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/CV

DURATION OF COURSE : 6 SEMESTERS   **WITH EFFECT FROM 2011-12**

SEMESTER : FOURTH   **DURATION: 16 WEEKS**

PATTERN : FULL TIME

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 (16004)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	Advance Surveying	ASU	12082	02	--	04	03	100	40	50#	20	--	--	25@	10	
2	Mechanics of Structures	MST	12083	03	-	02	03	100	40	--	--	--	--	25@	10	
3	Geo Technical Engineering	GTE	12084	03	--	02	03	100	40	--	--	--	--	25@	10	
4	Transportation Engineering	TEN	12085	04	--	--	03	100	40	--	--	--	--	--	--	50
5	Hydraulics	HUD	12086	03	01	02	03	100	40	--	--	25#	10	25@	10	
6	Computer Aided Drawing	CAD	12087	--	--	04	--	--	--	--	--	--	--	50@	20	
7	Professional Practices-IV	PPR	12088	--	--	05	--	--	--	--	--	--	--	50@	20	
			TOTAL	**15**	**01**	**19**	--	**500**	--	**50**	--	**25**	--	**200**	--	**50**

Student Contact Hours Per Week: **35 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 825**

@ Internal Assessment, # External Assessment,   No Theory Examination.

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 : Civil Engineering Group

Course Code : CE/CS/CR/CV

Semester   : Fourth

Subject Title : Advance Surveying

Subject Code : 12082

Teaching and Examination Scheme:

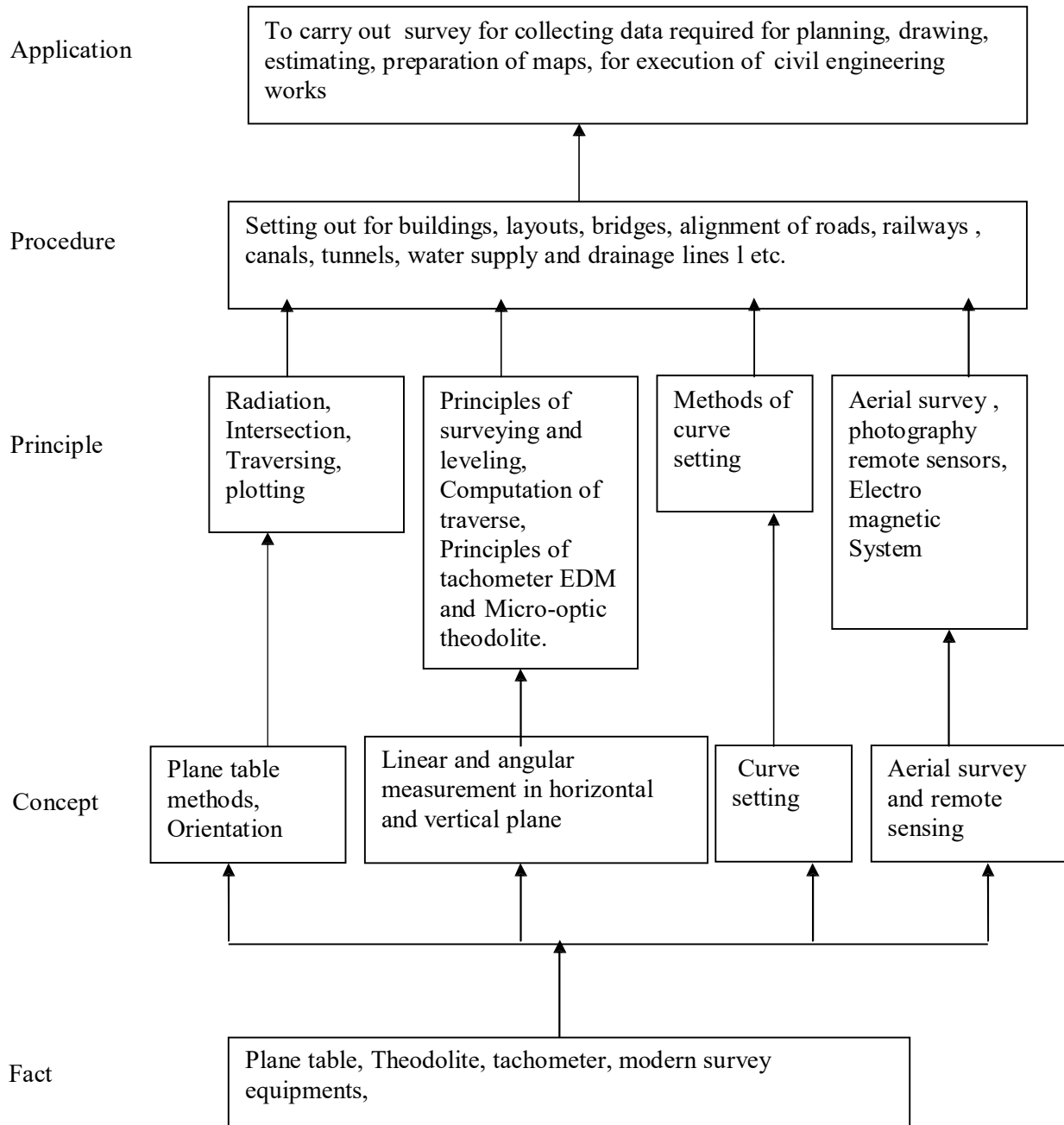| Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	04	03	100	50#	--	25@	175

Rationale:

   This is an applied technology Course Which is intended to teach Students application of facts, Concepts, Principles, and procedures in surveying and Levelling. It is also intended to teach students theodolite traversing and Modern Surveying equipments. With this knowledge and skill, He will be able to choose appropriate survey and levelling methods depending on requirement to carry out survey works for various civil engineering activities.

Objectives:

The Students will be able to:

1)   Use survey instruments like theodolite and plane table.
2)   Record the data in field book and plot the collected data.
3)   Find out horizontal and vertical distances with a tacheometer.
4)   Set out simple curve using Theodolite.
5)   Use of Modern Survey equipments - Micro Optic Theodolite and EDM.
6)   Apply principles of surveying and levelling for Civil Engineering works.

Learning Structure:

Application

> To carry out survey for collecting data required for planning, drawing, estimating, preparation of maps, for execution of civil engineering works

Procedure

> Setting out for buildings, layouts, bridges, alignment of roads, railways , canals, tunnels, water supply and drainage lines l etc.

Principle

> Radiation, Intersection, Traversing, plotting

> Principles of surveying and leveling, Computation of traverse, Principles of tachometer EDM and Micro-optic theodolite.

> Methods of curve setting

> Aerial survey , photography remote sensors, Electro magnetic System

Concept

> Plane table methods, Orientation

> Linear and angular measurement in horizontal and vertical plane

> Curve setting

> Aerial survey and remote sensing

Fact

> Plane table, Theodolite, tachometer, modern survey equipments,

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Plane Table Survey** 1.1 Principles of plane table survey. Accessories required Setting out of plane table , Leveling ,Centering and Orientation , Use of Telescopic Alidade 1.2 Methods of plane table surveying – Radiation, Intersection, and Traversing. 1.3 Merits and Demerits of plane table Surveying. situations where plane table survey is used.	05	14
02	**Theodolite Survey** 2.1 Components of Transit Theodolite and Their functions. Technical terms used. Temporary adjustments of Transit Theodolite. Swinging the telescope, Transiting, Changing the face. 2.2 Measurement of Horizontal angle, method of Repetition, errors eliminated by method of repetition. ,Method of Reiteration, Measurement of Deflection angle, Measurement of Vertical angle, Measurement of magnetic bearing of a line by Theodolite ,Prolonging a Straight line. 2.3 Sources of errors in Theodolite Surveying. Permanent adjustment of transit Theodolite (only relationship of different axes of Theodolite.). 2.4 Traversing with Theodolite – Method of included angles, locating details, checks in closed traverse, Calculation of bearings from angles. Traverse Computation - Latitude, Departure Consecutive Co-ordinates error of Closure, Distribution of a angular error, balancing the traverse by Bodwitch rule and Transit Rule, Gale's traverse table .simple problems on above topic.	10	30
03	**Tacheometric Survey** 3.1 Principle of Tacheometry,Essential requirements of Tacheometer. 3.2 Use of Theodolite as a Tacheometer with staff held in vertical and fixed hair method (No derivation). Determination of tacheometric constants, 3.3 Simple numerical problems on above topics.	05	16
04	**Curves** 4.1 Types of curves used in road and railway alignments.Notations of simple circular curve. Designation of curve by radius and degree of curves. 4.2 Method of Setting out curve by offset from Long chord method and Rankine's method of deflection angles.Simple Numerical problems on above topics.	05	14

05	**Advanced Survey Equipments** 5.1 Construction and use of one second Micro Optic Theodolite, Electronic Digital Theodolite. Features of Electronic Theodolite 5.2 Principle of E.D.M, Components of E.D.M and their functions, use of E.D.M. 5.3 Construction and Use of Total station 5.4 Construction and Use of Digital Level 5.5 Construction and Use of G.P.S.	**04**	**16**
06	**Aerial Survey and Remote sensing** 6.1 Aerial Survey Introductions, definition, Aerial photograph. 6.2 Remote Sensing – Introduction, Electro-Magnetic Energy , Remote sensing system- Passive system , Active system. Applications – mineral, land use / Land cover, Natural Hazards and Environmental engineering system.	**03**	**10**
	Total	**32**	**100**

Practical:
Skills to be developed:

Intellectual Skill:
1) Identify the components of plane table, theodolite, and advanced survey instruments.
2) Know the working principles of these survey instruments.
3) Finding the horizontal and vertical distances.
4) Identifying errors in setting out curve and tabulating elements of a curve.

Motor Skills:
1) Taking and recording the observation in the field book.
2) Preparing drawings, maps etc. with the observed data.
3) Setting out curve for the given alignment.
4) Use Micro optic thodolite, EDM for finding different parameters.

Instructions:-
1) Group size for Practical work should be limited to maximum 6 Students.
2) Each student from the group should handle the instrument to understand the function of different components and use of the instrument.
3) Drawing, plotting should be considered as part of practical.
4) One full day per project is required for carrying out project work, which is to be plotted on a drawing sheet.
5) **Term work** should consist of record of all practicals and projects, in Field Book and drawing sheets for the given projects.

List Of Practical: (Minimum 12 practical from list given below)
1) Using accessories carry out temporary adjustments of plane table. Locating details by method of Radiation.
2) Locating details with plane table by method of intersection.

3) Understanding the components of Theodolite and their functions, reading the vernier and temporary adjustments of theodolite.
4) Measurement of Horizontal angle by transit theodolite.
5) Measurement of Horizontal angle by method of Repetition.
6) Measurement of vertical angles by theodolite.
7) Measurement of Magnetic bearing of a line using theodolite.
8) Measurement of deflection angle by taking open traverse of 4 –5 sides.
9) To find reduced levels and horizontal distances using theodolite as a Tacheometer.
10) To find constants of a given Tacheometer.
11) Study and use of One Second Micro Optic Theodolite for measurement of Horizontal and Vertical angles
12) Study of Total Station for knowing its components.
13) Use of Total Station for finding horizontal and vertical distances and reduced levels.
14) Setting out simple circular curve by Rankine's method of Deflection angles / Long Chord method for a given problem.

List of Projects:
1) Plane table survey project for 5-6 sided traverse and locating details of buildings, Roads etc. by radiation and Intersection method , Sheet to be drawn by each student separately on A-1 size imperial drawing sheet.
2) Theodolite traverse Survey for a closed traverse of 5-6 sides for a small area. Computation by Gale's traverse table. Plotting the traverse with details on A1 size imperial drawing sheet

Learning Resources:

Books:

Sr. No.	Title	Author	Publisher
01	Surveying and Levelling	N N Basak	Tata Mc Graw-Hill
02	Surveying and Levelling Part I and II	T .P. Kanetkar & S. V, Kulkarni	Pune Vidhyarthi Griha Prakashan
03	Surveying and Levelling Vol. I and II	Dr. B. C. Punmiya	Laxmi Publication
04	Text book of Surveying	S.K.Husain, M.S. Nagaraj	S. Chand and company
05	Surveying and Levelling Vol. I and II	S. K. Duggal	TATA MC GRAW-HILL

Course Name : **Civil Engineering Group.**

Course Code : **CE/CS/CR/CV**

Semester : **Fourth**

Subject Title : **Mechanics of Structures**

Subject Code : **12083**

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)
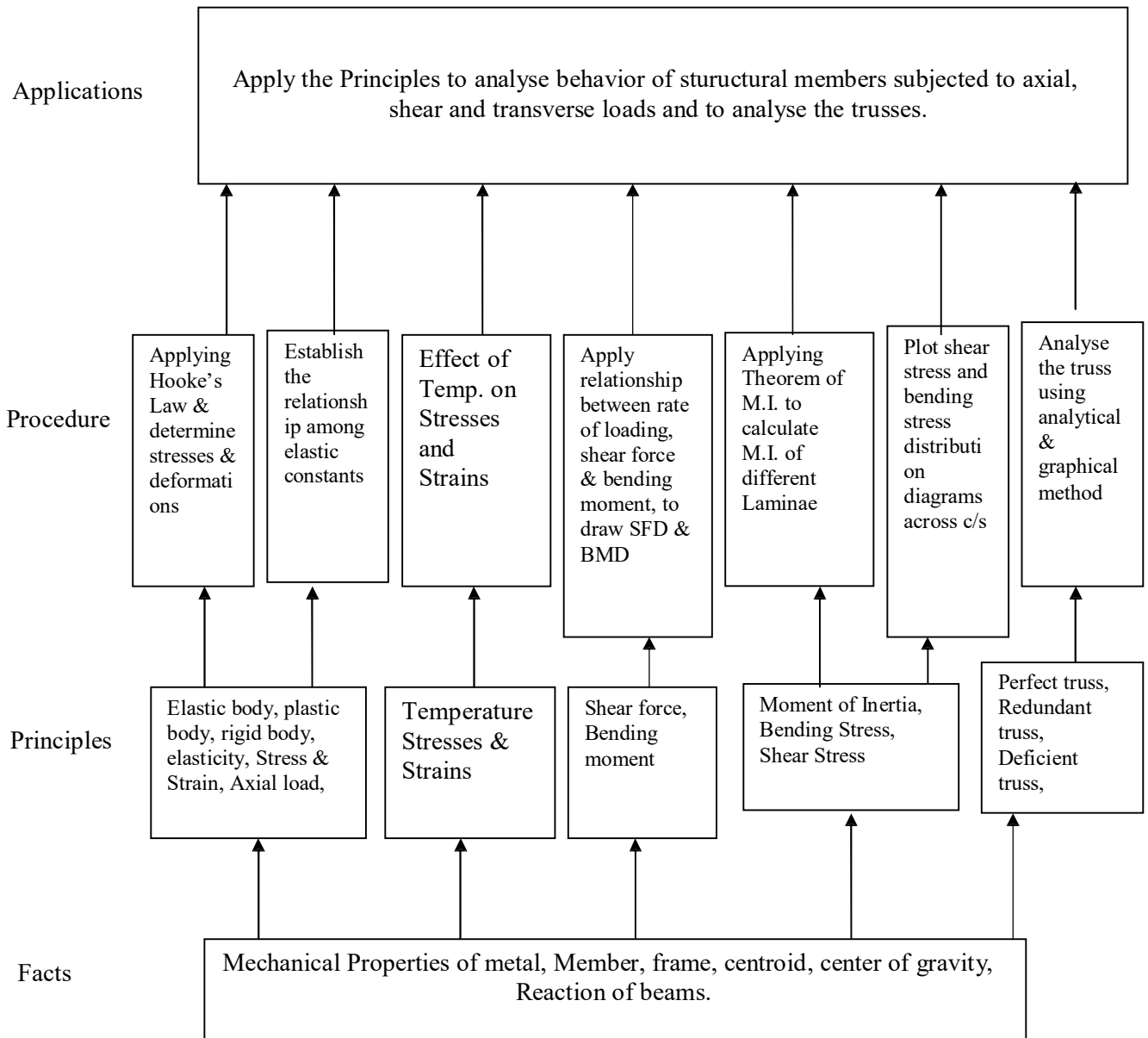
Rationale:

There are different types of structure depending upon type of materials like concrete steel, wood etc. They are subjected to various types of loading such as axial load, shear load, transverse load etc. This subject helps the student to analyze the internal behavior of structural members under different types of loading and to analyze trusses by using analytical and graphical method. The knowledge gained in this subject is helpful to study then subject Theory of Structure.

Objectives:

The students will be able to:

1. Calculate stresses in simple and composite sections.
2. Calculate deformations of the specimen subjected to uni-axial, bi-axial & tri-axial stress system.
3. Analyse the truss by using different methods.
4. Draw shear force and bending moment diagrams.
5. Calculate moment of Inertia of standard plane section & their composites
6. Calculate shear stress & bending stress in beam cross section.
7. Calculate strain energy for different types of loading.

LEARNING STRUCTURE:

Applications

Apply the Principles to analyse behavior of sturctural members subjected to axial, shear and transverse loads and to analyse the trusses.

Procedure

| Applying Hooke's Law & determine stresses & deformations | Establish the relationship among elastic constants | Effect of Temp. on Stresses and Strains | Apply relationship between rate of loading, shear force & bending moment, to draw SFD & BMD | Applying Theorem of M.I. to calculate M.I. of different Laminae | Plot shear stress and bending stress distribution diagrams across c/s | Analyse the truss using analytical & graphical method |

Principles

| Elastic body, plastic body, rigid body, elasticity, Stress & Strain, Axial load, | Temperature Stresses & Strains | Shear force, Bending moment | Moment of Inertia, Bending Stress, Shear Stress | Perfect truss, Redundant truss, Deficient truss, |

Facts

Mechanical Properties of metal, Member, frame, centroid, center of gravity, Reaction of beams.

Contents: Theory

Chapter	Name of the topics	Hours	Marks
01	**Stress & Strain** 1.1 Definition of rigid body, plastic body, mechanical properties of metal such as elasticity & elastic limit. 1.2 Definition of stress, strain, modulus of elasticity, S. I. Unit. Classification of stress, strain, Sign convention. Stress, strain curve for mild steel and HYSD bar , yield stress/ proof stress, Ultimate stress, breaking stress and percentage elongation. 1.3 Deformation of body due to axial load. Deformation of a Body subjected to axial forces. Deformation of body of stepped c/s due to axial load, max. stress and min. stress induced. Stresses in bars of composite section & deformation. 1.4 Shear stress, shear strain & modulus of rigidity, complementary shear stress, state of simple shear, punching shear.	10	16
02	**Elastic Constants & Principal Stressess** 2.1 Definition of lateral strain, Poisson's ratio, Change in lateral dimensions 2.2 Volumetric strain due to uni-axial force and change in volume 2.3 Biaxial and tri-axial stresses and volumetric strain & change in volume 2.4 Definition of bulk modulus, volumetric strain. 2.5 Relation between modulus of elasticity, modulus of rigidity and bulk modulus. 2.6 Definition of temperature stresses & strain, nature of stress & strain due to change in temperature (no composite sections) in a bar.	08	16
03	**Shear Force And Bending Moment :** 3.1 Types of beams - cantilever, simply supported, fixed and continuous beams, types of loading- point load, uniformly distributed load, support reactions for determinate structures 3.2 Concept of shear force and bending moment, sign convention. Relation between bending moment, shear force and rate of loading 3.3 Shear force and bending moment diagrams for simply supported beams, overhanging beams and cantilever subjected to point loads, UDL and couples, (combination of any two types of loading) point of contra flexure	08	16
04	**Moment Of Inertia:** 4.1 Concept of moment of inertia M.I of plane areas such as square, rectangle, triangle, circle, semicircle and quarter circle 4.2 Parallel axis and perpendicular axis theorem M.I of composite sections, built up sections, symmetrical and unsymmetrical sections, radius of gyration & polar moment of inertia.	06	16
05	**Stresses In Beams:** 5.1 Bending Stresses in Beams: Concept of pure bending, theory of simple bending, assumptions in theory of bending, neutral axis, bending stresses and their nature, bending stress distribution diagram, moment of resistance.	06	14

	5.2 Application of theory of bending to symmetrical and unsymmetrical sections. 5.3 Shear stresses in beams: Shear stress equation, meaning of terms in equation, shear stress distribution for rectangular, hollow rectangular, circular sections and hollow circular sections 5.4 Relation between max. shear stress and average shear stress.		
06	**Analysis Of Trusses** Definition of frames, classification of frames, perfect, imperfect, redundant and deficient frame, relation between members and joints, assumptions in analysis. Method of joint, method of section and graphical method to find nature of forces.	06	16
07	**Strain Energy** 7.1 Types of loading – gradual, suddenly applied load & Impact load 7.2 Definition of strain energy, modulus of resilience and proof resilience. 7.3 Comparison of stresses due to gradual load, sudden load and impact load.	04	06
	Total	48	100

Practical:

Skill to be developed:

Intellectual Skills:

1. Interpret the results.

2. Calculate design parameters.

Motor Skills:

1. Observe the phenomenon during testing of specimen.

2. Draw the graphs and diagrams.

List of Practical:

Group – A (Any Six)

1. Identify the components of universal testing machine & tension test on mild steel.

2. Tension test on tor steel / deformed bars .

3. Izod Impact test on mild steel, brass, copper and cast iron.

4. Charpy impact test on mild steel, brass, copper and cast iron.

5. Flexural test on timber.

6. Flexure test on floor tiles or roofing tiles.

7. Shear Test on metal.

8. Water Absorption & Compression test (Dry & Wet) on bricks

9. Abrasion Test on flooring tiles.

Group - B

1. Drawing of Shear force and Bending Moment diagrams on Graph Paper (6 Problems)

2. Graphical Solution of Two Problems on simple frames i) Cantilever ii)

    Simply supported on A2 size sheet with their analytical solutions.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
1.	F. L. Singer	Strength of Materials	Harpe Collins Publishers India, Delhi
2.	R. S. Khurmi	Strength of Materials	S. Chand & Company Delhi
3.	S. B. Junnarkar	Mechanics of Structures volume –I & II	Charotar Publishing House, Anand.

Course Name   : Civil Engineering Group.

Course Code   : CE/CS/CR/CV

Semester   : Fourth

Subject Title   : Geo-Technical Engineering

Subject Code   : 12084

Teaching and Examination Scheme:

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

Rationale:

Every engineering structure such as building, bridges, dams, towers, monuments etc are supported by soil and rock. The stability of these structures depends upon behaviors of soil and capacity of soil to carry loads under different environmental conditions.

The soil & rock is also used as construction materials for embankments, roads, dams, mud walls etc.
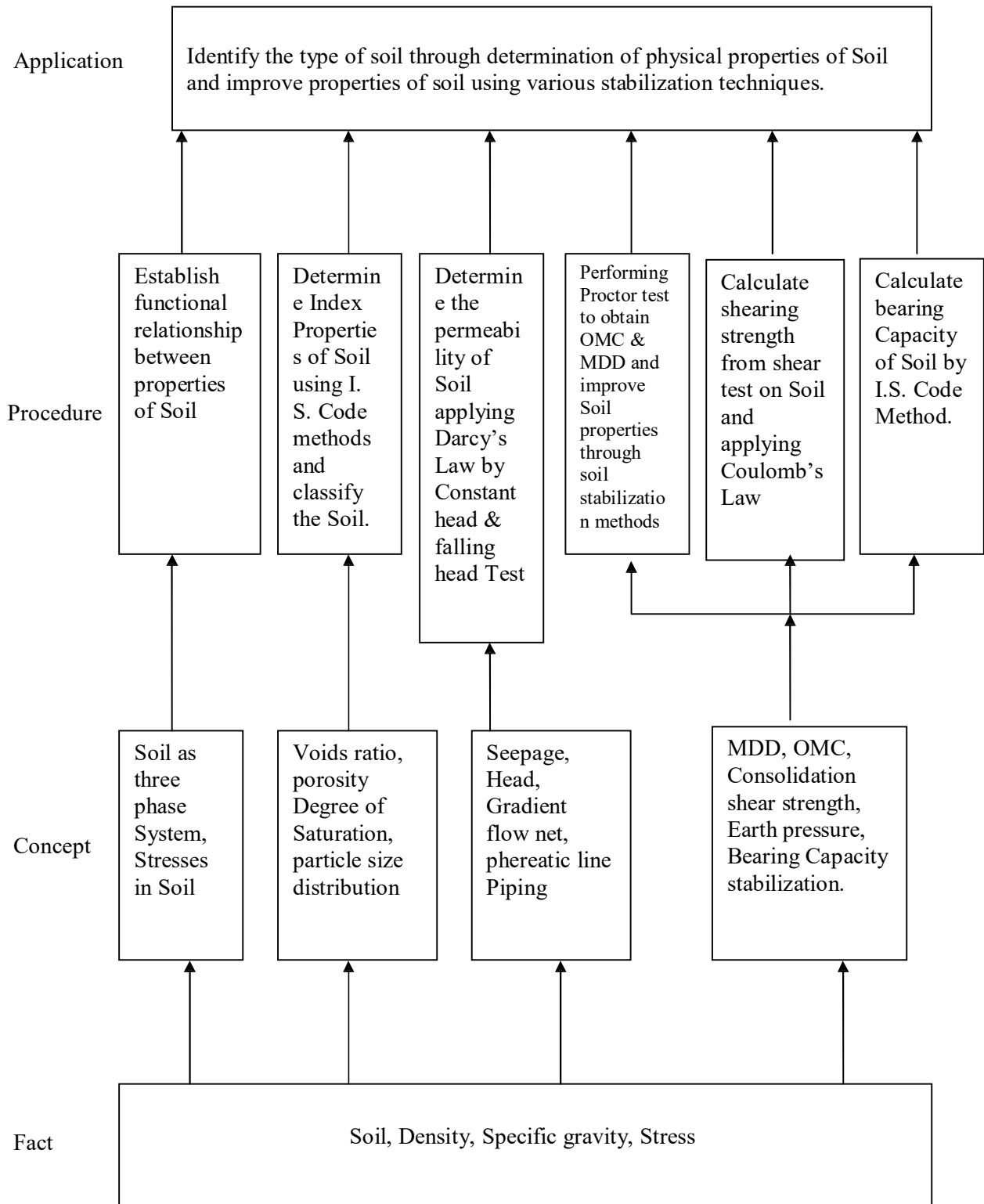
Thus it becomes mandatory to learn this subject which includes knowledge of physical properties, classification of soil, its behaviors and various techniques to improve soil properties.

Objectives:

Students will be able to:

1) Explain soil as three phase system and establish relationship between properties of soil.

2) Determine properties of soil by following standard test., procedure and plot particle size distribution curve.

3) Determine permeability by constant head and falling head test using Darcy's Law

4) Obtained OMC & MDD for any soil sample by performing Proctor Compaction test.

5) calculate shearing strength of soil, using Coulomb's law

Learning Structure:

Application

Identify the type of soil through determination of physical properties of Soil and improve properties of soil using various stabilization techniques.

Procedure

Establish functional relationship between properties of Soil	Determine Index Properties of Soil using I. S. Code methods and classify the Soil.	Determine the permeability of Soil applying Darcy's Law by Constant head & falling head Test	Performing Proctor test to obtain OMC & MDD and improve Soil properties through soil stabilization methods	Calculate shearing strength from shear test on Soil and applying Coulomb's Law	Calculate bearing Capacity of Soil by I.S. Code Method.

Concept

Soil as three phase System, Stresses in Soil	Voids ratio, porosity Degree of Saturation, particle size distribution	Seepage, Head, Gradient flow net, phereatic line Piping	MDD, OMC, Consolidation shear strength, Earth pressure, Bearing Capacity stabilization.

Fact

Soil, Density, Specific gravity, Stress

13

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Overview Geotechnical Engineering** 1.1 IS definition of soil, Importance of soil in Civil Engineering as construction material in Civil Engineering Structures, as foundation bed for structures 1.2 Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dams, salient features of earthen dam like Panshet dam, Chaskaman dam, Urmodi dam etc.. (brief ideas only)	02	02
02	**Physical Properties of Soil** 2.1 Soil as a three phase system, water content, determination of water content by oven drying method as per IS code, void ratio, porosity and degree of saturation, density index, unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight, determination of bulk unit weight and dry unit weight by core cutter method and sand replacement method as per IS code, specific gravity, determination of specific gravity by pycnometer. 2.2 Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, plasticity index, determination of liquid limit, plastic limit and shrinkage limit as per IS code. 2.3 Particle size distribution, mechanical sieve analysis as per IS code particle size distribution curve, effective diameter of soil, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils, particle size classification of soils & IS classification of soil.	12	24
03	**Permeability of Soil & Seepage Analysis** 3.1 Definition of permeability, Darcy's law of permeability, coefficient of permeability, typical values of coefficient of permeability for different soil, factors affecting permeability, determination of coefficient of permeability by constant head and falling head permeability tests, simple problems to determine coefficient of permeability. 3.2 Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines and equipotential lines, flow net, characteristics of flow net, application of flow net (no numerical problems)	05	12
04	**Shear Strength of Soil** 4.1 Shear failure of soil, field situation of shear failure, concept of shear strength of soil, components of shearing resistance of soil – cohesion, internal friction. 4.2 Mohr-coulomb failure theory, Strength envelope, strength equation, purely cohesive and cohesionless soils. 4.3 Laboratory determination of shear strength of soil – Direct shear test, Unconfined compression test & Vane shear test, plotting strength envelope, determining shear strength shear parameters of soil.	05	12

05	**Bearing Capacity of Soils & Earth Pressure** 5.1 Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure, Terzaghi's analysis and assumptions made, effect of water table on bearing capacity. 5.2 Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS:1888 & IS:2131, typical values of bearing capacity from building code IS:1904. 5.3 Definition of earth pressure, active earth pressure and passive earth pressure, coefficient of earth pressure, Rankine's theory and assumptions made for non-cohesive soils, total earth pressure distribution diagram for non-cohesive soils having dry backfill, submerged backfill and surcharge for horizontal plane surface and examples based on it.	**10**	**20**
06	**Compaction of Soil & Stabilization** 6.1 Concept of compaction, purpose of compaction field situations where compaction is required, Standard proctor test – test procedure as per IS code, Compaction curve, optimum moisture content, maximum dry density, Zero air voids line, Modified proctor test, factors affecting compaction, field methods of compaction – rolling, ramming & vibration and Suitability of various compaction equipments, difference between compaction and consolidation. 6.2 Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization – Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization,California bearing ratio, CBR test, significance of CBR value.	**10**	**20**
07	**Site Investigation And Sub Soil Exploration** 7.1 Necessity of site investigation & sub-soil exploration, types of exploration – general & detailed, method of site exploration open excavation & boring, criteria for deciding the location and number of test pits and bores 7.2 Disturbed & undisturbed soil samples for lab testing. Field identification of soil – dry strength test, dilitancy test & toughness test, empirical correlation between soil properties and SPT values.	**04**	**10**
	Total	**48**	**100**

Practical
Skills to be developed:

Intellectual Skills:
    a. Identify properties of soil.
    b. Interpret test results.
    c. Follow IS procedure of testing.

Motor Skills:
  a. Measure the quantities accurately.
  b. Handle the instruments carefully.

List of Practical (Any ten)

1. Determination of water content of given soil sample by oven drying method as per IS Code.
2. Determination of bulk unit weight dry unit weight of soil in field by core cutter method as per IS Code.
3. Determination of bulk unit weight dry unit weight of soil in field by sand replacement method as per IS Code.
5. Determination of Liquid limit & Plastic limit of given soil sample as per IS Code.
6. Determination of grain size distribution of given soil sample by mechanical sieve analysis as per IS Code.
7. Determination of coefficient of permeability by constant head test
8. Determination of coefficient of permeability by falling head test Practical (Live demo or Prerecorded demo)
9. Determination of shear strength of soil using direct shear test.
10. Determination of shear strength of soil using Laboratory Vane shear test
11. Determination of MDD & OMC by standard proctor test on given soil sample as per IS Code.
12. Determination of CBR value of given soil sample.
13. Determination of shear strength of soil using unconfined compressive strength.
14. Determination of shear strength of soil using tri-axial shear test.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Dr. B. C. Punmia	Soil Mechanics & Foundation Engineering	Standard Book house, New Delhi
02	Murthi	Soil Mechanics & Foundation Engineering	Tata McGraw Hill , New Delhi
03	B. J. Kasmalkar	Soil Mechanics	Pune Vidhyarti Griha, Pune
04	Gulhati & Dutta	Geo-technical Engineering	Tata McGraw Hill , New Delhi

Web Site:

www.totalgte.com

Course Name   : **Civil Engineering Group.**

Course Code   : **CE/CS/CR/CV**

Semester   : **Fourth**

Subject Title   : **Transportation Engineering**

Subject Code   : **12085**

Teaching and Examination Scheme:

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

NOTE:

Two tests each of 25 marks to be conducted as per the schedule given by 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 subject caters to the need of technician engaged in the investigation, planning, construction & maintenance of railway, bridges and tunnels. In Practical field each component of transportation is a specialized branch of engineering. This subject aims at basic knowledge about railway, bridges, and tunnels in respect of their various types, materials used, functions of component parts, methods of construction, planning principles, aspects of supervision and maintenance.

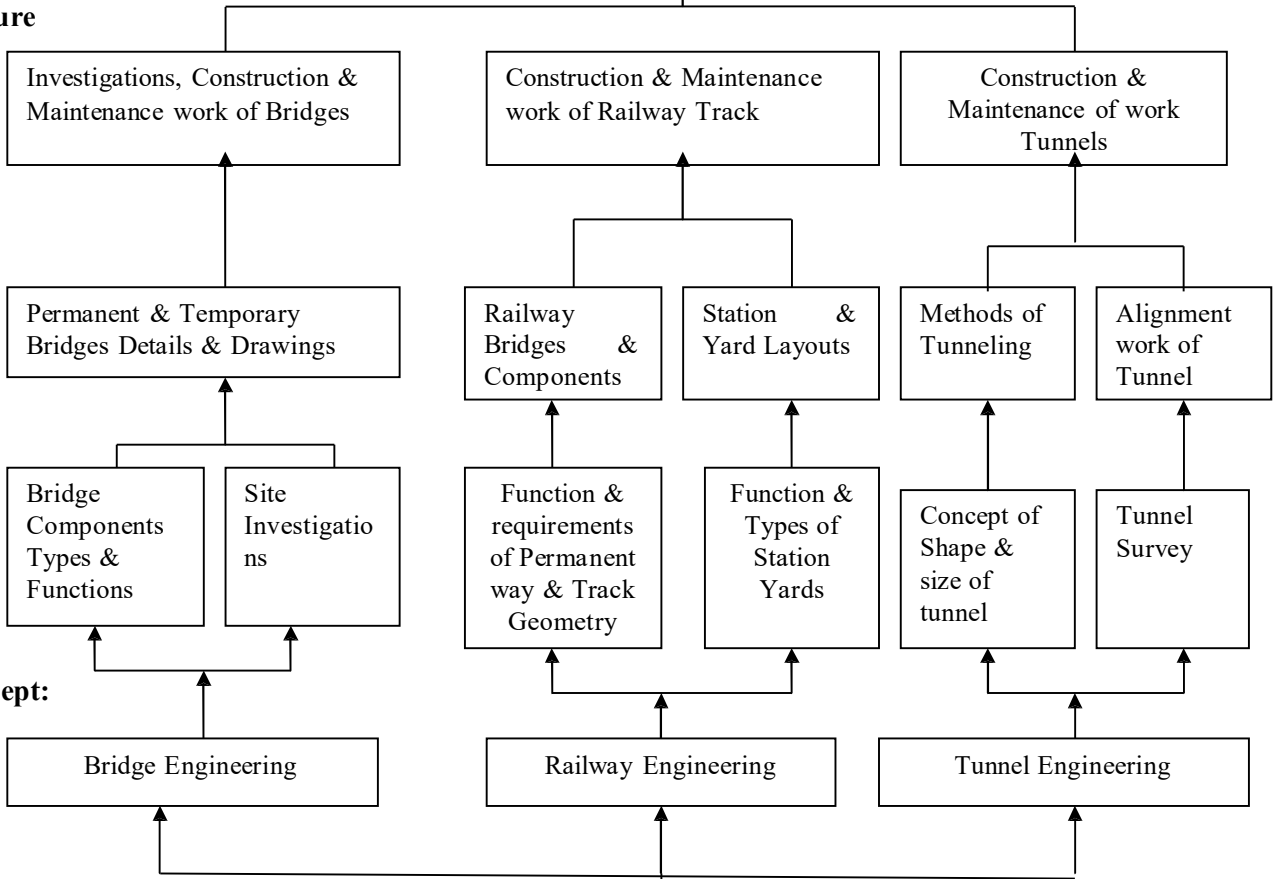**Objectives**:

Students should be able to..

1. Know component parts of railway, bridges and tunnels.
2. Understand methods of survey and investigation of alignment of railway, bridges and tunnels.
3. Organize, supervise and coordinate the construction activities related to railway, bridges and tunnels.
4. Understand, prepare and interpret the drawings related to work.

Learning Structure:

Applications

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┌─────────────────────────────────────────────────────────────────────────┐
│ Investigation, Planning, preparation of drawings, construction,           │
│ inspection & maintenance of Railway, Bridge & Tunnel Engineering          │
│ Structures.                                                               │
└─────────────────────────────────────────────────────────────────────────┘
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Procedure

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┌──────────────────────┐   ┌──────────────────────┐   ┌──────────────────────┐
│ Investigations,      │   │ Construction &       │   │ Construction &       │
│ Construction &       │   │ Maintenance work of  │   │ Maintenance of work  │
│ Maintenance work of  │   │ Railway Track        │   │ Tunnels              │
│ Bridges              │   │                      │   │                      │
└──────────────────────┘   └──────────────────────┘   └──────────────────────┘
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┌──────────────────────┐   ┌──────────┐ ┌──────────┐   ┌──────────┐ ┌──────────┐
│ Permanent & Temporary│   │ Railway  │ │ Station &│   │ Methods  │ │ Alignment│
│ Bridges Details &    │   │ Bridges &│ │ Yard     │   │ of       │ │ work of  │
│ Drawings             │   │ Components│ │ Layouts  │   │ Tunneling│ │ Tunnel   │
└──────────────────────┘   └──────────┘ └──────────┘   └──────────┘ └──────────┘
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┌──────────┐ ┌──────────┐   ┌──────────┐ ┌──────────┐   ┌──────────┐ ┌──────────┐
│ Bridge   │ │ Site     │   │ Function │ │ Function │   │ Concept  │ │ Tunnel   │
│ Components│ │ Investiga│   │ &        │ │ & Types  │   │ of Shape │ │ Survey   │
│ Types &  │ │ tions    │   │ requirem.│ │ of Station│  │ & size of│ │          │
│ Functions│ │          │   │ of Perm. │ │ Yards    │   │ tunnel   │ │          │
│          │ │          │   │ way &    │ │          │   │          │ │          │
│          │ │          │   │ Track    │ │          │   │          │ │          │
│          │ │          │   │ Geometry │ │          │   │          │ │          │
└──────────┘ └──────────┘   └──────────┘ └──────────┘   └──────────┘ └──────────┘
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Concept:

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┌──────────────────────┐   ┌──────────────────────┐   ┌──────────────────────┐
│ Bridge Engineering   │   │ Railway Engineering  │   │ Tunnel Engineering   │
└──────────────────────┘   └──────────────────────┘   └──────────────────────┘
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Facts:

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              ┌──────────────────────────────────┐
              │ Transport Engineering Systems    │
              └──────────────────────────────────┘
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Content: Theory

Chapter	Name of the topic	Hours	Marks
01	**Overview of Transportation Engineering** 1.1 Role of transportation in the development of nation. 1.2 Modes of transportation system – roads, railway, airways, waterways, Importance of each mode, comparison and their relative merits and demerits. 1.3 Necessity & importance of Cross drainage works for roads & railways.	02	04
02	**Railway Engineering.** 2.1 Alignment and Gauges Classification of Indian Railways, zones of Indian Railway. Alignment- Factors governing rail alignment. Rail Gauges – types, factors affecting selection of gauge. Rail track cross sections – standard cross section of BG & M.G Single & double line in cutting and embankment. (**Marks-08)** 2.2 Permanent ways **Ideal requirement, component parts.** Rails – function & its types. Rail Joints – requirements, types, Creep of rail, causes & prevention of creep. Sleepers – functions & Requirement, types – wooden, metal, concrete sleepers & their suitability, sleeper density. Ballast – function & different types with their properties, relative merits & demerits. Rail fixtures & fastenings – fish plate, bearing plates, spikes, bolts, keys, anchors & anti creepers. (**Marks-08)** 2.3 Railway Track Geometrics. Coning of wheels, tilting of rails, Gradient & its types, Super elevation limits of Super elevation on curves, cant deficiency negative cant, grade compensation on curves. **(Marks-10)** 2.4 Branching of Tracks Definition of point & crossing, a simple split switch turnout consisting of points and crossing lines. Sketch showing different components, their functions & working. Line sketches of track junctions-crossovers, scissor cross over, diamond crossing, triangle. Inspection of points and crossings. (**Marks-08)** 2.5 Station and Yards : Site selection for railway stations, Requirements of railway station, Types of stations (way side, crossing, junction & terminal) Station yards , types of station yard, Passenger yards, Goods yard Locomotive yard – its requirements, water column , Marshalling yard – its types. . (**Marks-06)** 2.6 Track Maintenance- Necessity, types, Tools required and their function, orgnisation, duties of permanent way inspector, gang mate, key man. (**Marks-02)**	25	42
03	**Bridge Engineering :**	23	36

	3.1 Site selection and investigation Factors affecting selection of site of a bridge. Bridge alignment Collection of design data Classification of bridges according to function, material, span, size, alignment, position of HFL. **(Marks-08)** 3.2 Component parts of bridge. Plan & sectional elevation of bridge showing component parts of, substructure & super structure. Different terminology such as effective span, clear span, economical span, waterway, afflux, scour, HFL, freeboard, etc. Foundation – function, types Piers-function, requirements, types. Abutment – function, types Wing walls – functions and types. Bearing – functions, types of bearing for RCC & steel bridges. Approaches –in cutting and embankment. Bridge flooring- open and solid floors. **(Marks-16)** 3.3 Permanent and Temporary Bridges- Permanent Bridges - Sketches & description in brief of culverts, causeways, masonry, arch, steel, movable steel bridges, RCC girder bridge, prestressed girder bridge, cantilever, suspension bridge. Temporary Bridges- timber, flying, floating bridges. **(Marks-08)** 3.4 Inspection & Maintenance Of Bridge. Inspection of bridges Maintenance of bridges & types – routine & special maintenance. **(Marks-04)**		
04	**Tunnel Engineering.** 4.1 Definition, necessity, advantages, disadvantages Classification of tunnels. Shape and Size of tunnels Tunnel Cross sections for highway and railways. **(Marks-04)** 4.2 Tunnel investigations and surveying –Tunnel surveying locating center line on ground, transferring center line inside the tunnel. Shaft - its purpose & construction. **(Marks-04)** 4.3 Methods of tunnelling in Soft rock-needle beam method, fore-poling method. Line plate method, shield method. Methods of tunnelling in Hard rock-Full-face heading method, Heading and bench method, drift method. **(Marks-06)** 4.4 Precautions in construction of tunnels Drilling equipments-drills and drills carrying equipments Types of explosives used in tunnelling. Tunnel lining and ventilation. **(Marks-04)**	14	18
	Total	**64**	**100**

Learning Resources:

Books:

Sr.No.	Name of Book	Author	Publisher
01	Railway Engineering	S.C. Saxena	Dhanpatrai & sons
02	Railway Track	K.R. Antia	The New Book Co. Pvt. Ltd Mumbai
03	Principles of Railway Engineering	S.C. Rangwala	Charotar Publication
04	Principles and Practice of Bridge Engineering	S.P. Bindra	Dhanpatrai & sons
05	A Text Book of Transportation Engineering	N.L.Arora and S.P. Luthra	IPH New Delhi
06	Elements of Bridge Engineering	J.S. Alagia	Charotar Publication
07	Bridge Engineering	D.R. Phatak	Everest Publisher
08	Elements of Bridges	D. Johnos Victer	Oxford & IBH Publishing co.
09	Road, Railway and Bridges	Birdi & Ahuja.	Std. Book House
10	Tunnel Engineering	S.C. Saxena	Dhanpatrai & sons
11	Explosive Engineering	C. B. Navalkar	--

2. **IS / International Codes.** : IS 4880, I.S. 5878, Part-I to X.

Course Name   : **Civil Engineering Group.**

Course Code   : **CE/CS/CR/CV**

Semester   : **Fourth**

Subject Title   : **Hydraulics**

Subject Code   : **12086**

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	01	02	03	100	--	25#	25@	150

Rationale:

       Hydraulics is a branch of engineering science deals with behavior of fluids at rest as well as in motion. Man encountered the problems in the field of water supply, irrigation, Navigation are resulted in the development of Hydraulics.

     Physical properties of water will play and important role in the through pipes, open channels. The empirical formulae developed in hydraulics have found useful application in several problems. The measurements of flow of water in pipes are useful in water supply system and assessment of water in irrigation field.

Objectives:

The student will able to:

1. Compute the total hydro static pressure & center of pressure.
2. Describe the principle of pressure measuring devices.
3. Identify the concept of fluid flow.
4. Compute the loss of water flowing through pipes.
5. Design most economical channel section.
6. Describe working of the velocity measuring devices.

LEARNING STRUCTURE:

Application — Enable students to use the principles of hydraulics in solving problems related to Hydrology, Water supply, Bridge, Irrigation, and Sanitary Engineering

Procedure — Total Hydrostatic Pressure | Simple Hydraulics Machines | Flow Measurement

Principle — Pressure & Its Measurement | Flow Through Pipe | Flow Through Open Channel

Concept — Physical Properties

Facts — Fluids → Fundamental of Fluid Flow

Contents: Theory

Chapter	Name of the topic	Hours	Marks
01	**Properties Of Fluid** 1.1 Definition of fluid, Difference in behavior of fluid with respect to solids. Introduction to fluid mechanics and hydraulics, Branches of hydraulics- Hydrostatics and hydrodynamics, Importance of Hydraulics with respect to Irrigation and Environmental engineering. 1.2 Physical properties of fluid Mass density, Weight density, Specific volume, Specific gravity, Surface tension and capillarity, Compressibility, Viscosity, Newton's law of viscosity – Dynamic and kinematics viscosity. Ideal and Real fluids	04	08
02	**Hydrostatic Pressure** 2.1 Free liquid surface, Definition of pressure and its SI unit Hydrostatic pressure at point, Pascal's law Variation of pressure in horizontal and vertical direction in static liquid Pressure diagram. 2.2 Total hydrostatic pressure and center of pressure, Determination of total pressure & center of pressure on vertical & inclined faces of dams, sluice gates, sides and bottom of water tanks, Determination of total hydrostatics pressure & center of pressure on sides and bottom of tank containing two liquids. Determination of net hydrostatic pressure and center of pressure on vertical surface in contact with liquid on either side. Numerical Problems.	08	14
03	**Measurement Of Liquid Pressure In Pipes** Concept of pressure head and its unit, Conversion of pressure head of one liquid in to other devices for pressure measurements in pipes – Piezometer, U-tube manometer, Measurement of pressure difference using differential manometer – U-tube differential manometer and inverted U-tube differential manometer. Bourdon's pressure gauge. Principle of working and limitations. Numerical Problems.	04	10
04	**Fundamentals Of Fluid Flow** 4.1 Concept of flow, Gravity flow and pressure flow. Types of flow – steady and Unsteady, uniform and non-uniform , Laminar and turbulent. Various combinations of flow with practical examples, Reynolds number and its application, Stream line and equi-potential line. Flow net and its uses 4.2 Discharge and its units Continuity equation for fluid flow. Datum head, pressure head, velocity head and total head, Bernoulli's theorem, Loss of head and modified Bernoulli's theorem, Impulse momentum theorem Numerical Problems.	06	10
05	**Flow Of Liquid Through Pipes** 5.1 Loss of head due to friction, Darcy-Weisbach Equation Friction factor, relative roughness. Moody's diagram and its use. Common range of friction factor for different types of pipe material. 5.2 Minor loss of head in pipe flow- loss of head due to sudden	07	16

		Contraction, sudden expansion, gradual contraction & expansion, at entrance and exit of pipe in various pipe fittings. Pipes in series and parallel Equivalent pipe – Dupuit's equation		
	5.3	Hydraulic gradient line and Energy gradient line, Siphon pipe. Water hammer in pipes – cause effects and remedial measures Use of Nomograms for design of water distribution system.Numerical Problems.		
06	**FLOW THROUGH OPEN CHANNEL**		**07**	**18**
	6.1	Types of channels- artificial & natural, purposes of artificial channel, Different shapes of artificial channels Geometrical properties of channel section – wetted area, wetted Perimeter, hydraulics radius Prismatic channel sections, steady- uniform flow through prismatic channel section.		
	6.2	Chezy's equation and Manning's equation for calculation of discharge through an open channel, common range of values of Chezy's constants and Manning's constant of different types of channel surfaces. Most economical channel section, conditions for most economical channel sections.		
	6.3	Froud's number and its significance. Critical, sub-critical and supercritical flow in channel Hydraulic jump and its occurrence in field, uses of hydraulic jump. Numerical Problems.		
07	**Flow Measuring Devices**		**08**	**16**
	7.1	Velocity measuring devices for open channels.Floats-surface, sub-surface and float rod Pitot tube – principle, expression for velocity Current meter-cup type & propeller type		
	7.2	Discharge measuring devices for channels Notches -Types of notches, expression for discharge. Francis formula, end contraction and velocity of approach Weirs - Broad crested weir, Cippolletti weir and expression for discharge. Flumes - Venturi flume, standing wave flume, expression for discharge. Velocity area method for measurement of discharge through open channels.		
	7.3	Discharge measuring devices for pipes. Venturimeter ,Orificemeter – Component parts, principle of working, Flow through orifice - Definition and use, Types of orifice based on various criteria. Coefficient of contraction, coefficient of velocity and coefficient of discharge, Relationship between them. Discharge through small sharp-edged circular orifice Determination of hydraulic coefficient of orifice. Study and use of Water meter. Numerical problems		
08	**Hydraulic Machines** Pumps - Definition and types. Suction head, delivery head, static head and manometric head. Centrifugal pump - component parts and their functions, principle of working, priming. Reciprocating pump - component parts and working.		**04**	**08**

	Submersible pump and Jet pump. Selection and choice of pump. Computation of power required for pumps. Turbines - Definition and types.		
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:
      a. Interpret test results
      b. Calculate quantities of parameters
      c. Draw graphs

Motor Skills:
      a. Measure different parameters accurately
      b. Adjust levels by operating valves

List of Practical:
Part A (Any Eight)
1. Measurements of pressure and pressure head by Piezometer, U-tube manometer, Measurement of pressure difference by U-tube differential manometer. Study of bourdon's gauge
2. Verification of Bernoulli's theorem
3. Reynolds experiment to study types of flow.
4. Determination of Darcy's friction factor for a given pipe
5. Determination of Minor losses in pipes (any two)
6. Determination of Manning's constant or Chezy's constant for given rectangular channel section.
7. Demonstration of Hydraulic jump
8. Determination of coefficient of discharge for given rectangular or triangular notch.
9. Determination of coefficient of discharge for a given Venturimeter.

Part B (Any Four)
1. Study and use of Moody's diagram, Nomogram of Manning's equation
2. Demonstration and use of Pitot tube and current meter
3. Determination of hydraulic coefficients for sharp edge orifice.
4. Study & use of water meter.
5. Study of a model of centrifugal and reciprocating pump.
6. Use of characteristic curves/ nomograms /charts / catalogs from manufactures for selection of pump for the designed discharge and head (Refer IS: 9694)

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Dr. P.N.Modi & Dr. S.M.Seth	Hydraulics & Fluids Mechanics	Standard Book House, Dehli
02	S.Ramamrutham	Hydraulics & Fluids Mechanics	Dhanpat Rai & Sons, Delhi
03	R.S.Khurmi	A Text Book of Hydraulics, Fluids Mechanics Hydraulics Machines	S.Chand & Company Ltd. New Delhi
04	R.K.Rajput	A Text Book of Fluids Mechanics Hydraulics Machines	S.Chand & Company Ltd. New Delhi
05	Dr. Jagdish Lal	Fluids Mechanics Hydraulics	Metropolitan Book Co. Private Ltd. New Delhi
06	S.K.Likhi	Hydarulics Laboratory Manual	T.T.T.I. Chandhigrah

Websites

1. www.icivilengineer.com

2. www.efunda.com

3. www.efm.com

Course Name : Civil Engineering Group

Course Code : CE/CS/CR/CV

Semester : Fourth

Subject Title : Computer Aided Drawing

Subject Code : 12087

Teaching and Examination Scheme:

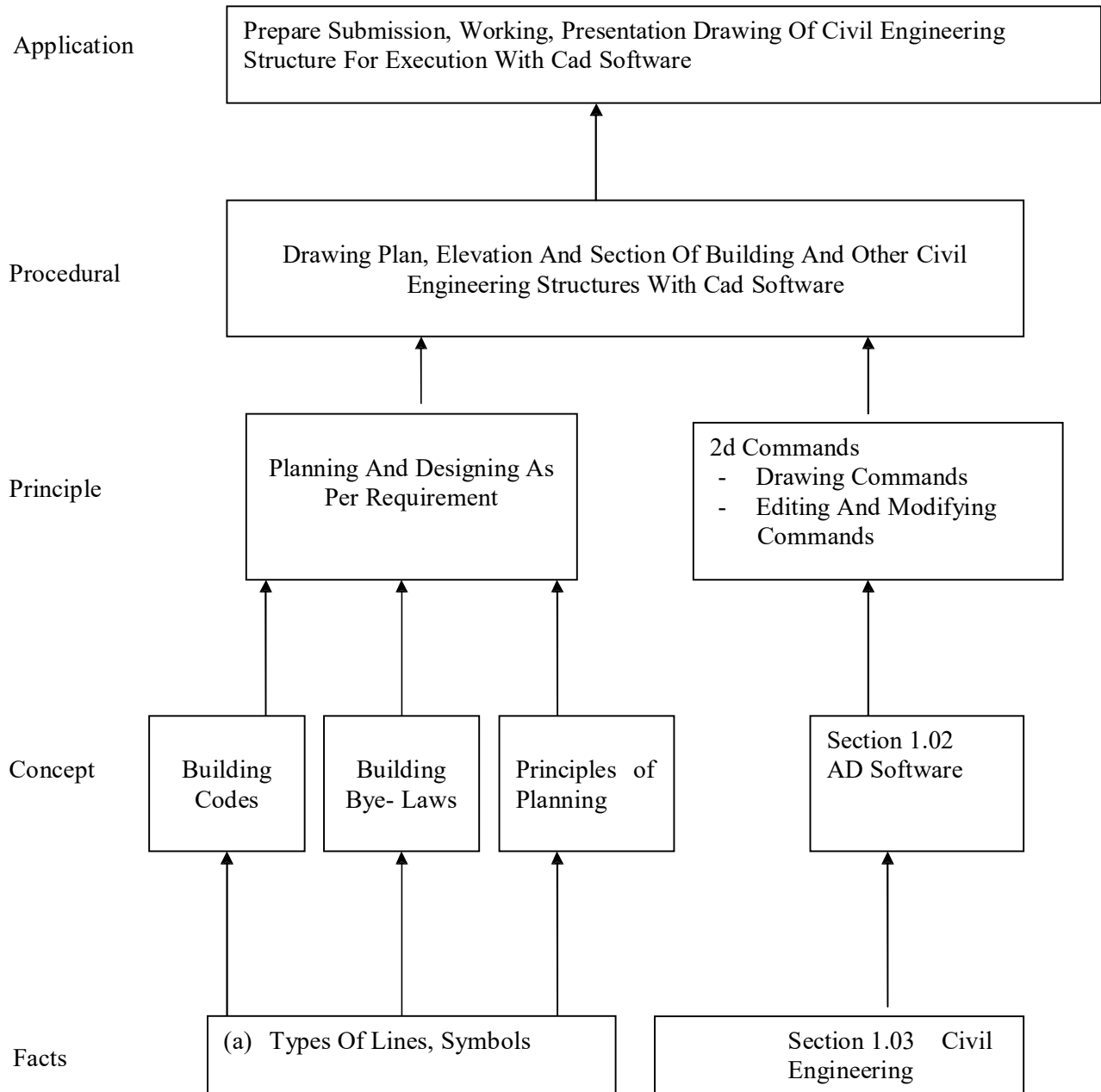| Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	--	50@	50

Rationale:

It is the age of computer. Architect / Engineers prepares most accurate and descent presentation of plans to satisfy the clients. Use of computer software such as AutoCAD, Felix Cad, Auto Civil enables Civil Engineers to prepare quality drawings in shortest possible time. This helps in reduction in the laborious, tedious work of draftsmanship. Working drawings are also prepared with the help of computer. In view of this computer aided drawing has been included in the present curriculum.

Objectives:

Students will be able to:

1) Use different CAD commands for drawing.

2) Prepare line plans with CAD software.

3) Prepare submission drawing/working drawing for the buildings with CAD software.

4) Prepare drawings of civil engineering structures.

Learning Structure:

Application	Prepare Submission, Working, Presentation Drawing Of Civil Engineering Structure For Execution With Cad Software

↑

Procedural	Drawing Plan, Elevation And Section Of Building And Other Civil Engineering Structures With Cad Software

↑ ↑

Principle	Planning And Designing As Per Requirement	2d Commands - Drawing Commands - Editing And Modifying Commands

↑ ↑ ↑ ↑

Concept	Building Codes	Building Bye- Laws	Principles of Planning	Section 1.02 AD Software

↑ ↑ ↑ ↑

Facts	(a) Types Of Lines, Symbols	Section 1.03 Civil Engineering

Contents:

Topic	Contents
1	CAD Software Meaning, various CAD software available in the market AutoCAD, Felix Cad, Auto Civil, 3D Max ; etc.)Starting up of CAD, CAD Window, Tool bar, Drop down menu, Command window, Saving the drawing. Introduction of Graphic screen.
2	CAD Commands WCS icon, UCS icon, co-ordinates, drawing limits, grid, snap, ortho features. Drawing commands, line, circle, polyline, multiline, ellipse, polygon etc. Editing commands – Copy, move, offset, fillet, chamfer, trim, lengthen, mirror, rotate, array etc. Working with hatches, fills, dimensioning, text etc.
3	Submission / Working Drawing Generation of line plan, Detailed Plan, elevation, section, site plan, Area statement Generation of 3D view and print commands Introduction to Auto Civil , 3D Max.

Note**: Above theoretical aspects should be covered in the practical periods.**

Practical:

A) Building Drawing:

Following exercises shall be completed with CAD software and Print of all the drawings should be prepared on A3 / A4 size paper

1) Preparation of line plan of a residential building.

2) Preparation of line plan of a Public building.

3) Preparation of detailed plan of a small residential building .

4) Preparation of submission drawing of residential building – showing Plan, Elevation, Section, Schedule of openings, Site Plan and Area Statement

B) Civil Engineering Drawing.

Preparation of Drawings with CAD software for the following exercises (Any THREE) and Print of all the drawings should be prepared on A3 /A4 size paper.

1) Plan, Cross Section and Longitudinal section of a Culvert (Pipe culvert/Box Culvert).

2) Section of an Earthen Dam.

3) Plan and Section of K. T. Weir.

4) Cross Section of Retaining wall.

5) Bonds in brickwork – Plan and Elevation for English bond and Flemish bond for one brick thick wall.

6) Cross Section of ESR.

7) Cross Section of Clarri-flocculator.

Learning Resources:
Books:

Sr. No.	Title	Author
1	Reference Manual of AutoCAD	AutoDesk
2	Reference Manual of Felix cad	Felix CAD
3	Reference Manual of Intel CAD	--
4	Reference Manual of Auto Civil	--
5.	Reference Manual of 3D-Max	--

Course Name : Civil Engineering Group

Course Code : CE/CS/CR/CV

Semester   : Fourth

Subject Title : Professional Practices-IV

Subject Code : 12088

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	05	--	--	--	--	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.
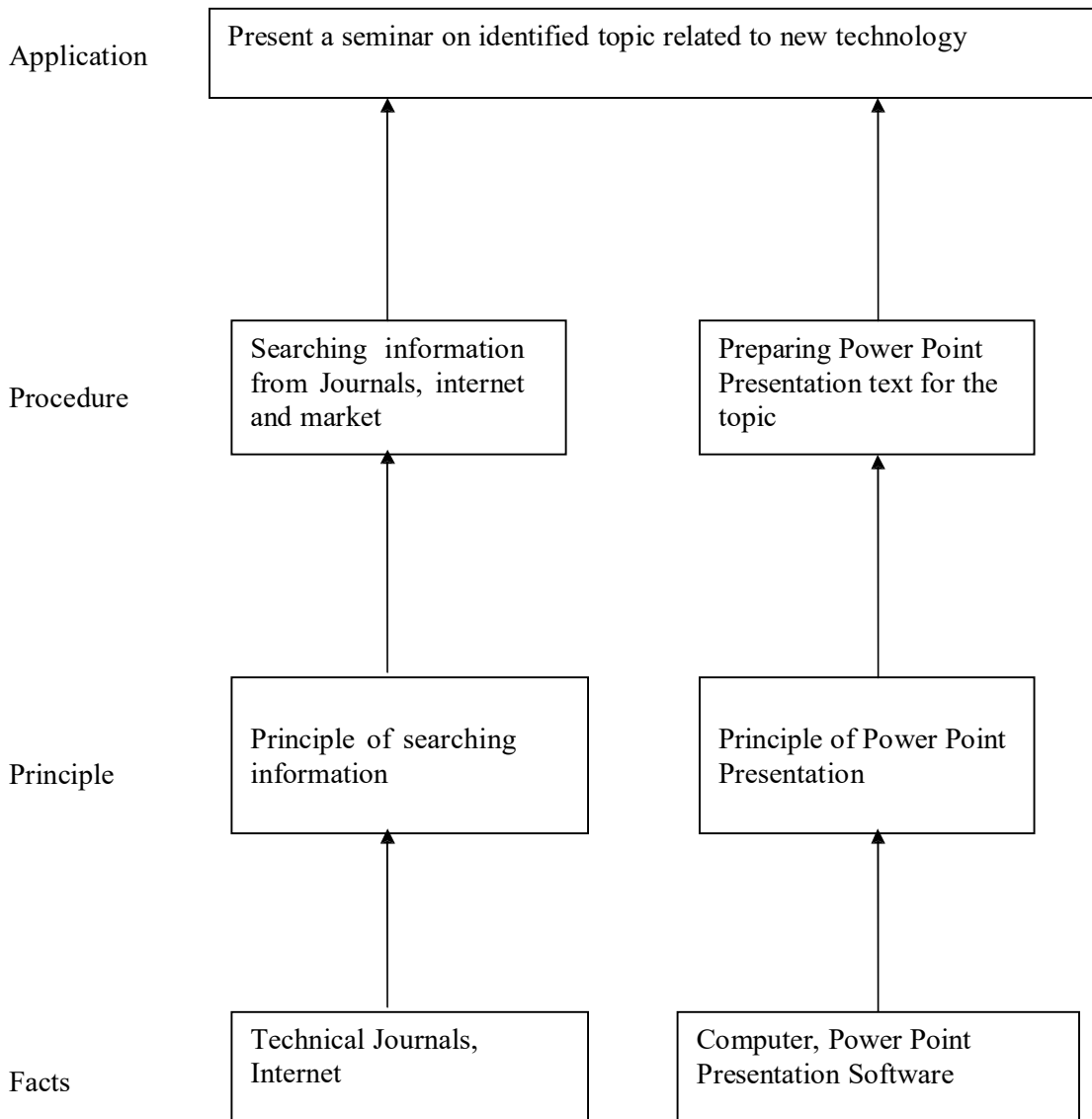
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation 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:

Application

Present a seminar on identified topic related to new technology

Procedure

Searching information from Journals, internet and market	Preparing Power Point Presentation text for the topic

Principle

Principle of searching information	Principle of Power Point Presentation

Facts

Technical Journals, Internet	Computer, Power Point Presentation Software

Activity No.	Content	Hours

1	Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries (Any three)
	   i) Bridge under construction
	   ii) Adarsh Gram
	   iii) Railway station
	   iv) Construction of basement/retaining wall/sump well
		20

2	Lectures by Professional / Industrial Expert / Student Seminars based on information search, expert lectures to be organized from any two of the following areas:
	   i) Construction of Flyovers: Special Features
	   ii) Ready Mix concrete
	   iii) Safety in Construction
	   iv) Latest Trends in Water proofing
	   v) Software for drafting
		10

3	Information search can be done through manufacturers, catalogue, internet, magazines; books etc. and submit a report.(any three)
	
	Following topics are suggested :
	
	   i) Collection and reading of drawings of buildings from architect / Practicing engineers and listing of various features from the drawings.
	   ii) Market survey for pumps ,pipes and peripherals required for multi storied buildings
	   iii) Non Conventional Energy Sources with focus on solar energy
	   iv) Elevators installation and maintenance
	   v) Any other suitable areas
		14

4	**Seminar :** Seminar topic should be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)	16

5	**Mini Project / Activities :(any one)**
	   a) Optimum design of concrete
	   b) Preparing three dimensional model of residential building using CAD
		20

	Total	**80**