

STATE BOARD OF TECHNICAL EDUCATION, JHARKHAND																	
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																	
COURSE NAME : CIVIL ENGINEERING GROUP																	
COURSE CODE : CE/CS/CR																	
DURATION OF COURSE : 6 SEMESTERS										WITH EFFECT FROM 2011-12							
SEMESTER : SIXTH										DURATION : 16 WEEKS							
PATTERN : FULL TIME - SEMESTER																	
SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										
				TH	TU	PR	PAPER HRS	TH (01)		PR (04)		OR (08)		TW (09)		SW (16006)	
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Management	MAN	12219	03	--	--	03	100	40	--	--	--	--	--	--		
2	Contracts and Accounts	CAA	12220	04	--	02	03	100	40	--	--	--	--	25@	10	50	
3	Environment Engineering	EEN	12221	04	--	02	03	100	40	--	--	--	--	25@	10		
4	Design of Structures	DST	12222	04	--	02	04	100	40	--	--	25#	10	50@	20		
5	Civil Engineering Project	CEP	12228	--	--	04	--	--	--	--	--	50#	20	50@	20		
6	Professional Practices	PPR	12229	--	--	03	--	--	--	--	--	--	--	50@	20		
7	Rural Engineering	REN	12230	--	--	02	--	--	--	--	--	50#	20	50@	20		
8	<b>Elective for CE/CS/CV (Any One)</b>																
	Advanced Construction Techniques and Equipments	ACT	12223	03	--	02	03	100	40	--	--	--	--	25@	10		
	Architectural Practices and Interior Design	APA	12225	03	--	02	03	100	40	--	--	--	--	25@	10		
	Maintenance and Rehabilitation of Structures	MRS	12224	03	--	02	03	100	40	--	--	--	--	25@	10		
	Plumbing Services	PSE	12999	03	--	02	03	100	40	--	--	--	--	25@	10		
8	<b>Elective for CR (Any One)</b>																
	Maintenance and Rehabilitation of Structures	MRS	12224	03	--	02	03	100	40	--	--	--	--	25@	10		
	Micro Irrigation	MIR	12226	03	--	02	03	100	40	--	--	--	--	25@	10		
	Water Shade Management	WSM	12227	03	--	02	03	100	40	--	--	--	--	25@	10		
	Plumbing Services	PSE	12999	03	--	02	03	100	40	--	--	--	--	25@	10		
<b>TOTAL</b>				<b>18</b>	--	<b>17</b>	--	<b>500</b>	--	--	--	<b>125</b>	--	<b>275</b>	--	<b>50</b>	
Student Contact Hours Per Week: <b>35 Hrs.</b>																	
<b>THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.</b>																	
Total Marks : <b>950</b>																	
@ Internal Assessment, # External Assessment, <span style="background-color: #cccccc; padding: 2px;">    </span> No Theory Examination., * Practical on alternate week																	
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, 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 : All Branches of Diploma in Engineering / Technology**

**Course Code : EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/CO/CM  
/IF/ EE/EP/CH/CT/PS/CD/EDEI/CV/FE/IU/MH/MI**

**Semester : Sixth for EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE /CS/CR  
/CO/CM/IF/EE/EP/CH/CT/PS/CD/EDEI/CV/FE/IU and Seventh for MH  
/MI**

**Subject Title : Management**

**Subject Code : 12219**

**Teaching and Examination Scheme:**

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

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by SBTE.**
- **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:**

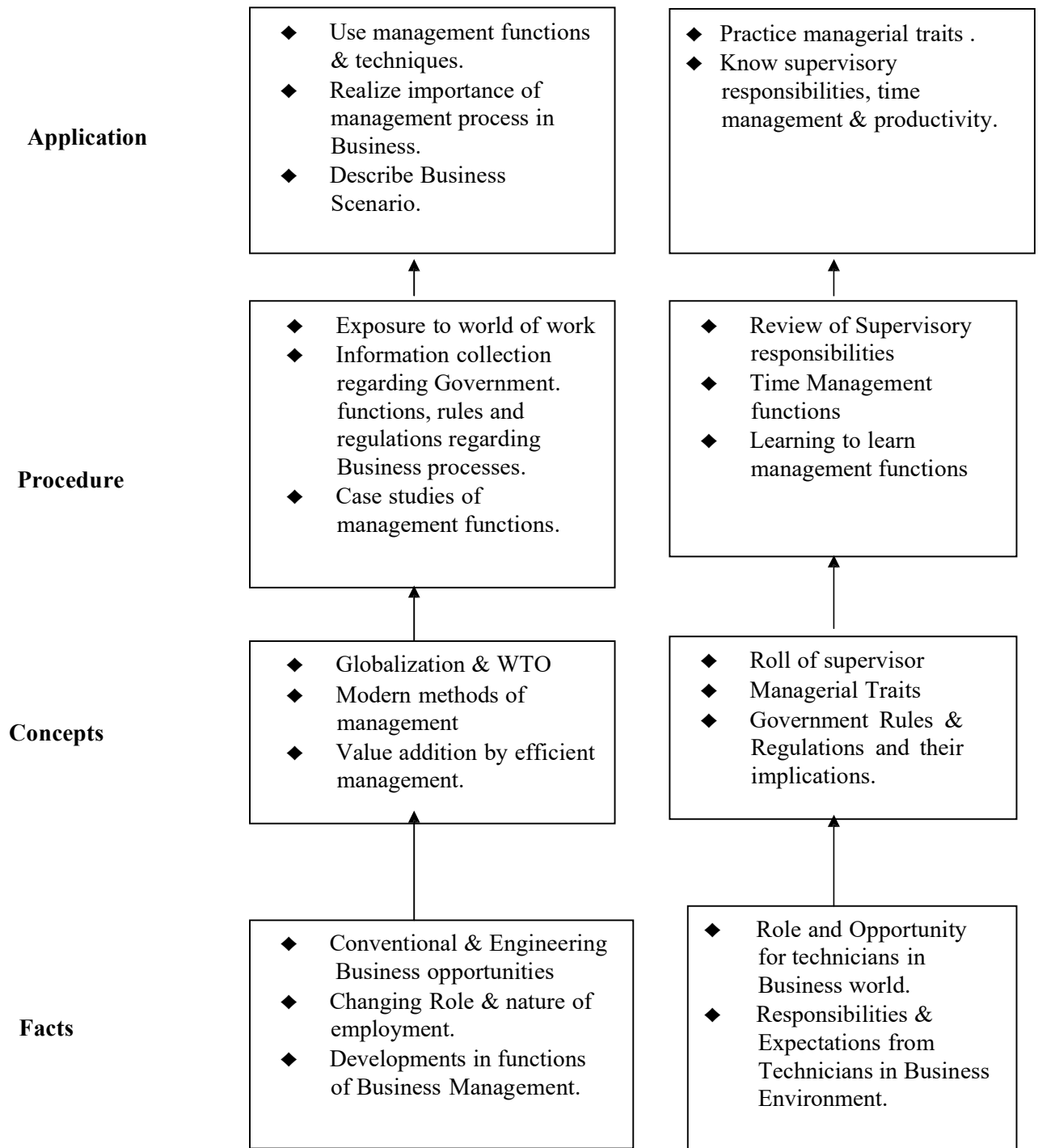
After completion of three years of technical training, Polytechnic students are expected to enter in to the World of Work. The business environment is altogether different and new to the students. A proper introduction and understanding of Business Processes is therefore essential for all Polytechnic students. Management is a subject which deals with basics of Managerial science required to understand the processes in Industrial & Commercial environment. This will enable the students of Polytechnics to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities.

**Objective:**

The students will able to:

1. Familiarize environment in the world of work
2. Explain the importance of management process in Business.
3. Identify various components of management.
4. Describe Role & Responsibilities of a Technician in an Organizational Structure.
5. Apply various rules and regulations concerned with Business & Social responsibilities of the Technician.

**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Name of the Topics</b>	<b>Hours</b>	<b>Marks</b>
01	<p><b>Overview of Business</b></p> <p>1.1. Types of Business</p> <ul style="list-style-type: none"> <li>• Service</li> <li>• Manufacturing</li> <li>• Trade</li> </ul> <p>1.2. Industrial sectors</p> <ul style="list-style-type: none"> <li>• Introduction to</li> <li>• Engineering Industry</li> <li>• Process Industry</li> <li>• Textile Industry</li> <li>• Chemical Industry</li> <li>• Agro Industry</li> </ul> <p>1.3 Globalization</p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Advantages &amp; disadvantages w.r.t India</li> </ul> <p>1.4 Intellectual Property Rights I( I P R )</p> <ul style="list-style-type: none"> <li>• Concept</li> <li>• Types of IPR</li> </ul>	02	04
02	<p><b>Management Process</b></p> <p>2.1 What is Management?</p> <ul style="list-style-type: none"> <li>• Evolution</li> <li>• Various Definitions</li> <li>• concept of Management</li> <li>• Levels of Management</li> <li>• Administration and Management</li> <li>• Scientific Management by F W Taylor</li> </ul> <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management:</p> <ul style="list-style-type: none"> <li>• Planning</li> <li>• Organizing</li> <li>• Coordinating</li> <li>• Directing</li> <li>• Controlling</li> <li>• Decision Making</li> </ul>	07	14

03	<p><b>Organizational Management</b></p> <p>3.1 Organization</p> <ul style="list-style-type: none"> <li>• Definition</li> <li>• Steps in forming organization</li> </ul> <p>3.2 Types of Organization</p> <ul style="list-style-type: none"> <li>• Line</li> <li>• Line &amp; Staff</li> <li>• Functional</li> <li>• Project type</li> </ul> <p>3.3 Departmentation</p> <ul style="list-style-type: none"> <li>• Centralized &amp; Decentralized</li> <li>• Authority &amp; Responsibility</li> <li>• Span of Control (Management)</li> </ul> <p>3.4 Forms of ownerships</p> <ul style="list-style-type: none"> <li>• Proprietorship</li> <li>• Partnership</li> <li>• Joint stock company</li> <li>• Co-operative society</li> <li>• Govt. Sector</li> </ul>	07	14
04	<p><b>Human Resource Management</b></p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Definition</li> <li>• Function</li> </ul> <p>4.2 Staffing</p> <ul style="list-style-type: none"> <li>• Introduction to HR</li> <li>• Introduction to HR Planning</li> <li>• Recruitment procedure</li> </ul> <p>4.3 Personnel – Training &amp; Development</p> <ul style="list-style-type: none"> <li>• Types of training <ul style="list-style-type: none"> <li>- Induction</li> <li>- Skill enhancement</li> </ul> </li> </ul> <p>4.4 Leadership &amp; Motivation</p> <ul style="list-style-type: none"> <li>• Leadership- Styles &amp; types</li> <li>• Motivation –Definition , Intrinsic &amp; Extrinsic</li> <li>• Maslow’s theory of Motivation and its significance</li> </ul> <p>4.5 Safety Management</p> <ul style="list-style-type: none"> <li>• Causes of Accidents</li> <li>• Safety Procedures</li> </ul> <p>4.6 Introduction, Objectives &amp; feature of Industrial Legislation such as</p> <ul style="list-style-type: none"> <li>• Factory Act</li> <li>• ESI Act,</li> <li>• Workman Compensation Act,</li> <li>• Industrial Dispute Act.</li> </ul>	08	20

05	<p><b>Financial Management ( No Numericals)</b></p> <p>5.1. Financial Management- Objectives &amp; Functions</p> <p>5.2. Capital Generation &amp; Management</p> <ul style="list-style-type: none"> <li>• Types of capitals</li> <li>• Sources of finance</li> </ul> <p>5.3. Budgets and Accounts</p> <ul style="list-style-type: none"> <li>• Types of Budgets</li> <li>• Production Budget ( including Variance Report)</li> <li>• Labour Budget</li> <li>• Introduction to Profit &amp; Loss Account ( Only concept)</li> <li>• Balance sheet etc.</li> </ul> <p>5.4. Introduction to Various Taxes</p> <ul style="list-style-type: none"> <li>• Excise Service Tax,</li> <li>• Income Tax</li> <li>• VAT</li> <li>• Custom Duty.</li> </ul>	08	18
06	<p><b>Materials Management</b></p> <p>6.1. Inventory Management ( No Numericals)</p> <ul style="list-style-type: none"> <li>• Meaning &amp; Objectives</li> </ul> <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity:</p> <ul style="list-style-type: none"> <li>• Introduction &amp; Graphical Representation</li> </ul> <p>6.4 Purchase Procedure</p> <ul style="list-style-type: none"> <li>• Objectives of Purchasing</li> <li>• Functions of Purchasing Department</li> <li>• Steps inPurchasing</li> </ul> <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> <li>• Introductory treatment to Just inTime( JIT)/ System Applications &amp; Products (SAP) /Enterprise Resource Planning (ERP)</li> </ul>	08	18
07	<p><b>Project Management (Simple /Elementary Numericals)</b></p> <p>7.1 Project Management</p> <ul style="list-style-type: none"> <li>• Introduction &amp; Meaning</li> <li>• Introduction to CPM/PERT Techniques ( simple network problems )</li> <li>• Concept of Break Even Analysis and its significance</li> </ul> <p>7.2 Quality Management</p> <ul style="list-style-type: none"> <li>• Definition of Quality, Concept of Quality, Quality Circle, Quality Assurance</li> <li>• Introduction to TQM, Kaizen, 5 'S' &amp; Six Sigma</li> </ul>	08	12
<b>Total</b>		<b>48</b>	<b>100</b>

**Learning Resources:**

**Books:**

<b>Sr. No</b>	<b>Author</b>	<b>Tit;e</b>	<b>Publisher</b>
01	Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New Delhi
02	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
03	W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall of India Pvt. Ltd. New Delhi - 110001

**2. Video Cassetts:**

<b>No</b>	<b>Subject</b>	<b>Source</b>
1.	Business opportunity selection and guidance	Website : <a href="http://www.ediindia.org">http://www.ediindia.org</a>
2.	Planning for completion and Growth	

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**  
**COURSE CODE : CE/CS/CR/CV**  
**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV**  
**SUBJECT TITLE : CONTRACTS AND ACCOUNTS**  
**SUBJECT CODE : 12220**

**Teaching and Examination Scheme**

TEACHING SCHEME			EXAMINATION SCHEME					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	--	--	25@	125

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by SBTE.**
- **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:**

This is a core technology subject which will enable the students to learn facts, concepts, principles and procedure in contracts and accounts. With this knowledge and skill, he will be able to prepare tender papers for contract and contract documentation before start of construction.

He will get acquainted with procedures and different forms used by PWD as well as private construction firms and will therefore be able to prepare bills and pay contractor for the work as well as penalize for defective work

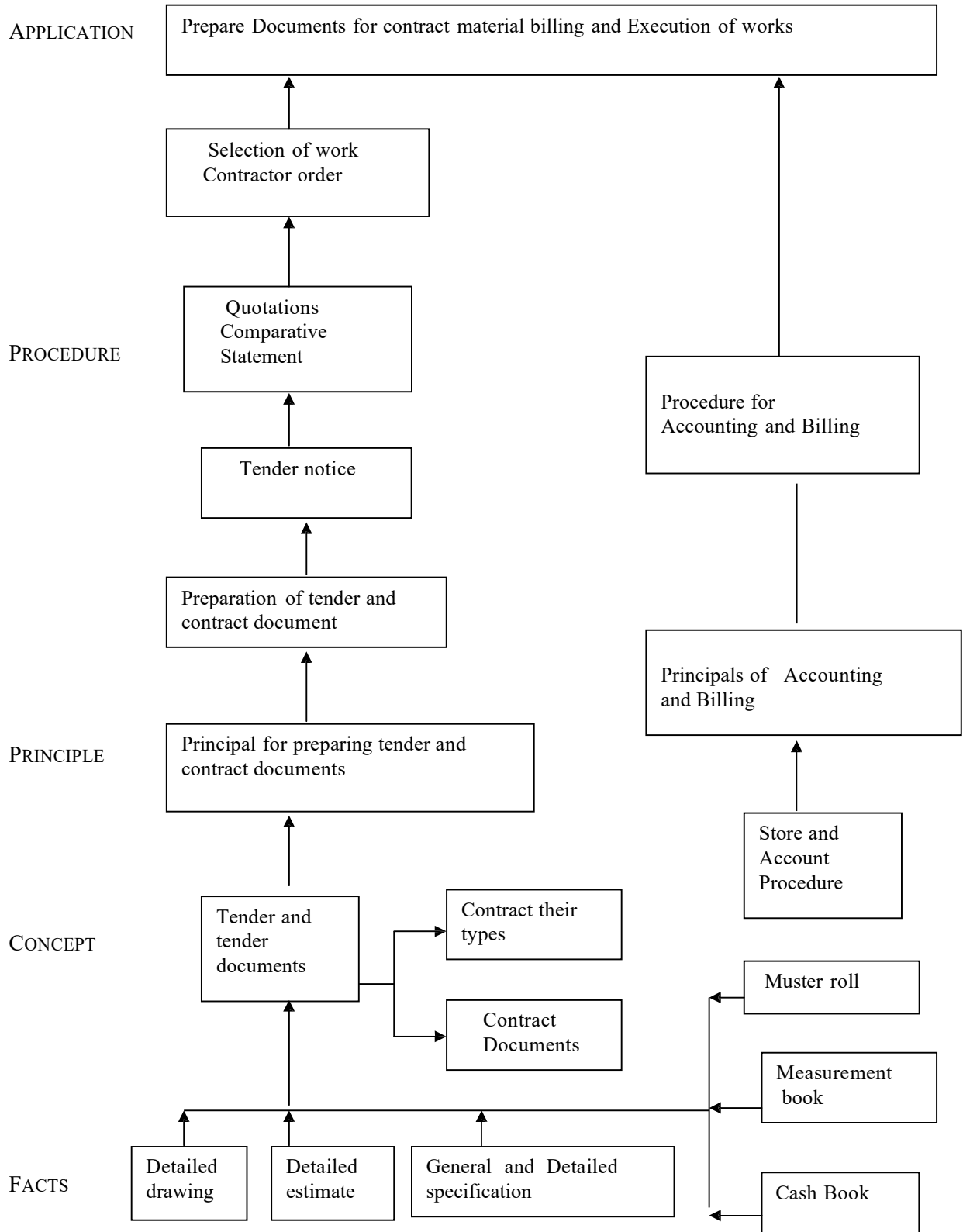
He will also use the core knowledge of this subject area for assessment of expenses for repairs and maintenance of civil engineering works.

**Objectives:** The students shall be able to:

- 1) Differentiate between types of contract.
- 2) Prepare tender documents.
- 3) Draft tender notice for various types of construction
- 4) Prepare specification of an item of construction.
- 5) Calculate the value of a land and old buildings.



**LEARNING STRUCTURE:**



**CONTENTS: THEORY**

<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>PROCEDURE OF EXECUTION OF WORK BY P.W.D.</b> 1.1 Organizational structure of p.w.d., functions of their personnel. 1.2 P.w.d. Procedure of initiating the work, administrative approval, technical sanction, budget provision. 1.3 Methods used in p.w.d. For carrying out works contract method and departmental method , rate list method , piece work method , day's work method , department method ( NMR and Casual Muster Roll.)	06	12
02	<b>Contract</b> 2.1 Definition of contract, Objects of contract, requirements of valid contract 2.2 Types of engineering contract with advantages and disadvantages their suitabilities - Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract , target contract, negotiated contract . 2.3 Class of contractor, Registration of contractor. 2.4 BOT Project: objectives, scope, advantages, disadvantages, examples	14	20
03	<b>Tender &amp; Tender Documents</b> 3.1 Definition of tender, necessity of tender, types-local and global. 3.2 Tender notice, points to be included while drafting tender notice, drafting of tender notice. 3.3 Meaning of terms: earnest money, security deposit, validity period, right to reject one or all tenders, corrigendum to tender notice and its necessity. 3.4 Tender documents – list, schedule a, schedule b, schedule C 3.5 Terms related to tender documents – contract conditions: time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items ,escalation ,arbitration, price variation clause, defect liability period, liquidated and unliquidated damages. 3.6 Filling the tender by contractor and points to be observed by him. 3.7 Procedure of submitting filled in tender document , procedure of opening tender , comparative statement , scrutiny of tenders ,award of contract, acceptance letter and work order. 3.8 Unbalanced tender, ring formation.	14	20
04	<b>Accounts in P.W.D.</b> Various account forms and their uses -Measurement Books, Nominal Muster Roll, Imprest Cash , Indent, Invoice, Bills, Vouchers, Cash Book, Temporary Advance.	04	08

05	<b>Payment to Contractors</b> Mode of payment to the contractor- Interim Payment And Its Necessity, Advance Payment, Secured Advance, On Account Payment, Final Payment, First And Final Payment, Retention Money, Reduced Rate Payment, Petty Advance, Mobilization Advance.	04	08
06	<b>SPECIFICATIONS</b> 6.1 Necessity And Importance Of Specifications Of An Items, Points To Be Observed In Framing Specifications Of An Item, Types Of Specification –Brief And Detailed, Standard And Manufacturers Specification. 6.2 Preparing Detailed Specifications Of Items In Civil Engineering Works. From Each of Following: Building Construction System, Irrigation Engineering System, Transportation Engineering System, Environmental Engineering System 6.3 Legal Aspects Of Specification.	06	12
07	<b>VALUATION</b> 7.1 Definition, Necessity Of Valuation. Definitions – Cost, Price, Value, Characteristics Of Value, Factors Affecting Value. 7.2 Types Of Value: - Book Value, Scrap Value, Salvage Value, Speculative Value , Distress Value, Market Value, Monopoly Value, Sentimental Value, Factors Affecting Value. 7.3 DEPRECIATION, Obsolescence, Sinking Fund. Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method Quantity Survey Method. 7.1 Computation of Capitalized Value, Gross Income, Outgoing, Net Income, Years Purchase. Types of Outgoing And Their Percentages. 7.2 Fixation Of Rent as Per PWD Practice	16	20
<b>TOTAL</b>		<b>64</b>	<b>100</b>

**Practical:**

Skills to be developed:

**Intellectual Skills:**

1. Know the importance of specification in civil engineering works.
2. Draft tender notice and prepare tender documents.
3. Identify and use various account forms used in PWD

**Motor Skill:**

1. Write the detailed specification.
2. Draft brief tender notice for construction of WBM road.
3. Prepare tender document for construction of a residential building.

4. Prepare valuation report for land and building.
5. Prepare tender document for a civil engineering work.

**Assignments:**

1. Collecting old set of tender document and writing a report on it
2. Collection of tender notices published in newspapers for various items of civil engineering works. ( At least 5) Write salient features of them.
3. Drafting a tender notices for construction of a civil engineering Work ( W. B. M. Road, Residential Building )
4. Preparation of Tender Document for the Building. (Detailed Estimate prepared for R.C.C. Building in Estimating and Costing shall be used )
5. Collection of various account forms from PWD & writing report on it
6. Writing a report on store procedure and account producer of PWD. For it a
  - a. Guest Lecture of PWD official may be arranged.
7. Writing detailed Specifications for one item from each of following :
  - a) Building construction system.
  - b) Irrigation engineering system.
  - c) Transportation engineering system.
  - d) Environment engineering system.

**LEARNING RESOURCES:**

**BOOKS:**

Sr. No.	Author	Title	Publisher
01	B.N. Datta	ESTIMATING & COSTING IN CIVIL ENGINEERING	UBS Publishers
02	M. Chakraborti	Estimating & costing, Specification and Valuation in Civil Engineering	M. Chakraborti , Calcutta
03	S.C. Rangwala	Estimating & costing	Charotar Publication
04	B.S. Patil	Civil Engineering Contracts and accounts Vol I , II	Orient Longman,
05	G. S. Birdie	ESTIMATING & COSTING	Dhanpat Rai and Sons
07	S.C. Rangwala	Valuation of Real properties	Charotar Publication

**VIDEO CASSETTES / CDS:**

Sr. No.	Title
01	SBTE CAI Package.

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**  
**COURSE CODE : CE/CS/CR/CV**  
**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV**  
**SUBJECT TITLE : ENVIRONMENTAL ENGINEERING**  
**SUBJECT CODE : 12221**

**Teaching and examination scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	--	--	25@	125

**NOTE:**

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**Rationale:**

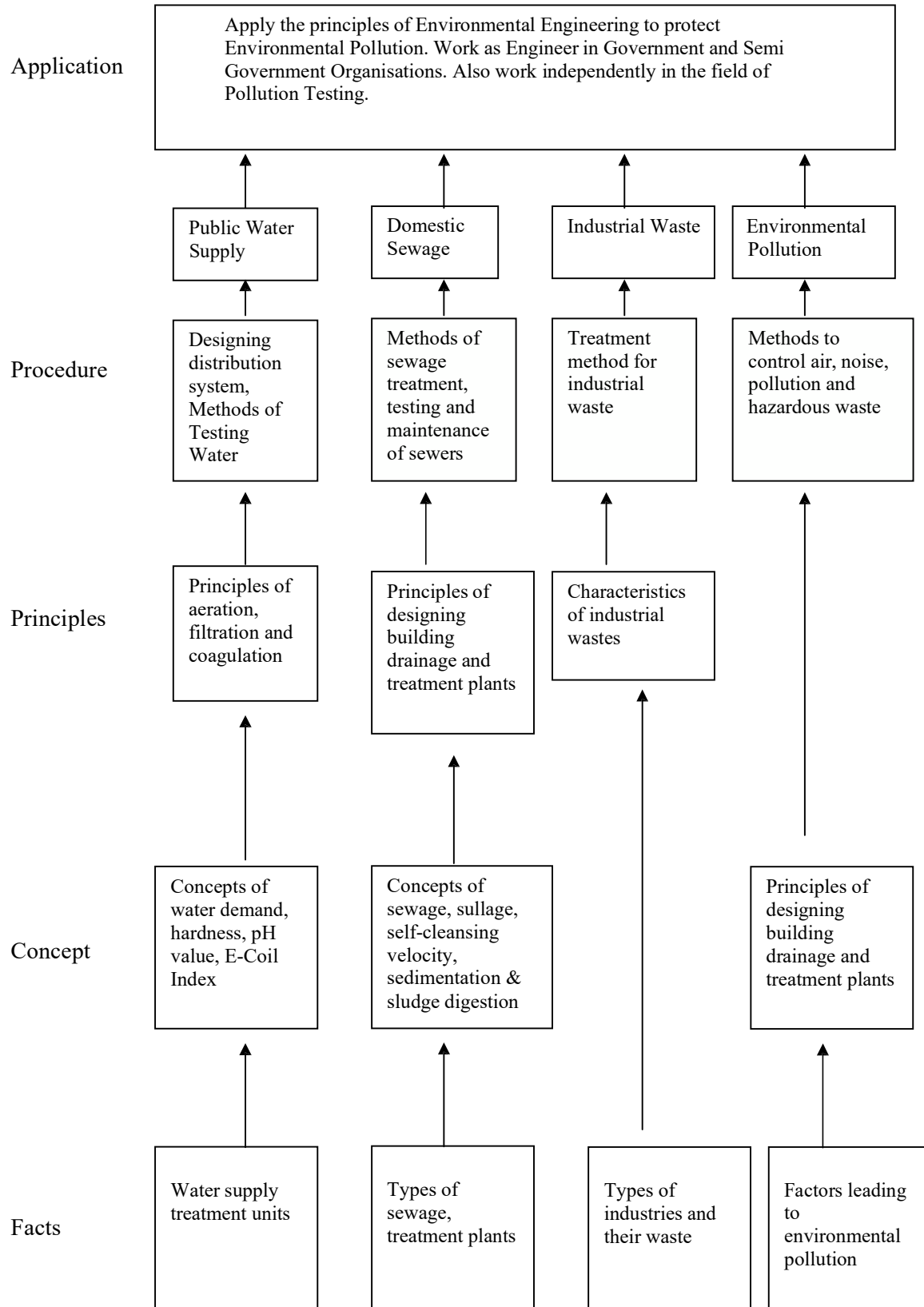
Environment is the integral part of life. It consists of biotic and abiotic things. There should be a proper balance between biotic and abiotic things to maintain ecological balance. Man has exploited the environment which has hampered this ecological balance which leads to environmental degradation. The population explosion and affluent society which desires for a vast array of products, increased radiation, the automobile, greater energy use, increased food production needs and other developments have created strains on parts of the ecological system. At present, entire cultural history, man is facing one of the most horrible ecological crises- the problem of pollution of his environment which sometimes in past was pure, virgin, undisturbed, uncontaminated and basically quite hospitable for him.

Hence there is a need to study the problems related to environment in general and water pollution, land pollution, air pollution, solid waste management and noise pollution etc.; in particular.

**Objectives: The students will be able to**

- 1) Estimate water demands
- 2) Analyse the quality of water
- 3) Suggest the treatment required by knowing the quality of water
- 4) Know the sewerage system.
- 5) Analyse the sewage
- 6) Suggest the waste water treatment
- 7) Suggest the treatment for industrial waste
- 8) Know the solid waste management

**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>ENVIRONMENTAL POLLUTION AND CONTROL</b> 1.1 Introduction Environment, Ecosystem, Environmental Pollution and its types, Causes of Pollution, Effects of Pollution, Control of Pollution, Existing laws related to Environmental Pollution.	03	04
02	<b>PUBLIC WATER SUPPLY</b> 2.1 Quantity of Water Demands of water: Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand ; Factors affecting rate of Demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, Design period for water supply scheme. Estimation of quantity of water supply required for a town or city, Types of water supply schemes. 2.2 Sources of Water Surface and Subsurface sources of water, Intake Structures- Definition and types, Factors governing the location of an intake structure, Water conservation, Ground water recharging – Necessity Importance and advantages. 2.3 Quality of Water Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli index, MPN, Sampling of water, Water quality standards as per I.S. 2.4 Purification of Water Screening- Types of screens, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Filtration-theory of filtration, classification of filters : slow sand filter, rapid sand filter, pressure filter, domestic filter, filter media, construction and working of slow sand filter and rapid sand filter, Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, orthotolidine test, Miscellaneous water Treatments (Water softening, Defluoridation techniques ), Advanced Water Treatments (Electrolysis, Reverse Osmosis ) , Flow diagram of water treatment plants, Low cost water Treatments: Necessity and importance in rural areas, Prevention of pollution of bores and bore wells. 2.5 Conveyance and Distribution of Water Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on	24	32

	a pipeline. Methods of distribution of water- Gravity, pumping, and combined system Service reservoirs – functions and types , Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system ; their suitability, advantages and disadvantages.		
03	<p><b>DOMESTIC SEWAGE</b></p> <p>3.1 Introduction Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage</p> <p>3.2 Building Sanitation Definitions of the terms related to Building Sanitation- Water pipe, Rain water pipe, Soil pipe , Sullage pipe, Vent pipe, Building Sanitary fittings- Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals, Traps- types, qualities of good trap, Systems of plumbing – one pipe, two pipe, single stack, choice of system Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan) , inspection and junction chambers, their necessity, location , size and shape. Maintenance of sanitary units.</p> <p>3.3 Systems of Sewerage Types of Sewers, Systems of Sewerage, Design of sewers, self-cleansing velocity and non-scouring velocity Laying, Testing and maintenance of sewers.</p> <p>3.4 Sewer Appurtenances Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets, Flushing Tanks – manual and automatic</p> <p>3.5 Analysis of Sewage Characteristics of sewage, B.O.D./ C.O.D. and significance. , Aerobic and anaerobic process, Maharashtra Pollution Control Board Norms for the discharge of treated sewage</p> <p>3.6 Treatment of Sewage Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch.</p>	21	36
04	<p><b>INDU STRIAL WASTE</b></p> <p>4.1 Industrial Waste Water Characteristics of Industrial waste water from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments</p>	03	04
05	<p><b>ENVI RONMENTAL POLLUTION</b></p> <p>5.1 Air Pollution and Noise Pollution Sources, Effects and Control of Air Pollution, Sources , Effects and Control of Noise Pollution ( only brief idea ) Global warming, Acid Rain</p>	02	04



06	<b>SOLID WASTES FROM THE SOCIETY</b> 6.1 Solid Waste Management Definitions – Refuse, Rubbish, Garbage, Ashes, Constituents of solid wastes Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes Methods of treatment and disposal of solid waste. 6.2 Hazardous Wastes Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous wastes.	05	08
07	<b>ENVIRONMENTAL SANITATION</b> 7.1 Environmental Sanitation Necessity and importance, Rural sanitation- Types of Privies – Aqua privy and Bore Hole Latrine- construction and working Composting (Nadep or Vermiculture), 7.2 Emerging Trends ( only brief idea ) Sant Gadge Baba Swachhatha Abhiyan Low cost Latrines Jalswarajya Scheme.	04	08
08	<b>PLUMBING</b> 8.1 Sanitary Plumbing, Layout, Details of water supply arrangement for residential and public building Rainwater and sewage collection systems	02	04
<b>Total</b>		<b>64</b>	<b>100</b>

**Practical:**

Skills to be developed:

**Intellectual Skills:**

1. Identify the method for testing of water.
2. Interpret the results.

**Motor Skills:**

1. Observe chemical reactions
2. Handle instruments carefully

**List of Practical:**

**Water Supply and Sanitary Engineering:**

- 1) To determine the pH of a given water and wastewater sample by using digital pH meter.
- 2) To determine the turbidity of the given sample using Turbidity meter(Jackson Turbidity meter/ Digital Turbidity meter.)
- 3) To determine residual chlorine of a given sample of water by Orthotolidine test.
- 4) To determine fluoride concentration in given water sample
- 5) To determine the Hardness of given water sample by standard EDTA method.

- 6) To determine suspended solids, dissolved solids and total solids of given water and waste water sample.
- 7) To determine the optimum dose of coagulant (Alum) for given sample of raw water by jar test.
- 8) To determine the dissolved oxygen in a sample of water and waste water sample.
- 9) To determine Biological Oxygen Demand (5days BOD) of given sample of waste water.
- 10) To determine C.O.D. of given sample of waste water.
- 11) Design the Septic Tank and soak pit for the public building such as hostel or hospital
- 12) Report on visit to Energy generation plant from solid waste (Bio gas plant) and energy generation plant from cow dung (Gobar Gas plant)
- 13) To determine Total suspended particulate matter in the atmosphere using High Volume Sampler

**Learning Resources:**

**Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
01	Santosh Garg	Environmental Engineering (Volume I & II)	Khanna Publishers,
02	Kamla A. & Kanth Rao D. L.	Environmental Engineering	Tata McGraw Hill,
03	Birdie G. S. Birdie J. S.	Water Supply and Sanitary Engineering	Dhanpat Rai & Sons
04	Deolalikar S. G.	Plumbing – Design and Practice	Tata McGraw Hill,
05	Rao M. N. Rao H. V. N.	Air Pollution	Tata McGraw Hill,
06	H. M. Raghunath	Ground Water	New Age International
07	Rao & Dutta	Industrial Water Treatment	-----

**COURSE NAME : DIPLOAM IN CIVIL ENGINEERING**

**COURSE CODE : CE/CS/CR/CV**

**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV**

**SUBJECT TITLE : DESIGN OF STRUCTURES**

**SUBJECT CODE : 12222**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	04	100	--	25#	50@	175

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by SBTE.**
- **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:**

Different Civil Engineering Structures made of reinforced concrete are to be supervised by Civil Engineering technicians. For effective supervision & site control he must be able to draw read & interpret the R.C.C. drawing & design details. To inculcate these abilities he must have gone through design strategies also.

Design of a structure is the subject placed at technology level. This subject requires prerequisite knowledge, skill & competencies acquired from the subject Concrete Technology & Theory of structure. In working stress method, the structures are designed with classical elastic theory based on calculations on service load conditions alone. In W.S.M., the concept of modular ratio is applied and the stresses in steel and concrete are based on higher factor of safety. Thus full strength of materials cannot be utilized.

Limit State method is based on statistical probability approach, which provides rational solution to the design problem. L.S.M. philosophy uses multiple safety factors format which attempts to provide adequate safety at ultimate load as well as adequate serviceability at service load by considering all possible limit states.

Prestressed concrete is high - strength concrete in which permanent internal stresses are deliberately introduced to counteract to the desired degree the stresses caused in the members

in service usually by high tensile steel wires or tensioned steel, embedded and pretensioned, prior to the application of external loads. By this the concrete is precompressed to such a degree that after structure is loaded, there is practically no resultant tension developed in the beam.

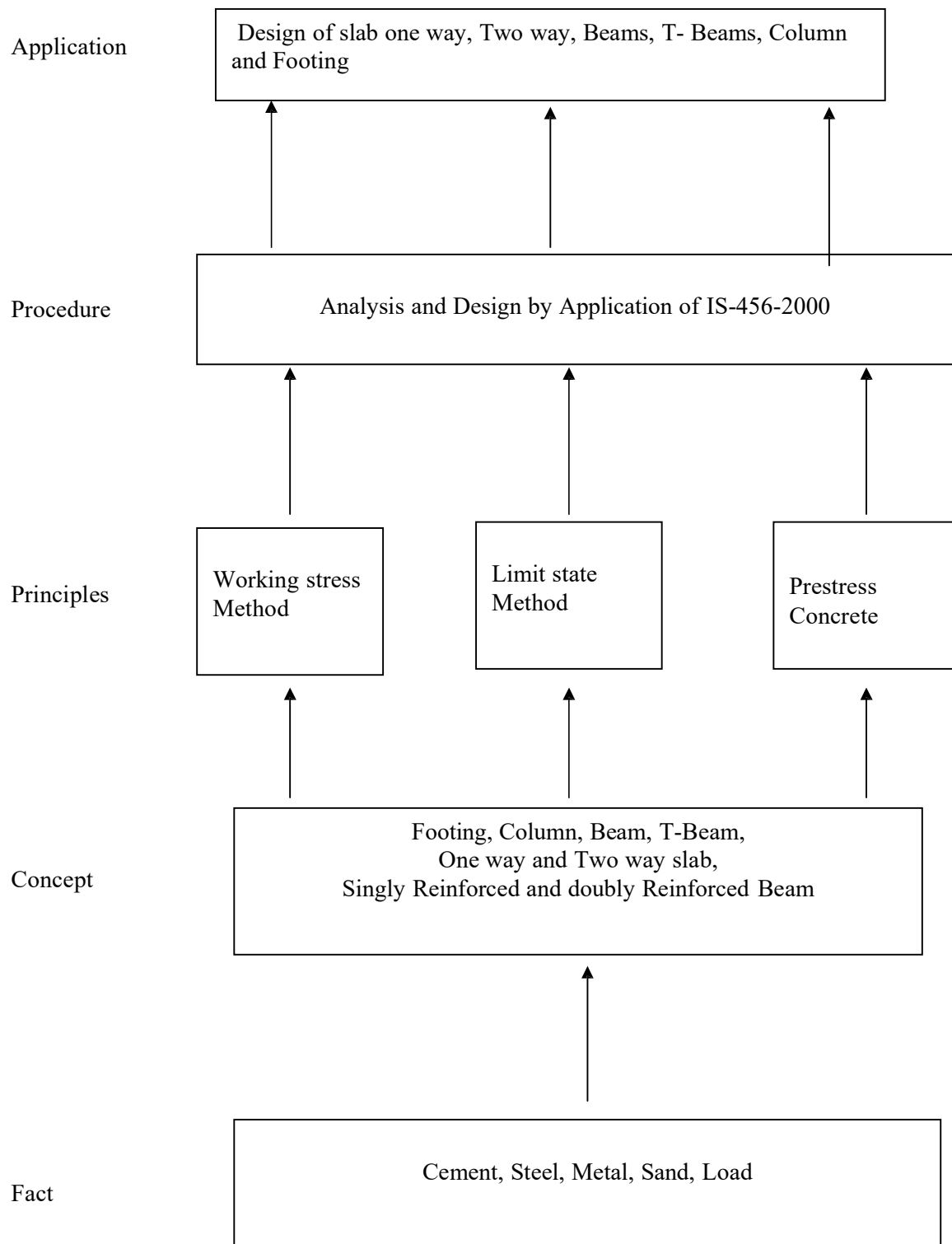
Prestressed concrete finds application in situations where long span are encountered ( as in bridges) or where cracks (even hair line ) in concrete are not permitted ( as in pressure vessels, pipes and water tanks ) or where fatigue loading is encountered ( as in rail track sleepers )

**Objectives:**

Students will be able to:

1. Analyse the section by LSM.
2. Select Proper materials and Calculate the design values for the materials.
3. Calculate the loads on structural components as per IS 875 (Part-I &II) provisions.
4. Read and interpret structural drawing.
5. Understand the basic principles of design of R.C.C. sections.
6. Use & Correlate the specifications of IS 456-2000 code.
7. Draw and appreciate the proper reinforcement detailing of R.C. structural member and their connection.
8. Prepare the detailed drawing of structural elements with key plans and schedule of reinforcement
9. Design singly reinforced, Doubly reinforced and flanged section of beams, simply supported one way & two way slabs, cantilevers slab, axially loaded columns & footings by LSM.

**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<p><b>Working Stress Method &amp; Prestressed Concrete</b></p> <p>1.1 Introduction to reinforced concrete, R.C. Sections their behavior, grades of concrete steel. Permissible stresses, Assumptions in W.S.M.</p> <p>1.2 Equivalent bending stress distribution diagram for singly reinforced section,</p> <p>1.3 Concept of prestressed concrete, externally and internally prestressed member.</p> <p>1.4 Advantages and disadvantages of prestressed concrete.</p> <p>1.5 Methods of prestressing, pretensioning and post tensioning. Losses in prestressing. (No numerical problems shall be asked in written examination on pre-stressed concrete.)</p>	06	08
02	<p><b>Limit State Method</b></p> <p>2.1 Definition, types of limit states, partial safety factors for materials strength, characteristic strength, characteristic load, design load. Loading on structure as per I.S 875.</p> <p>2.2 I.S. Specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column &amp; footing, minimum reinforcement in slab, beam &amp; column, lapping, anchoring effective span for beam, &amp; slab.</p>	04	08
03	<p><b>Analysis and Design of Singly Reinforced Sections (LSM)</b></p> <p>3.1 Limit State of collapse ( Flexure), Assumptions stress. Strain relationship for concrete and steel neutral axis, Stress block diagram and Strain diagram for singly reinforced section.</p> <p>3.2 Concept of under- reinforced, over-reinforced and balanced section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for balanced singly R.C. Section.</p> <p>3.3 Simple numerical problems on determining design constants, moment of resistance and area of steel and design of beam section.</p>	10	12
04	<p><b>Analysis and Design of Doubly Reinforced Sections (LSM)</b></p> <p>4.1 General features, necessity of providing doubly reinforced section reinforcement limitations.</p> <p>4.2 Analysis of doubly reinforced section, strain diagram stress diagram, depth of neutral axis, moment of resistance of the section.</p> <p>4.3 Simple numerical problems on finding moment of resistance and design of beam sections.</p>	08	12

05	<p><b>Shear, Bond and Development Length (LSM)</b></p> <p>5.1 Nominal Shear stress in R.C. Section, design shear strength of concrete, Maximum shear stress, Design of shear reinforcement, Minimum shear reinforcement, forms of shear reinforcement.</p> <p>5.2 Bond and types of bond, Bond Stress, check for bond stress, Development length in tension and compression, anchorage value for hooks 90° bend and 45° bend Standard Lapping of bars, check for development length.</p> <p>5.3 Simple numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams; Determination of Development length required for tension reinforcement of cantilevers beam and slab, check for development length.</p>	08	12
06	<p><b>Analysis and Design of T-Beam (LSM)</b></p> <p>6.1 General features, advantages, effective width of flange as per IS : 456-2000 code provisions.</p> <p>6.2 Analysis of singly reinforced T-Beam, strain diagram &amp; stress diagram, depth of neutral axis, moment of resistance of T-beam Section with neutral axis lying within the flange</p> <p>6.3 Design of T-beam for moment and shear for Neutral axis within or up to flange bottom.</p> <p>6.4 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section with N. A. lies within or upto the bottom of flange shall be asked in written examination.)</p>	06	12
07	<p><b>Design of Slab (LSM)</b></p> <p>7.1 Design of simply supported one-way slabs for flexure check for deflection control, and shear.</p> <p>7.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.</p> <p>7.3 Design of two-way simply supported slabs for flexure with corner free to lift.</p> <p>7.4 Design of dog-legged staircase.</p> <p>7.5 Simple numerical problems on design of one-way simply supported slabs cantilever slab &amp; two-way simply supported slab. (No problem on design of dog-legged staircase shall be asked in written examination.)</p>	12	20

08	<b>Design of Axially Loaded Column and Footing (LSM)</b>	10	16
	8.1 Assumptions in limit state of collapse – compression		
	8.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.		
	8.3 Analysis and design of axially loaded short, square, rectangular and circular columns with lateral ties only, check for short column and check for minimum eccentricity may be applied.		
	8.4 Types of footing, Design of isolated square footing for flexure and shear.		
8.5 Simple numerical problems on the design of axially loaded short columns and isolated square footing. (Problems on design of footing shall be asked in written examination for moment shear only.)			
<b>Total</b>		<b>64</b>	<b>100</b>

**Practical:**

Skill to be developed:

**Intellectual skills:**

1. Analyse the Data for Design.
2. Design component parts of building.

Motor Skills:

1. Draw proportionate sketches.
2. Draw constructional details.

Term work shall consist of sketch book, design of R.C.C structural components.

**Sketch book:**

Sketch book consists of approximately ten plates from R.C.C. Design shall include important information of clauses of IS 456-2000 code. Typical sketches of components members/stress distribution & strain distribution diagrams R.C.C. section/detailing of reinforcement in joints/members. Design of R.C.C. structural components by LSM.

The students should make detailed simple design and drawing of reinforcement detailing on two full imperial size sheets finished in pencil on *any five* of the following R.C.C. component members of a two - storied building with detailing of reinforcement (G+1) at the joints as per requirements & IS 13920

1. One-way simply supported slab.



2. Two-way simply supported slab.
3. Cantilever slab/chajja.
4. T-Beam.
5. Column and column footing.
6. Dog-legged staircase.

**Learning Resources:**

**Books:**

Sr. No.	Authors	Title	Publisher
1.	Dr. V. L. Shah & Late Dr. S. R. Karve	Limit State Theory & Design of Reinforced Concrete	Structures Publications
2.	N. C. Sinha & S. K. Roy	Fundamentals of Reinforced Concrete	S. chand & Company,
3.	N. Krishna Raju R. N. Pranesh	Reinforced concrete Design ( IS 456- 2000) Principles & Practice	New Age International
4.	N. Krishna Raju	Prestressed Concrete	--
5.	S.U.Pillai & Devdas Menon	Reinforced concrete Design	Tata Mcgraw Hill.
6.	P. C. Varghase	Limit State Design of Reinforced Concrete	Prentice Hall of India,

**I.S. Codes:**

1. IS 456:2000 - Plain and Reinforced concrete code of Practice.
2. SP16- Design Aids for reinforced concrete to IS 456.
3. I.S. 875 (Part 1-5) - 1987 code of practice of design loads for Buildings and structures.  
Part 1 - Dead load  
Part 2 - Imposed (live) load  
Part 3 - Wind load
4. SP 24 - Explanatory Handbook on IS 456
5. IS 1343-1980 - Indian Standard code of (Reaffirmed 1990) Practice for Prestressed concrete.
6. SP34 : 1987 - Handbook on concrete reinforcement and Detailing.
7. IS 13920-1993 DUCTILE detailing of R. C. Building subjected to Seismic forces.

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**  
**COURSE CODE : CE/CS/CR/CV**  
**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV**  
**SUBJECT TITLE : CIVIL ENGINEERING PROJECT**  
**SUBJECT CODE : 12228**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	50#	50@	100

**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.

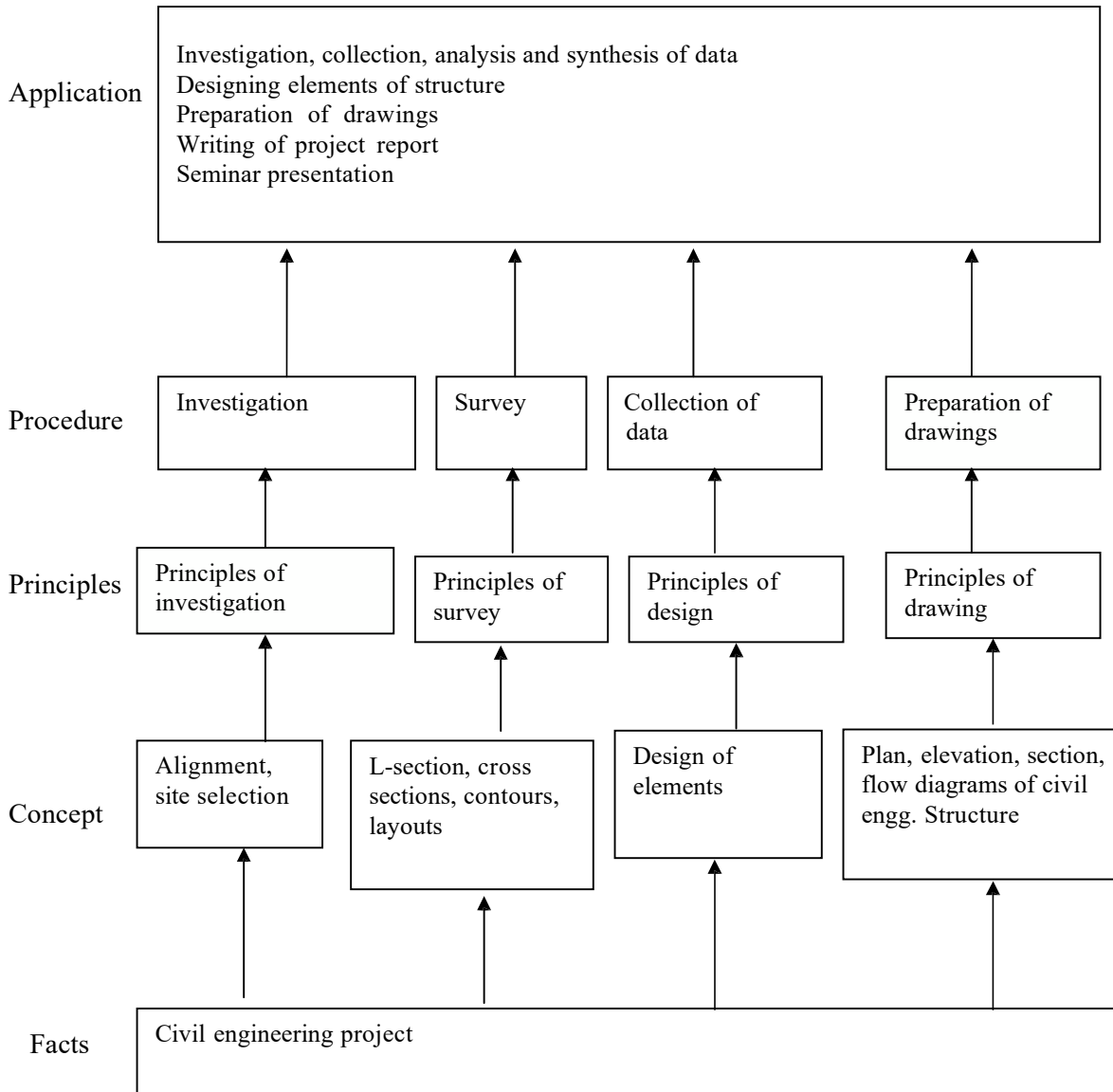
**Objectives:**

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 4 to 6 students .The project can be selected from any four civil engineering system like Building construction system, transportation engineering system, irrigation engineering system. A topic for project can also be selected on recent development in civil engineering.

**The project report shall be in the following format:**

- f* Topic and objectives
- f* Collection of data, required survey work,
- f* Management and construction procedure
- f* Resources scheduling and networking
- f* Design details
- f* Required drawing set
- f* Utility to society if any
- f* Conclusion

**LIST OF CIVIL ENGINEERNG PROJECTS:**

- 1) K.T. Weir
- 2) Lift Irrigation scheme.
- 3) Micro irrigation –Drip/Sprinkler Irrigation.
- 4) Junction planning for city roads/planning for roads for congested area/parking Studies etc.
- 5) Water shed development of small catchments.
- 6) Rain water harvesting for domestic or public building.
- 7) Campus development.
- 8) Interior decoration.
- 9) Concrete mix design.

- 10) Bridge design.
- 11) NDT of any RCC building.
- 12) Solid waste management.
- 13) Hospital waste disposal.
- 14) Recycling of resources.
- 15) Manufacturing of Pre-cast concrete products.
- 16) Prestressed concrete.
- 17) Non-conventional sources of energy.
- 18) Concrete pipe manufacturing unit.
- 19) Advance construction techniques.
- 20) Transfer of technology to villages.
- 21) Planning and design for residential apartments/commercial complex.
- 22) Planning and design of water treatment plant for given data.
- 23) Planning and design of water supply scheme for given lay out.
- 24) Planning and design of sewage treatment plant for given data.
- 25) Planning and design of sanitary scheme for given lay out.

Any other similar project can be selected.

**Term Work:** Shall consist of ---Detailed project report in above format.  
Separate drawing sheets covering details of the project shall also be prepared.

**Learning Resources:**

- 1) Civil Engineering Hand Books / Reference books.
- 2) Civil Engineering Magazines
- 3) Relevant IS / International codes.
- 4) PWD Handbooks / M.I.Manuals
- 5) Material / Machinery / Product Catalogue.

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**  
**COURSE CODE : CE/CS/CR/CV**  
**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV**  
**SUBJECT TITLE : PROFESSIONAL PRACTICES-V**  
**SUBJECT CODE : 12229**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

**Rationale:**

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, attitude and ability to communicate and attitude, in addition to basic technological concepts.

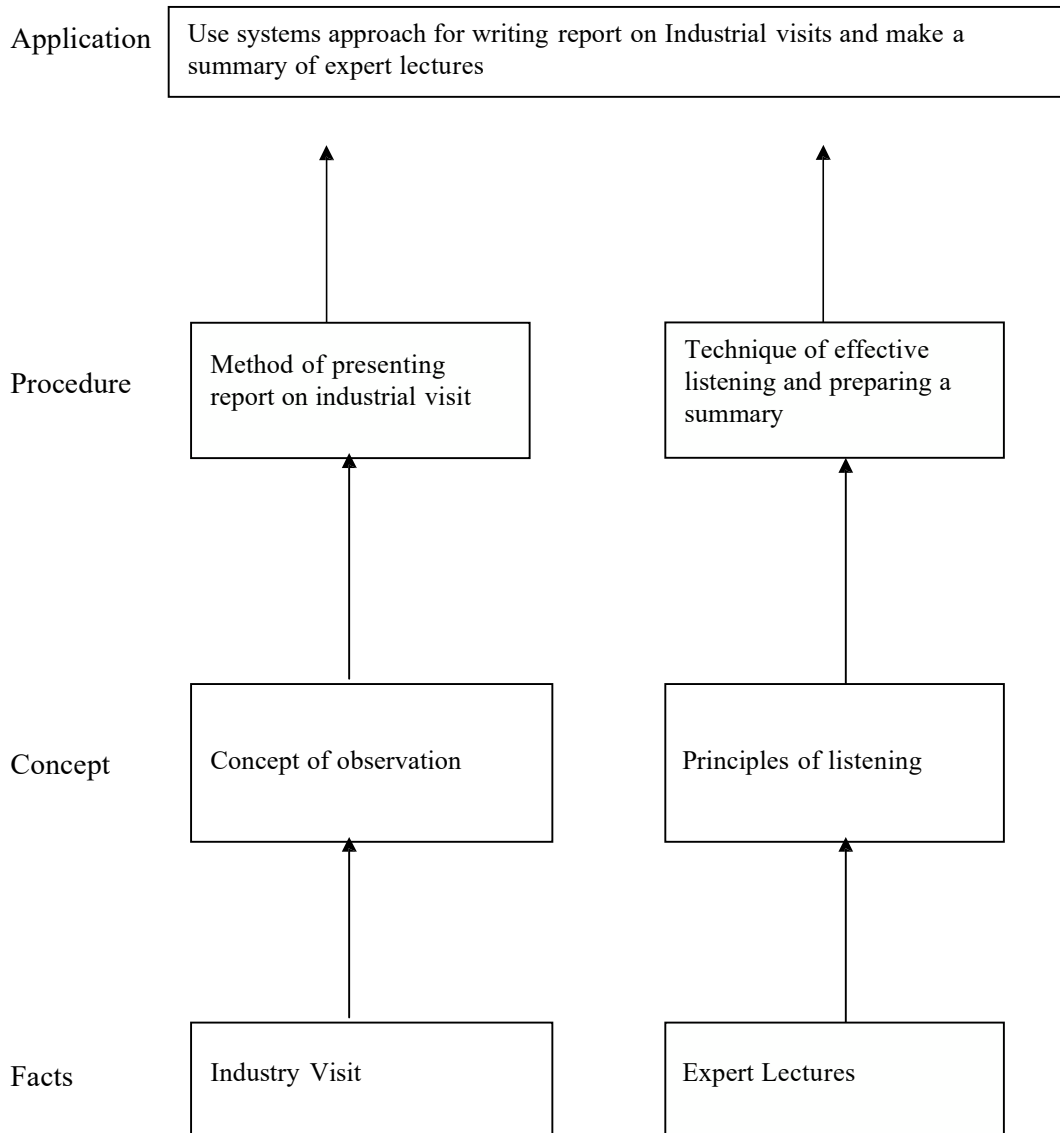
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

**Objectives:**

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

**Learning Structure:**



Sr. No.	Activity	Hours
01	<p>Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work. (minimum 3 visits)</p> <p>Following are the suggested type of Industries/ Fields -</p> <ul style="list-style-type: none"> <li>a) Visit to RCC framed structure building for details of reinforcement.</li> <li>b) Visit to water /sewage treatment plant.</li> <li>c) Visit to works carried out under watershed development/micro irrigation scheme.</li> <li>d) Visit to any structure undergoing rehabilitation/retrofitting.</li> </ul>	18
02	<p>The Guest Lecture/s from field/industry experts, professionals to be arranged (2 Hrs duration), minimum 2 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work.</p> <ul style="list-style-type: none"> <li>a) HRD and civil engineering projects.</li> <li>b) Project planning and execution of civil engineering projects.</li> <li>c) PWD system of accounts</li> <li>d) Contract Management</li> <li>e) RCC design and detailing</li> </ul>	14
03	<p>Information Search ,data collection and writing a report on the topic</p> <ul style="list-style-type: none"> <li>a) Collection of data for valuation of old building</li> <li>b) Collection of details of BOT project under execution.</li> <li>c) Collection of Data and case study of failure of RCC structure.</li> <li>d) Collection of information on any topic from journal available in library.</li> </ul>	10
04	<p><b>The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are -</b></p> <ul style="list-style-type: none"> <li>a) Role of civil engineer in disaster management.</li> <li>b) Scope of out sourcing of civil engineering services.</li> <li>c) Pollution control.</li> </ul>	10
05	<p><b>Seminar Presentation</b></p> <p>The students should select a topic for <b>Seminar</b> based on recent developments in civil engineering field, emerging technology etc.</p>	12
<b>Total</b>		<b>64</b>



**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**  
**COURSE CODE : CE/CS/CR/CV**  
**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV**  
**SUBJECT TITLE : RURAL ENGINEERING**  
**SUBJECT CODE : 12230**

**Teaching & Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	02	--	--	--	50#	50@	100

**Rationale:**

This subject is real contribution of civil engineering technologies studied by students in all six semesters of the course towards rural development.

Agriculture Industry is the largest industry in India and therefore back bone of the economy of the country. About 75% of population in India is residing in villages, therefore for nation building sustainable development of villages is the only way. Otherwise migration of rural population to Urban area will remain continued as till today.

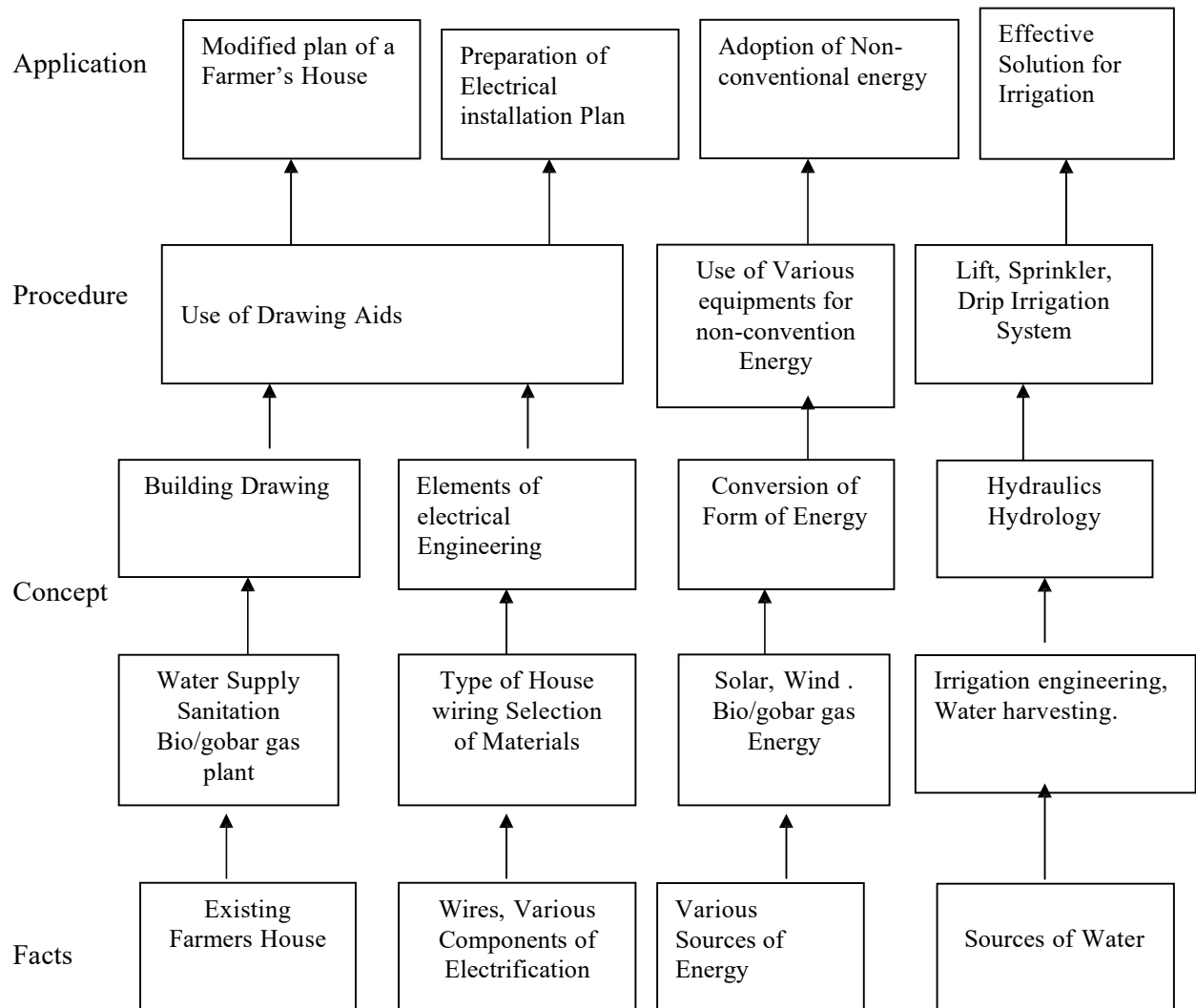
Civil engineering students can understand the facts, concepts, principles, procedure and problem solving methods through various practical, visits, surveys conducted in this subject.

**Objectives:**

The students will be able to:

- Use knowledge for solving the problems of rural population.
- Render their services for the various development schemes of state / central Govt.
- Prepare modified plan for existing farmer's house with due suggestions.
- Provide support services as a Civil Engineer for rural population..
- Provide guidance to start cottage industries related to Civil Engineering.
- Inspire the villagers for using non-conventional energy appliances.
- Provide services for developing and propagating the programmes of water shade management.

**Learning Structure:**



**Practical:**

**Term work shall consist of reports on any six of the following assignments:**

- 1.1 Socio Economic survey of village, to identify, the needs of village people
- 1.2 Visit to the Structures built under water shade management program (at least two structure)
  1. Gabian structure
  2. Underground Bandhara
  3. Kolhapur type weir
  4. Cement Plug, Contour Bunding
  5. Rain Water Harvesting

Prepare neat labeled sketches and report on the above visits.
- 2 Visit to a farmer's house
  - 2.1 Profile of a farmer for case study
  - 2.2 Measured drawing of existing farmers house
  - 2.3 Preparation of modified plan with due suggestions with respect to water supply, sanitations, cattle shade, fodder shade, court yard, composting yard, bio/Gobar Gas plant.
- 3 Report writing on the following with neat labeled sketches (Minimum one)
  - 3.1 Sprinkler Irrigation System, with capacity calculation, head and discharge calculation, power calculation for pump, pressure calculation for pipe.
  - 3.2. Drip Irrigation System with capacity calculation, head and discharge calculation, Power calculation for pump, pressure calculation for pipe
  - 3.3 Layout of Lift Irrigation, with capacity calculation, head and discharge calculation, power calculation for pump, pressure and dia. Calculation for pipe.
- 4 Report writing on any one of the cottage industries related to civil engineering regarding demand, utility, advantages, effect on rural economy etc.
  - 1 Brick Manufacturing
  - 2 Cement Block manufacturing
  - 3 Cement concrete pole for fencing
  - 4 Roof tiles / decorative Terracotta tiles manufacturing.
  - 5 Stone Crusher.
- 5 Collecting information regarding schemes declared by State / Central Govt. in which Civil Engineer has effective participation (at least one)

1. Indira Awas Yojna
  2. Walmiki Awas Yojna
  3. Swajal Dhara Yojna
  4. Jawahar Well Yojna
  5. Village / Farm Tank.
- 6 Collecting information regarding use of non-conventional energy source like- Solar energy, Bio/Gobar Gas plant, wind mill,
- 7 A Study report on any one
- 1) Basic Study of electrical installation for house wiring, its components, different types of wires and its uses, need of fuse and its material used, need of earthing and its use.
  - 2) Identification of electrical motor pump set, its electrical connection, fault finding and its remedies.
- 8 A Study report on
- Concept of Community Polytechnic in India regarding their role in upliftment of rural population, their area of working, such as manpower development, transfer of technology, technical support services, information dissemination, community services. A visit to nearest Community Polytechnic shall be arranged. A visit report shall be prepared covering all aspect.

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**  
**COURSE CODE : CE/CS/CV**  
**SEMESTER : SIXTH FOR CE/CS AND SEVENTH FOR CV**  
**SUBJECT TITLE : ADVANCED CONSTRUCTION TECHNIQUES & EQUIPMENTS (ELECTIVE)**  
**SUBJECT CODE : 12223**

**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 SBTE.**
- **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:**

Civil Engineering is a basic branch of Engineering and involves construction of roads, railways, bridges, irrigation structures, building construction, water supply and sanitary system, tunnels, airports and offshore Structures.

In the recent decades large developments have taken place in the methodology of construction and wide variety of equipments are used on the construction sites to obtain quality construction to increase productivity in construction.

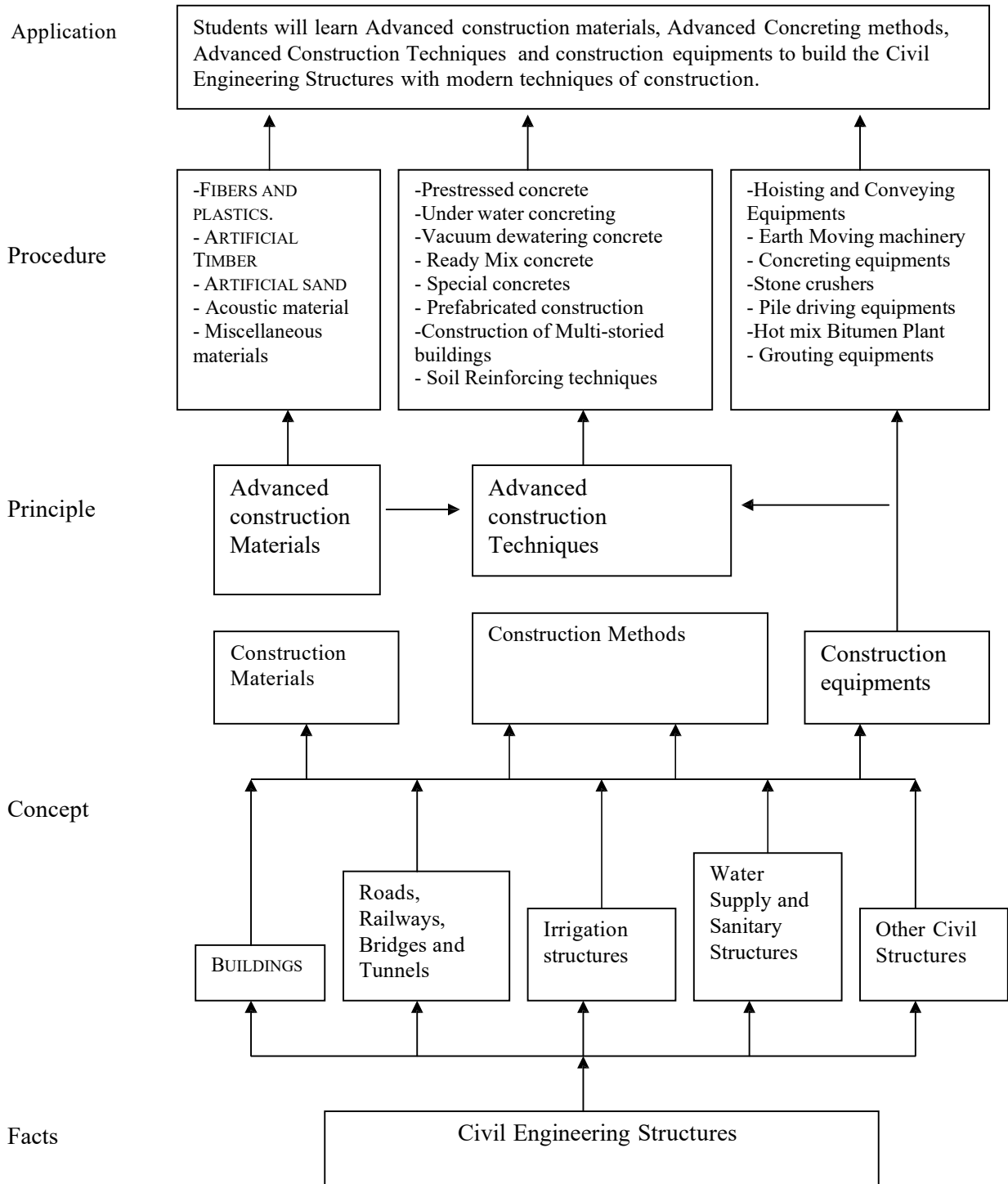
This subject is indented to learn advanced constructional methods, materials and equipments used on construction sites.

**Objectives:**

Student shall be able to:

1. Know the new materials of construction.
2. Understand various advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

**LEARNING STRUCTURE:**



**Contents: Theory**

<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
<b>01</b>	<p><b>1.0 Advanced Construction Materials</b></p> <p><b>1.1 FIBERS AND PLASTICS.</b> Types of fibers – Steel, Carbon, Glass fibers. Use of fibers as construction materials. Properties of fibers.</p> <p>Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material.</p> <p><b>1.2 Artificial Timber</b> Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber.</p> <p><b>1.3 Miscellaneous materials</b> Properties and uses of acoustics materials, wall claddings, plaster boards, Micro-silica, artificial sand, bonding agents, adhesives etc.</p>	04	08
<b>02</b>	<p><b>Advanced Concreting Methods</b></p> <p><b>2.1 Prestressed Concrete</b> Grades of Concrete and prestressing cables for prestressed concrete. Methods of pre-tensioning and post tensioning. Equipments and accessories for prestressing. Precautions during prestressing of members.</p> <p><b>2.2 Under water Concreting</b> Underwater concreting for bridge piers and bored pile construction. Tremy method of underwater concreting. Procedure and equipments required for tremy method. Properties, workability and water cement ratio of the concrete required.</p> <p><b>2.3 Ready Mix concrete</b> Necessity and use of Ready Mix Concrete. Production and equipments for RMC. Ready Mix Concrete plant. Conveying of RMC. Transit mixers- working and time of transportation. Workability and water cement ratio for RMC. Strength of RMC.</p> <p><b>2.4 Tremix Concreting method</b> Definition, application of vacuum dewatering concreting. Equipments used in tremix concreting. Procedure of vacuum dewatering concreting ( Tremix).</p> <p><b>2.5 Special Concretes</b> Properties, uses and procedure of Roller compacted concrete. Properties and uses of High Impact Resisting concrete.</p> <p>Properties, uses and constituents of Steel fiber reinforced concrete. Percentage of steel fibers in SFRC. Effect of size, aspect ratio and percentage of steel fibers on strength of concrete.</p>	11	24

03	<p><b>Advanced Construction Methods.</b></p> <p><b>3.1 Formwork</b> Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms.</p> <p><b>3.2 Construction of Multistoried Buildings</b> Use of lifts, belt conveyors, Pumped concrete, Equipments and machinery required for construction of Multistoried Buildings. Precautions and safety measures.</p> <p><b>3.3 Prefabricated Construction</b> Meaning of prefabrication and precast. Methods of prefabrication- plant prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, wall panels, Jointing of structural members.</p> <p><b>3.4 Soil Reinforcing techniques</b> Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques.</p>	09	20
04	<p><b>Hoisting and Conveying Equipments</b></p> <p><b>4.1 Hoisting Equipments</b> Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks.</p> <p><b>4.2 Conveying Equipments</b> Working of belt conveyors. Types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.</p>	06	12
05	<p><b>Earth Moving machinery</b></p> <p><b>5.1 Excavation Equipments</b> Use, Working and output of bulldozers, scrapers, graders, and power shovels, JCB, draglines.</p> <p><b>5.2 Compacting Equipments</b> Use of rollers, Roller types- Plain rollers, Sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working.</p>	06	12
06	<p><b>Concreting Equipments</b></p> <p><b>6.1 Concrete Mixers</b> Types of concrete mixers. Weigh batching equipments, Equipments for transportation of concrete- trollies, lifts. Transit mixers, Concrete vibrator- Needle vibrators, Screed vibrators. Automatic concrete plants – layout, process and working.</p> <p><b>6.2 Stone Crushers</b> Types of stone crushers, capacities and working. Equipments for production of artificial sand.</p>	08	16



<b>07</b>	<b>Miscellaneous Equipments and Equipment management</b> <b>7.1 Miscellaneous Equipments</b> Pile driving equipment, Pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver. Grouting equipments, Floor polishing machine.	04	08
	<b>7.2 Equipment Management</b> Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment. Preventive maintenance of equipment, Break down maintenance of equipments.		
<b>Total</b>		<b>48</b>	<b>100</b>

**Practical:**

Skills to be developed:

**Intellectual Skills:**

1. know the new materials of construction.
2. get acquainted with advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

**List of Practical:**

1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
2. Writing report on Tremie method of concreting for piles/ Bridge piers.
3. Finding effect of size of fibers and aspect ratio (l/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
5. Writing a report on method of preparation and conveyance of ready mix concrete.
6. Writing a report on working and output of any three earth moving machinery.
7. Observing at site/ Video/ LCD demonstration of bitumen paver and writing report of the process and equipments observed.
8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two-storied framed structured residential building.

**Learning Resources:**

**Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
1	R. Chudly	Construction Technology Vol. I to IV	ELBS- Longman Group
2	R.L. Peurifoy	Construction Planning equipment and methods	McGraw-Hill Co. Ltd.
3.	S. Seetharaman	Construction Engineering and management	Umesh Publication, New Delhi.
4	B. Sengupta and Guha	Construction management and Planning	Tata McGraw Hill
5	M. L. Gambhir	Concrete Technology( Third Edition)	Tata McGraw Hill
6	R. C. Smith	Materials of construction	McGraw-Hill Co. Ltd.
7	TTTI Madras	Building Technology and valuation	TTTI Madras
8	R. Satyanarayana and S. C. Saxena	Construction Planning and Equipment	Standard Publication New Delhi
9	TTTI Chandigarh	Civil Engineering materials	TTTI Chandigarh
10	S. C. Rangawala	Construction of structures and Management of Works	Charotar Publication
11	D.N. Ghose	Construction Materials	Tata McGraw-Hill
12	Mantri Construction	A to Z of Building Construction	Mantri Publication

**Handbooks:**

<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
01	PWD Handbooks for -Materials - Foundation - Construction equipments	Govt. of Maharashtra	Govt. of Maharashtra
02	Practical Civil Engineering Handbook	Khanna Publication	Khanna Publication

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**

**COURSE CODE : CE/CS/CV**

**SEMESTER : SIXTH FOR CE/CS AND SEVENTH FOR CV**

**SUBJECT TITLE : ARCHITECTURAL PRACTICES & INTERIOR DESIGN**

**(ELECTIVE)**

**SUBJECT CODE : 12225**

**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 SBTE.**
- **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:**

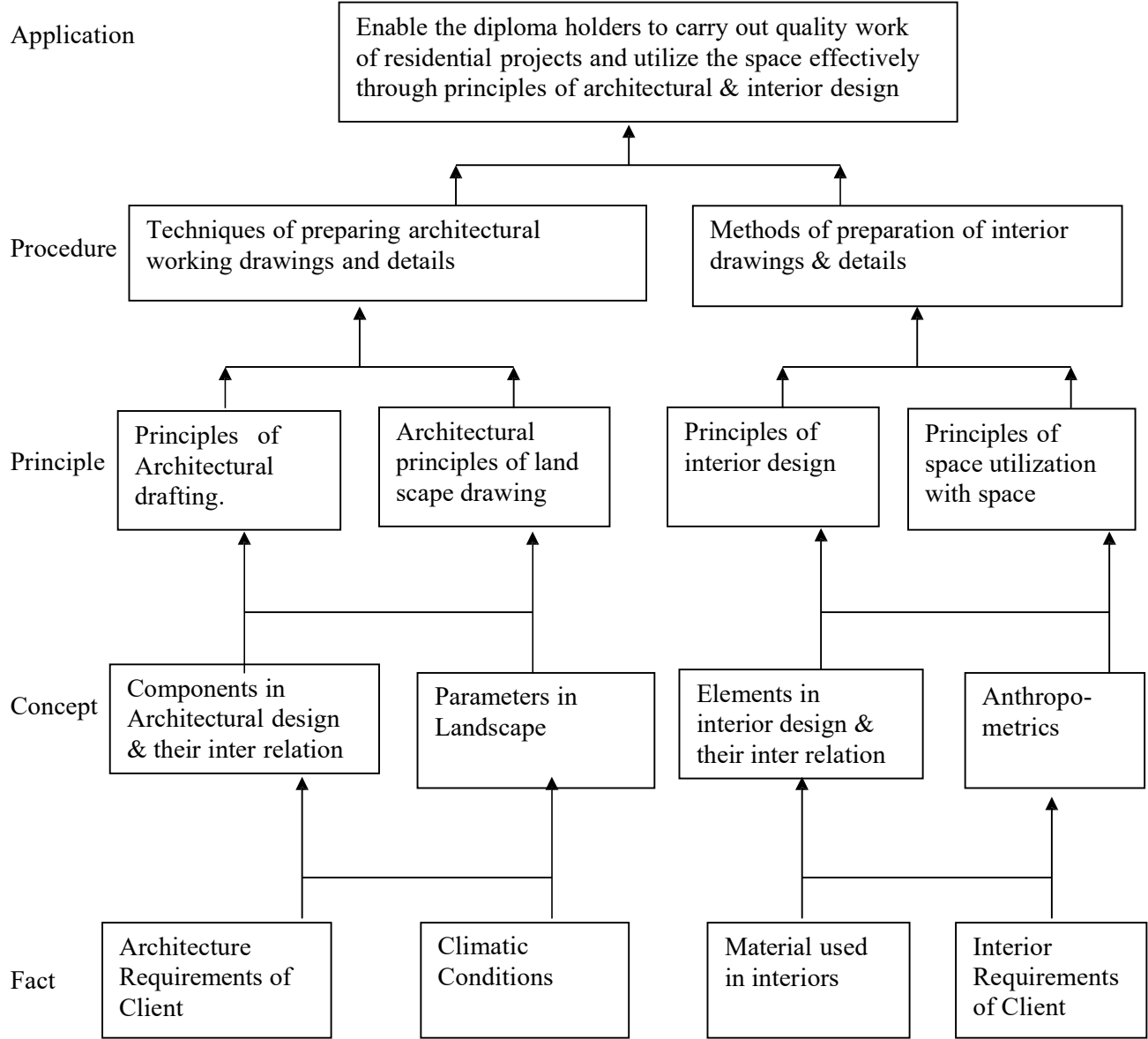
The Civil Engineering technicians are to work under certain architectural firms and interior decorators. Hence he/she should be able to draw working drawings and supervise the building works effectively. He/She should be able to utilize the space effectively by using the principles of interior design. He/She should be able to prepare innovative and economic plans considering the functional utility as per the requirements of the customer.

He/She should be able to prepare required interior drawings for presentation to customers.

**Objectives:** The students will be able to:

1. Use the basic architecture principles for working drawings.
2. Prepare working drawings of buildings.
3. Design landscape for a institutional / commercial campus.
4. Use the basic principles of interior design for drawing interior plans.
5. Prepare innovative sketch plans for presentation to customer as per requirements.
6. Design interior for a commercial buildings or Flats.

**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Architectural Design:</b> 1.1 Basic knowledge of Architecture. 1.2 Feeling for aesthetics and utility, mass composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern. 1.3 Building by laws & its applications.	04	04
02	<b>Design of Projects:</b> 2.1 Architectural Symbol, Scale and its Importance 2.2 A case study of residential building. 2.3 A case study of public / commercial building. 2.4 Aspect of working drawing – plan, elevation, section, Site Plan, Schedule of Openings, Area Calculation, F.S.I.	14	40
03	<b>Landscaping:</b> 3.1 Basic Principle of landscaping. 3.2 Soft and Hard landscaping. 3.3 Elements Of Landscaping 3.4 A case study of Indoor landscaping for public/ commercial / Residential building campus	04	06
04	<b>Elements and principles of design.</b> 4.1 Elements such as form, texture, light, colour, effect of light on colour and texture, space organization of space in design, space pattern. 4.2 Importance of colour as art element. Various colour scheme. Anthropometrics Data: 4.3 Relation of human measurement to furniture and movement and to circulation patterns.	08	08
05	<b>Interior Materials:</b> 5.1 Different interior materials, paneling, partitions, finishing materials, furniture, False ceiling, flooring, paints.	04	06
06	<b>Interior of Residential and small commercial building:</b> 6.1 Use of space, circulation, standard size of furniture. 6.2 Draw Plans and elevation of interior with furniture for Living, Kitchen, Dining, Bed room, Guest room etc. 6.3 Planning of interior for small commercial units such as Offices, Consulting chambers, shops etc. 6.4 Draw Furniture details such as Executive table, Architectures table etc. used in commercial units.	14	36
<b>Total</b>		<b>48</b>	<b>100</b>

**Term Work: (Any Three)**

1. Prepare working drawing – plans, elevation sections, Site Plan, Schedule of Openings, Area statement, Calculation of FSI with scale 1:50 of a given Line Plan.
2. Prepare innovative plans, elevations, sections, with scale 1:50 showing details of components such as Doors, Windows, Stairway, Grill, Gates, Kitchen otta etc. (Minimum **Three** Component Drawings.)

3. Prepare interior plan for 2 BHK residential bungalow / flat.
4. Prepare interior plan of any one commercial unit such as office, bank, restaurant, shop etc.
5. Prepare a report of market survey for different materials required for interiors.

**Learning Resources:**

**Books:**

Sr. No.	Author	Title	Publisher
01	M. G. Shah, C.M. Kale / S.Y. Patki	Building construction	Tata McGraw Hill
02	Joseph De Chiara, Julins Panch, martin Zelnik	Time saver standard for interior design & space planning	Tata McGraw Hill
03	Albert O. Halse	The use of colours in interiors	Tata McGraw Hill
04	Bousmaha Baiche & Nicholes Willium	Nwtert – Architects	Black Well Science

**A. IS/International codes** – National building codes.

**B. Journals / Periodicals:**

1. Inside-Outside
2. A + D Journal on architecture.
3. Indian Architects and builders.
4. Design & Interiors.

**C. Software:**

1. Auto CAD
2. 3 D Home

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**

**COURSE CODE : CE/CS/CR/CV**

**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV SUBJECT**

**TITLE : MAINTENANCE & REHABILITATION OF STRUCTURE**

**(ELECTIVE)**

**SUBJECT CODE : 12224**

**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 SBTE.**
- **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:**

For maintenance and retrofitting a rational and technical base is essential instead of leaving it to experience of masons. The secondary importance to maintenance has caused less development of retrofitting technology.

The natural hazards lead to unfit the existing structures for their use by weakening the strength of members. Detailed investigation of failure pattern, evaluating strength of existing structures decides the remedial approach and techniques.

Strengthening of building for sustaining future earthquake and hazards prolongs the life, use and economic of structures.

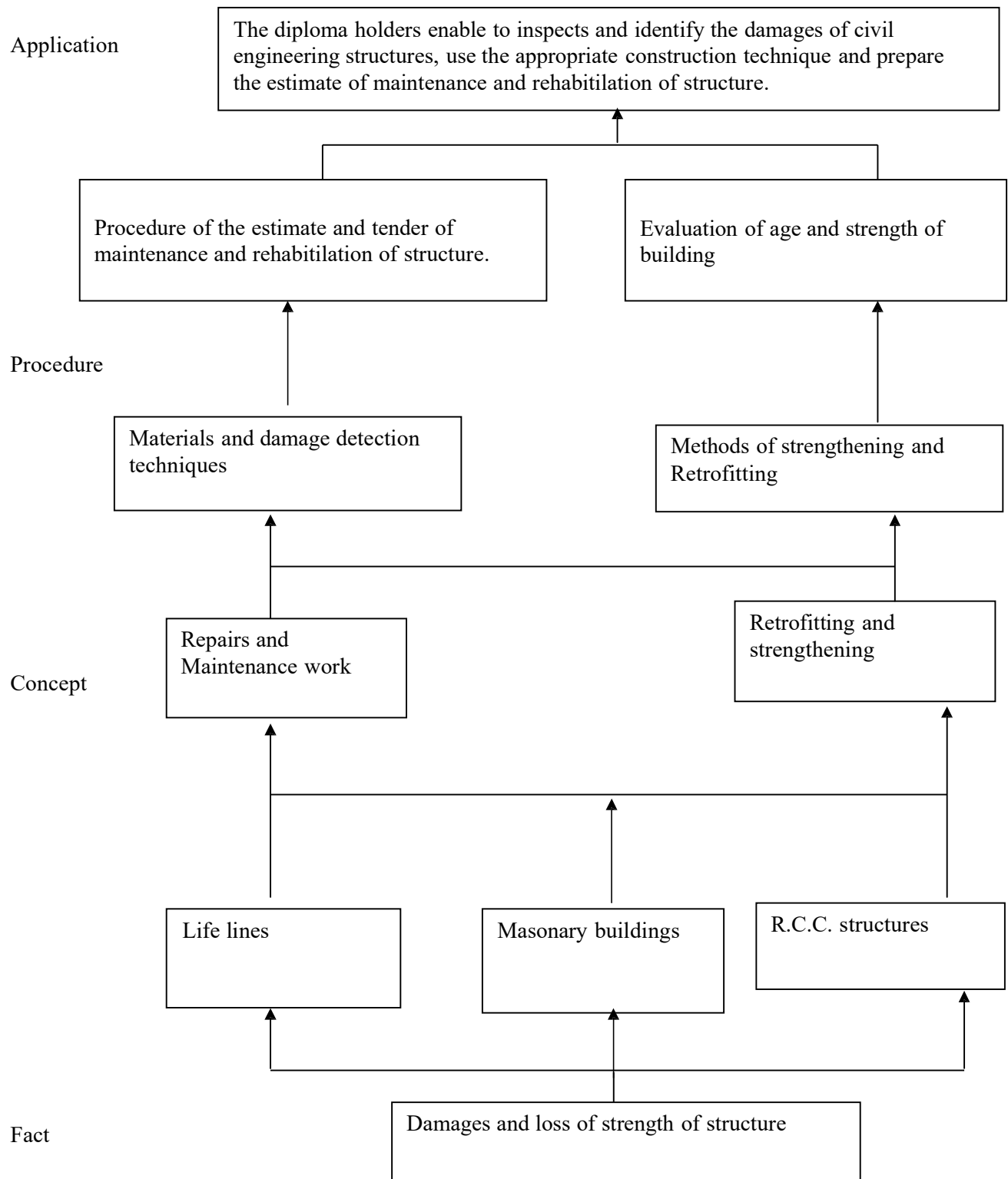
If the cost of maintenance and restoration happens to be intolerable then one has to obsolete the maintenance. Thus the estimate and preparation of tenders requires special attention.

**Objectives:**

Student will be able to

1. Distinguish between different types of causes of damage.
2. Decide the appropriate technique according to failure.
3. Identify causes of failure of masonry building & its retrofitting.
4. List causes of failure of R.C.C. building, its retrofitting.
5. Find the strength, age of building & maintenance of life lines.
6. Prepare estimates & tenders for structure damage due to hazards.

### Learning Structure





**Contents: Theory**

<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Introduction</b> 1.1 Necessity, operation, maintenance & repairs of structures 1.2 Classification of maintenance, 1.3 Rehabilitation (restoration), strengthening, retrofitting. 1.4 Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.	04	08
02	<b>Causes &amp; detection of damages:</b> 2.1 Causes of damages, damages due to earthquakes, fire hazards, flood, hazards, dilapidation, 2.2 List of basic equipments for investigation.	06	12
03	<b>Materials for repairs:</b> 3.1 Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting, cement mortar, 3.2 Shot-creting 3.3 Mechanical anchors.	02	06
04	<b>Masonry walls:</b> 4.1 Damp walls, causes effects, remedies, eradication of efflorescence 4.2 cracks in walls, remedial & preventive measures bond between old & new brick work, reinforced brickwork.	04	08
05	<b>Repairs to foundation:</b> 5.1 Remedies, types & processes of settlement, foundation sinking 5.2 Examination of existing foundation, strengthening of foundation.	04	08
06	<b>Water proofing:</b> 6.1 Leaking Basements & roofs	02	04
07	<b>Concept of repairs &amp; strengthening of RCC structures:</b> 7.1 Concept of repairs of RCC structures 7.2 Physical examination of common defects, 7.3 Structural repairs & strengthening repairs by new developments.	02	06
08	<b>Damage due to fire:</b> 8.1 Fire resistance, effects of temp. of RCC, 8.2 Repairs to RCC structures damaged due to fire	04	08
09	<b>Advanced Damage detection techniques:</b> 9.1 Advanced damage detection techniques, non-destructive testing.	04	08
10	<b>Strength ening methods:</b> 10.1 Cantilevers, beams, slabs, walls, columns, foundation.	08	12
11	<b>Evaluation of strength, economic &amp; age of building:</b> 11.1 Determination of approx. age of a building. 11.2 Determination of strength of structural member of old building.	02	06

	11.3 Finding cost in use of a existing building.		
12	<b>Maintenance of life lines:</b> 12.1 Maintenance of electric supply, water supply leaking pipe joints and sewerage systems, closed drains, sewers. 12.2 Maintenance of roads, road berms, side drain maintenance of bridges, culverts causeways	04	08
13	<b>Estimates and tendering:</b> 13.1 Estimates of annual repairs, special repairs and maintenance work. 13.2 Preparation of tender	02	06
<b>Total</b>		<b>48</b>	<b>100</b>

**Assignments:**

1. Inspection of any historical building which has limitations for alternation, finding damages, classifying minor & special repairs, decide suitable method of retrofitting, estimating cost of retrofitting.
2. Finding the approximate. Strength of structural members in a existing building like beams, columns, slabs, calculating additional reinforcement & necessary improvement in section, estimating cost of strengthening.
3. Prepare estimate of retrofitting of plumbing of a building.
4. Determine approximate age and economics of an old house.
5. Determine load carrying capacity of a slab, beam, column by using rebound hammer.

**Learning Resources:****Books:**

Sr. No.	Author	Title	Publisher
01	P.K. Guha	Maintenance and Repairs of Buildings	New Central book Agencies
02	Nayak B. S.	Maintenance Engineering For Civil Engineers	Khanna Publication
03	Hutchin Son, BD	Maintenance and Repairs of Buildings	Newnes –Butterworth.
04	Ransom W. H.	Building Failures – Diagnosis and Avoidance	E and F. N. Span.
05	P.S.Gahlot, Sanjay Sharma	Building Repair and maintenance management	CBS Publishers and Distributors, N. Delhi

**COURSE NAME : DIPLOMA IN CIVIL ENGINEERING**

**COURSE CODE : CE/CS/CR/CV**

**SEMESTER : SIXTH FOR CE/CS/CR AND SEVENTH FOR CV**

**SUBJECT TITLE : PLUMBING SERVICES (ELECTIVE)**

**SUBJECT CODE : 12999**

**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 SBTE.**
- **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:**

A properly structured course in plumbing is not available in India. Plumbing, though crucial, has so far remained as neglected subject. As a result, there is a great demand to the well trained plumbing professionals in the building industry.

As the buildings are becoming more complex and more and more modern plumbing materials and systems are available in India, it is necessary to include the same in the Civil Engineering curriculum.

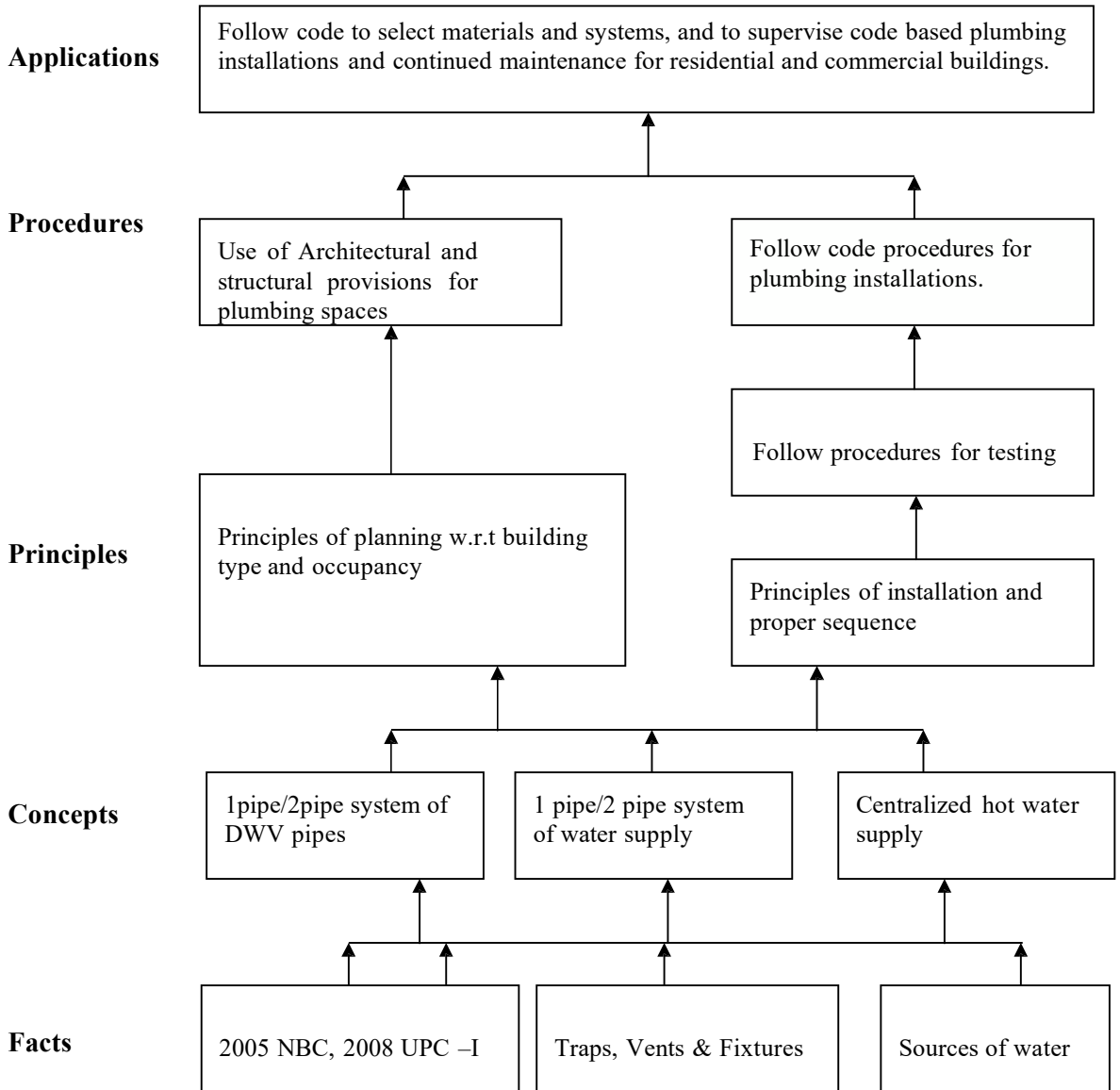
Indian Plumbing Association (IPA) had adopted, reviewed and revised the Uniform Plumbing Code of International Association of Plumbing and Mechanical Officials to suit Indian practices, customs and laws. The code is published as 'Uniform Plumbing Code – India' (UPC-I).

Students who opt for code based education and training in plumbing will have better job opportunities and improved income. The formal education in plumbing will improve the plumbing system design and installation standards, thereby, ensuring health and safety of people and structures.

**Objectives:** The students will be able to:

- a. Coordinate plumbing works with architects and structural engineers.
- b. Select proper plumbing materials and systems.
- c. Read and interpret plumbing drawings.
- d. Supervise code based plumbing installations.
- e. Understand methods to conserve water and energy.
- f. Follow safety at site.
- g. Follow dos and don'ts in plumbing.

**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Topic</b>	<b>Hours</b>	<b>Marks</b>
1	<p><b>Introduction to Codes, Architectural and Structural Coordination</b></p> <p><b>1.1</b> Model code, roles, scope, purpose and uses of codes and standards in the building industry, approvals, AHJ, general regulations, minimum standards, labeling, alternative materials, sewers required, damage to drainage system, improper location, workmanship, prohibited fittings and practices, engineered systems, water conservation, protection of pipes and structures, waterproofing, rat proofing.</p> <p><b>1.2</b> Architectural and structural coordination is the only topic outside of UPC-I Code and ITM. topics include architectural and structural provisions for plumbing systems, coordination required during the planning stage, various agencies involved and their roles, policy decisions, schematic alternatives, planning spaces for plumbing systems, water tanks, pump room, centralized hot water systems, toilet locations, toilet planning, plumbing shafts, basements and terraces planning. Structural parameters, sunken toilets, location of columns and beams, post-tension slabs, importance of ledge walls, water proofing. Local municipal laws, domestic and fire static water requirements, water sources, prohibited fittings and systems.</p>	06	12
2	<p><b>Plumbing Terminology</b></p> <p>Definitions, use/purpose of the following.</p> <p><b>2.1</b> Plumbing Fixtures: accessible/readily accessible, aerated fittings, AHJ, bathroom group, carrier, flood level rim, floor sink, flush meter valve, flush tanks, lavatories, macerating toilet, plumbing appliances, plumber.</p> <p><b>2.2</b> Traps, indirect waste, vent: blow off, developed length, dirty arm, FOG, indirect waste, receptors, slip joints, trap, and vent.</p> <p><b>2.3</b> Drainage: adapter fitting, adjusted rood area, AAV, air break, air gap, area drain, base, bell and spigot joint, building drain, branch, DFU, grease interceptor, joints, roof drain, smoke test, stack.</p> <p><b>2.4</b> Water supply: angle valve, anti-scald valve, backflow, bypass, check valve, cross connection, ferrule, gate valve, gray water, joints, PRV.</p>	06	16
3	<p><b>Plumbing Fixtures and Fixture Fittings</b></p> <p>Difference between plumbing fixtures, fittings and appliances, water conserving fixtures, water closets, bidets, urinals, flushing devices, lavatories, bath/shower, kitchen sinks, water coolers, drinking fountain, clothes washer, mop sink, overflows, strainers, prohibited fixtures, installation standards, strainers, floor drains, floor slopes, location of valves, and hot water temperature, installation standard dimensions in plan and elevation.</p>	06	12

4	<p><b>Traps, Interceptors, Indirect Waste and Vents</b></p> <p><b>4.1</b> Traps required, trap arms, developed length, trap seals, venting to traps, trap primers, prohibited traps, building traps.</p> <p><b>4.2</b> Two forms of discharge for indirect waste piping, nature of contents or systems, proper methods to install indirect waste piping, air gap and air break, sink traps, dish washers, drinking fountains, waste receptors, sterile equipment, appliances, condensers, point of discharge, venting.</p> <p><b>4.3</b> Vent requirement, purpose of venting, trap seal protection, materials, vent connections, flood rim level, termination, vent stacks, water curtain and hydraulic jump, cleanouts, venting of interceptors, introduction to vent sizing.</p>	10	20
5	<p><b>Sanitary Drainage and Storm Drain</b></p> <p><b>5.1</b> Preamble on single and two pipe systems, different pipe materials and jointing methods, special joints, hangers and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below invert level, suds relief, testing, building sewers, trenching, testing, sumps and pumps, introduction to dfu and sizing of horizontal and vertical pipes.</p> <p><b>5.2</b> Storm drain required, prohibited connections, subsoil drains, sub-drains, gutters/channels/scuppers, roof drains, strainers, leaders, conductors and connections, collect/capture storm water, discharging storm water, safety, traps required, prohibited installations.</p>	10	20
6	<p><b>Water Supply, Gray and Reclaimed Water</b></p> <p><b>6.1</b> Preamble on municipal water, sources of water, potable and non-potable water, reclaimed water, water storage, hot and cold water distribution system, backflow prevention, air gap, cross connection control, pipe materials and jointing methods, alternative materials, hangers and supports, workmanship, prohibited fittings and practices, protection of pipes and structures, pressure controls, unions, thermal expansion, types of valves, installation and testing, disinfection, protection of underground pipes, color codes and arrow marking, introduction to wsfu.</p> <p><b>6.2</b> Definition of gray water, approvals, specifications and drawings, safety, total gray water discharge, holding tanks, valves and piping, reclaimed water systems, definition of reclaimed water, pipe identification, installation, safety signs, valves, cross connection, approved uses.</p>	10	20
<b>Total</b>		<b>48</b>	<b>100</b>

**Practical:**

**List of Assignments:**

1	Draw sketches of installation details of plumbing fixtures and fittings in plan, elevation, and section; with standard dimensions and heights (minimum 4).
2	Interpretation of sample plumbing drawings for a multistoried building.
3	Draw toilet layouts, plans, elevations and sections of a selected case for study. Give dimensions.
4	Seminar: Based on the topics covered so far, students can select any topic; refer to codes, text books, professional magazines, technical papers published and websites of manufacturers and make a seminar presentation in 10 minutes using power point. Students can work in a group of two. Weight age is assigned for both, the contents as well as presentation skill.
5	Prepare layout of internal and external (outside the toilet) DWV pipes and fittings of a selected case for study. If possible, write pipe diameters.
6	Site visit report: Visit any plumbing site and submit a report on observations on plumbing system, architectural and structural provisions, pipe materials, work methods, reporting, safety and recommendations based on the provisions of UPC-I and ITM.

**Learning Resources:**

- f* 2008 Uniform Plumbing Code – India (UPC-I) and
- f* 2008 Illustrated Training Manual (ITM)
- f* Extracts thereof subject to approval in writing by IAPMO India
- f* Students’ reference material.

**COURSE NAME : DIPLOMA IN CIVIL & RURAL ENGINEERING**

**COURSE CODE : CR**

**SEMESTER : SIXTH**

**SUBJECT TITLE : MICRO IRRIGATION (ELECTIVE)**

**SUBJECT CODE : 12226**

**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 SBTE.**
- **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:**

The population explosion has put tremendous pressure on the natural resources, such as land and water. Majority of the areas in the country are facing acute problem of water scarcity. Traditional methods of irrigation means wastage of precious water and it creates other problems too.

Micro Irrigations is a method of irrigation, in which water is applied over a long period of time at frequent intervals either by spraying or directly into the plants root zone. It saves water, doubles the area under irrigation with the same quantity of water, improves yield and quantity as well as saves on labor, energy and crop protection cost. It is a total plant support system and a management tool, which rewards good design and reduced cost and premium quality.

After the study of irrigation Engineering and Hydraulics, the subject plays and important role for engineering students to analyse and design various micro irrigation systems for optimum use of irrigation water and increase the irrigation efficiency.

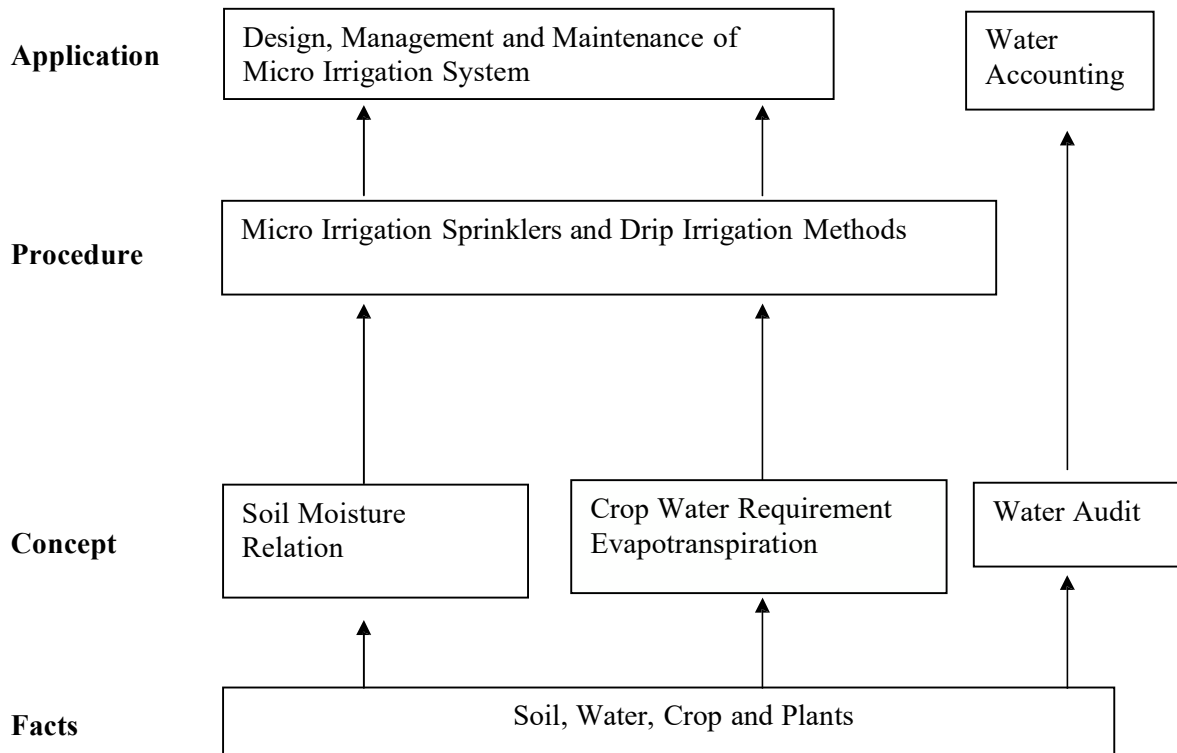
**Objectives:**

The student will be able to:

1. Find out consumptive use of water.
2. Suggest suitable micro irrigation system for a farm.
3. Give Layout of micro irrigation system.
4. Design micro irrigation system.
5. Supervise functioning of micro irrigation system.
6. Maintain micro irrigation system



**Learning Structure:**



**Contents: Theory**

<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
<b>1.</b>	<b>Introduction:</b> 1.1 Definition of micro irrigation 1.2 Necessity of micro irrigation, 1.3 Advantages of micro irrigation system, 1.4 Difficulties in micro irrigation. 1.5 Comparison between micro and other methods of irrigation.	02	04
<b>2.</b>	<b>Soil– Plant-Water-Relation:</b> 2.1 Soil moisture relation, Hygroscopic water, Field capacity water, Gravitational water, Field capacity, Permanent wilting point, Available moisture, Readily available moisture, Soil moisture deficiency, Equivalent moisture. 2.2 Definition of irrigation frequency. Estimating depth and frequency of irrigation on the basis of soil moisture regime concept, Simple problems. 2.3 Optimum utilization of irrigation water, Definition of irrigation efficiencies. 2.4 Evapotranspiration and/or Consumptive use of water, Methods of finding evapotranspiration by Pan Evaporimeter and Modified Penman method. (No Problems) 2.5 Water audit , Concept of water audit , Necessity of water audit, Benefits of water audit	10	20
<b>3.</b>	<b>Methods of Micro Irrigation:</b> 3.1 Sprinkler and Drip irrigation. 3.2 Benefits and limitations of sprinkler and drip irrigation systems. 3.3 Comparison between sprinkler irrigation and drip irrigation system. 3.4 Layout of sprinkler irrigation system and drip irrigation system.	06	12
<b>4.</b>	<b>Design of Sprinkler Irrigation System:</b> 4.1 Design of main, sub-main, lateral and sprinkler 4.2 Hazen-William Equation for frictional losses 4.3 Types of sprinklers and selection 4.4 Design and selection of micro sprinkler Irrigation systems.	12	24
<b>5.</b>	<b>Design of Drip Irrigation System:</b> 5.1 Design of main, Submain, Lateral and Drippers 5.2 Types of drippers and selection 5.3 Design and selection of micro jet 5.4 Selection of Pumps 5.5 Installation and maintenance of drip irrigation system	12	24
<b>6.</b>	<b>Fertigation And Filtrations:</b> 6.1 Advantage and limitations of Fertigation 6.2 Methods for Fertilizer injection 6.3 Filtration – Particle size, Selection of filter, Filtration	06	16

	methods 6.4 Methods of cleaning filters. 6.5 Filters and their types.		
<b>Total</b>		<b>48</b>	<b>100</b>

**Assignments:**

- 1) Report writing on visit to farm with sprinkler irrigation system and preparing layout plan and neat-labeled sketches.
- 2) Report writing on visit to farm with drip irrigation system and preparing layout plan and neat-labeled sketches.
- 3) Design of sprinkler irrigation system for given farm with cost estimation.
- 4) Design of drip irrigation system for a given fruit garden farm with cost estimation.

**Learning Resources:**

**Books:**

Sr. No.	Author	Title	Publisher
01	A.M.Michael	Irrigation Theory and Practice	Vikas Publisher House, New Delhi.
02	--	Sprinkler Irrigation	WALMI Aurangabad.
03	--	Drip Irrigation	WALMI Aurangabad.
04	Dr.M.S.Mane, B.L.Ayare Dr.S.S.Magar	Principle of Drip Irrigation	Jain Brothers New Delhi.
05	R.K.Sivanappan	Sprinkler Irrigation	Oxford & I B Publishing New Delhi.

**Video Cassettes and CDs:**

1. Estimation of reference crop.
2. Evapotranspiration by Modified Penman Method including analysis of weather data  
- WALMI Aurangabad.

**COURSE NAME : DIPLOMA IN CIVIL & RURAL ENGINEERING**

**COURSE CODE : CR**

**SEMESTER : SIXTH**

**SUBJECT TITLE : WATERSHED MANAGEMENT (ELECTIVE)**

**SUBJECT CODE : 12227**

**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 SBTE.**
- **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:**

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 be enhance erosion. If instead it can be captured allowed percolation time, it can deplete reservoir and half 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 Maharashtra. It aims at actual identifying ideal water harvesting and soil conservation structure situated to a particular topography.

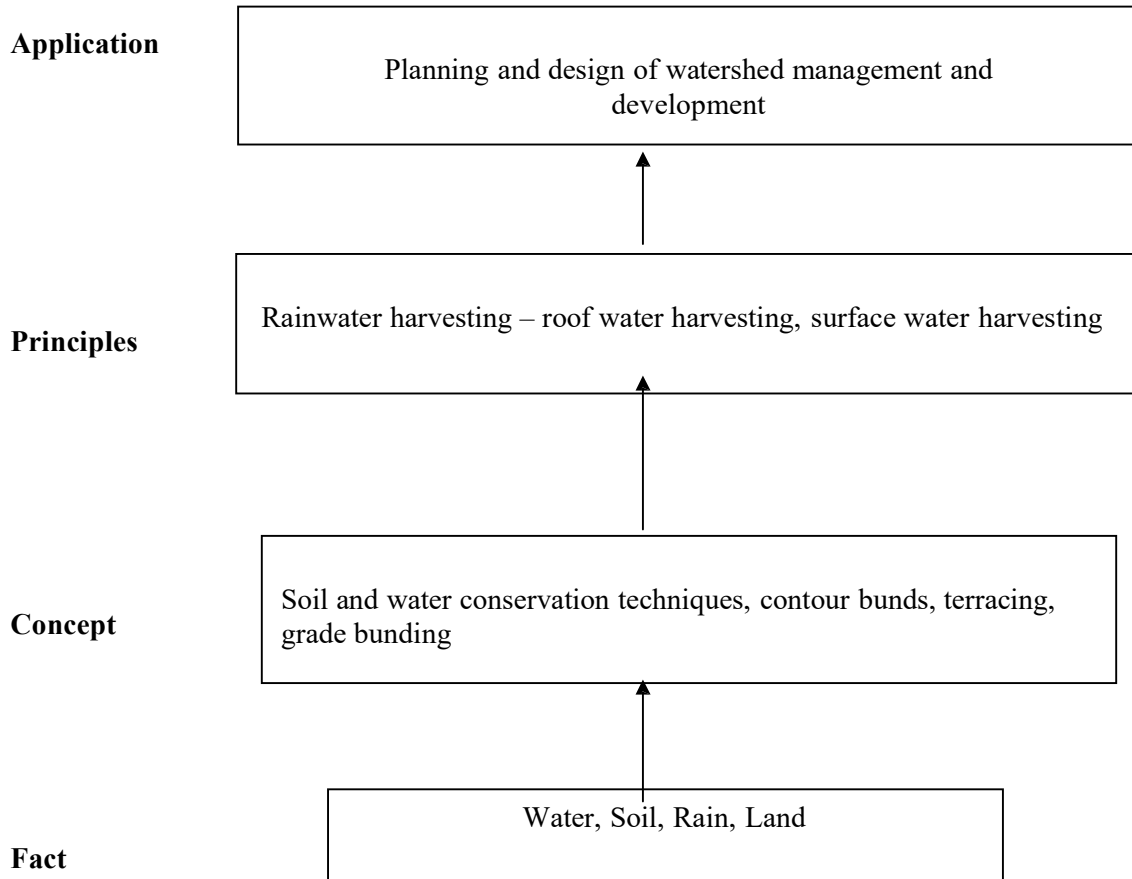
The input to the subject is the knowledge of Survey and Geotechnic engineering which helps in deciding the stability of topography and soil for successful implementation of watershed, hydrology for parameter associated with rainfall and runoff.

**Objectives:**

The students will be able to:

1. Apply integrated approach to watershed.
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:**



**Contents: Theory**

Chapter	Name of the Topic	Hours	Marks
01	<b>Introduction:</b> 1.1 Definition of watershed, concept of watershed, definition of watershed management, need of watershed management 1.2 Characteristics of watershed, objectives of watershed management, benefits of watershed development 1.3 Causes and effects of degradation 1.4 Integrated multidisciplinary approach for watershed, steps in watershed management. 1.5 Ill effects of urbanisation on watershed management	06	12
02	<b>Soil and Water Conservation:</b> 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. 2.9 Control of gullies and their reclamation for various land use	14	28
03	<b>Water Harvesting:</b> 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 deccan plateau-cheruva, kohli tank, phad, kere, the ramtek model and bhandaras (short description with neat sketch). 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 Recharge structures – pit, trench, dug well, hand pump,	12	24

	recharge well, lateral shaft with borehole, percolation pit with borehole. Types of filters 3.4 Reuse of domestic water		
<b>04</b>	<b>Water Harvesting Structures:</b> 4.1 Types of watershed structures- such as small weir, banchara, K.T. weir, percolation tank, jalbandh, farm pond and check dam. 4.2 Details of watershed structure with neat sketch.	08	20
<b>05</b>	<b>Socio Economic Aspects:</b> 5.1 People's awareness, participation and response. 5.2 State and integrated approach. 5.3 Sustainable society for economical upliftment. 5.4 Economics.	08	16
<b>Total</b>		<b>48</b>	<b>100</b>

**Term work should contain Mini project on any one of the following:**

1. Rain Water Harvesting of a building.
2. Integrated water resource management of small area (e.g. college campus, small village etc.)
3. Preparation of complete water shed management plan for small area identified from toposheet
4. Case study of watershed management plan.

**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, Hyderabad- 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