Mastering in AutoCAD by George Ommura.
2. Reference Manual of AutoCAD by Autodesk
3. AutoCAD 3D – by Geoge Head.
4. Object oriented programming with C^{++} by Balaguruswami.
5. et us C^{++} by Yashwant Kanetkar.
6. Object oriented Programming in Turbo C^{++} by Robert Lafore
7. C^{++} Programming – by Schaum Series

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER: VI

Subject Name: **Computer Aided Drafting & Programming Technologies (Elective)**
Subject Code: **2360617**

1. RATIONALE:

This course is designed to guide and establish fact in student community that the drawing is a language which is common from skilled labours to the highest authority in any Civil Engineering Project.

By just giving outline of planning, entire project documents can be prepared because diagramming techniques are holding mechanism as well as coding medium to communicate with end user and craftsman.

All automatic work, items, symbols, processes, block diagrams, flow charts, system flow charts, data flow diagrams are the members in this course.

After studying this course, the student will feel being empowered for international quality and supervision standards.

OBJECTIVES:
The student should be able to;

1. Familiarize with CAD terminology, need, importance and application.
2. Know hardware requirements for CAD software.
3. Know features and various applications of CAD software.
4. Prepare 2D construction drawing using ACAD commands.
5. Prepare 3D drawing using wire frame, surface and solid modeling.
6. Prepare AutoLisp program for automatic generation of drawing.
7. Plot drawings and organize them giving project name and sequence.
8. Understand model and layout requirements.

Sr. No	Course Content	Hours
1	**INTRODUCTION AND RECALLING EDITING TOOLS.** 1.1 Recall drawing tools, objects, text, hatch. 1.2 Recall editing tools.	2
2	**ADVANCE 3D DRAFTING** 2.1 Extrude 2.2 Subtract and union 2.3 3D views 2.4 Shading 2.5 Rendering	2

3	**IDEA OF WALK THROUGH** 3.1 Introduction to walk through 3.2 List of available software 3.3 Application in marketing	**2**
4	**INTRODUCTION TO AUTOLISP** 4.1 Expressions and arguments 4.2 Variables and data types 4.3 Manipulating list functions 4.4 Get function	**2**
5	**CREATING AND ORGANIZING LISP PROGRAM** 5.1 Create, load and run a program using ACAD commands. 5.2 Local and global variables 5.3 Managing large ACAD.LSP files 5.4 Using AutoLisp in a menu. 5.5 Using, adding and reusing a function 5.6 3D box and 3D wedge program 5.7 Dynamic scoping	**5**
6	**INTERACTION WITH DRAWING EDITOR AND DECISION MAKING** 6.1 Getlist, Getangle, Getorient 6.2 Getstring, Getkword, Get numeric value 6.3 Getreal, Getint 6.4 Using initget 6.5 Ssget 6.6 Tests for conditions 6.7 IF, Cond., While, Repeat	**5**
7	**WORKING WITH GEOMETRY AND TEXT** 7.1 Find angles and distances 7.2 Angle, Distance and Polar function 7.3 String data types 7.4 Search for strings 7.5 Conversions	**4**
8	**EDITING AND CHANGING PROPERTIES OF OBJECT** 8.1 Filtering 8.2 Selecting 8.3 Accessing 8.4 Improving speed 8.5 Understand the property list 8.6 Changing property list 8.7 Getting objects name and coordinate together	**4**
9	**DEBUGGING PROGRAMS** 9.1 Common errors 9.2 Using variables as debugging tools	**2**

References Books:

1. Reference manual of AutoCAD Autodesk Inc. ----
2. The ABC's of AutoLisp by George Ommura, BPB
3. Mastering in AutoCAD by George Ommura, BPB

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN CIVIL ENGINEERING
SEMESTER: VI

Subject Name: Computer Aided Drafting & Programming Technologies Practice (Elective Practice)
Subject Code: 2360618

Laboratory Experiments:

Experiment No.	Description of the Experiment	Hours 28
1	Recall 2D editing tools of AutoCAD Prepare plan, elevation and sectional view (including hatching wherever required) of any one of the following using AutoCAD and Auto LISP : (Computer Practice) - Small Residential building - Simple Irrigation structure like canal fall - Septic tank, Manhole, Drop Manhole - Section of a road pavement	**4 hrs**
2	3D drafting and editing tools of AutoCAD: Civil Engineering application, Different 3d models : (Computer Practice) - 3D View of steps - 3D view of small residential building - Any irrigation structure	**10 hrs**
3	Introduction to Auto Lisp : (Demo. only)	**2 hrs**
4	Creating an object using Auto Lisp: (Computer Practice)	**2 hrs**
5	Changing properties of objects: (Computer Practice)	**2 hrs**
6	Condition, loop and recursion : (Computer Practice)	**2 hrs**
7	Geometry and text in Auto Lisp: (Computer Practice)	**2 hrs**
8	Writing Programs and Plotting/Printing the output of the structure selected in above lab. Experiences.	**4 hrs**

References Books:

1. Reference manual of AutoCAD Autodesk Inc. ----
2. The ABC's of Autolisp George Ommura BPB
3. Mastering in AutoCAD George Ommura BPB

Term Work:

1. Term work should also include certification by subject teachers and has to be counter signed by HOD.
2. Practical examination is to be defended (along with term work) in front of External and Internal examiners .
3. Practical examination will include followings:

Viva

Explanation of output of Auto Lisp programs prepared in the Laboratory.