
 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																	
COURSE NAME : DIPLOMA IN CIVIL ENGINEERING																	
COURSE CODE : CC																	
DURATION OF COURSE : EIGHT SEMESTERS										WITH EFFECT FROM 2013-14							
SEMESTER : FIFTH										DURATION : 16 WEEKS							
PATTERN : CORRESPONDANCE - SEMESTER										SCHEME : G							
SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17905)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Advanced Surveying	ASU	17963	05	01	48	03	100	40	50#	20	--	--	50@	20	50	
2	Theory of Structures	TOS	17964	07	01	--	04	100	40	--	--	--	--	--	--		
3	Geo Technical Engineering	GTE	17965	06	01	22	03	100	40	--	--	--	--	50@	20		
4	Hydraulics	HYD	17966	06	01	22	03	100	40	25#	10	--	--	25@	10		
Total				24	04	92	--	400	--	75	--	--	--	125	--	50	
TOTAL CONTACT HOURS DURING RESIDENT SESSION: 120 HRS [15 days * 8 hrs per day]																	
Total Marks : 650																	
@ Internal Assessment, # External Assessment, No Theory Examination, * Online Examination. Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work.																	
NOTE:																	
1. HOURS MARKED BY * FOR INTERNAL PRACTICAL EXAMINATION TO BE CONDUCTED AT RESSIDENT SESSION.																	
2. ONE TEST OF 25 MARKS TO BE CONDUCTED AT RESIDENT SESSION AND MARKS TO BE SUBMITTED TO GPDL PUNE.																	
3. 240 HOURS FOR SELF STUDY AT HOME.																	
4. ALL PRACTICALS/ORAL EXAMS [EXTERNAL ASSESSMENT INDICATED BY #] TO BE CONDUCTED AT EXAM CENTRE.																	
5. ORAL EXAMINATION [INTERNAL ASSESSMENT @] TO BE CONDUCTED AT EXAM CENTRE.																	
6. INTERNAL ASSESSMENT @ OF TERM WORK WILL BE DONE AT RESIDENT SESSION.																	

 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																	
COURSE NAME : DIPLOMA IN CIVIL ENGINEERING																	
COURSE CODE : CI																	
DURATION OF COURSE : EIGHT SEMESTERS										WITH EFFECT FROM 2013-14							
SEMESTER : FIFTH										DURATION : 16 WEEKS							
PATTERN : PART TIME - SEMESTER										SCHEME : G							
SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17905)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Advanced Surveying	ASU	17963	03	--	04	03	100	40	50#	20	--	--	50@	20	50	
2	Theory of Structures	TOS	17964	03	--	--	04	100	40	--	--	--	--	--	--		
3	Geo Technical Engineering	GTE	17965	03	--	02	03	100	40	--	--	--	--	50@	20		
4	Hydraulics	HYD	17966	03	--	02	03	100	40	25#	10	--	--	25@	10		
Total				12	--	08	--	400	--	75	--	--	--	125	--	50	
Student Contact Hours Per Week: 20 Hrs. THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH. Total Marks : 650 @ Internal Assessment, # External Assessment, No Theory Examination, * Online Examination. Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work. ➤ Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW). ➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms. ➤ Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.																	

Course Name : Diploma in Civil Engineering**Course Code : CC / CI****Semester : Fifth****Subject Title : Advanced Surveying****Subject Code : 17963****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	04	03	100	50#	--	50@	200

NOTE:

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

Rationale:

In search of precision and accuracy surveyor has to use more precise instruments like transit theodolite, micro optic theodolite, digital theodolite, total station and digital planimeter. Being a versatile instrument theodolite can be used more precisely for all civil engineering survey works. After studying theodolite survey student will able to precisely measure horizontal and vertical angles and calculate coordinates of various stations. After studying components of curve students will able to set the curve.

After studying Tacheometry student will able to find horizontal distances and elevations of various stations. After studying contouring student will able to prepare and interpret contour map.

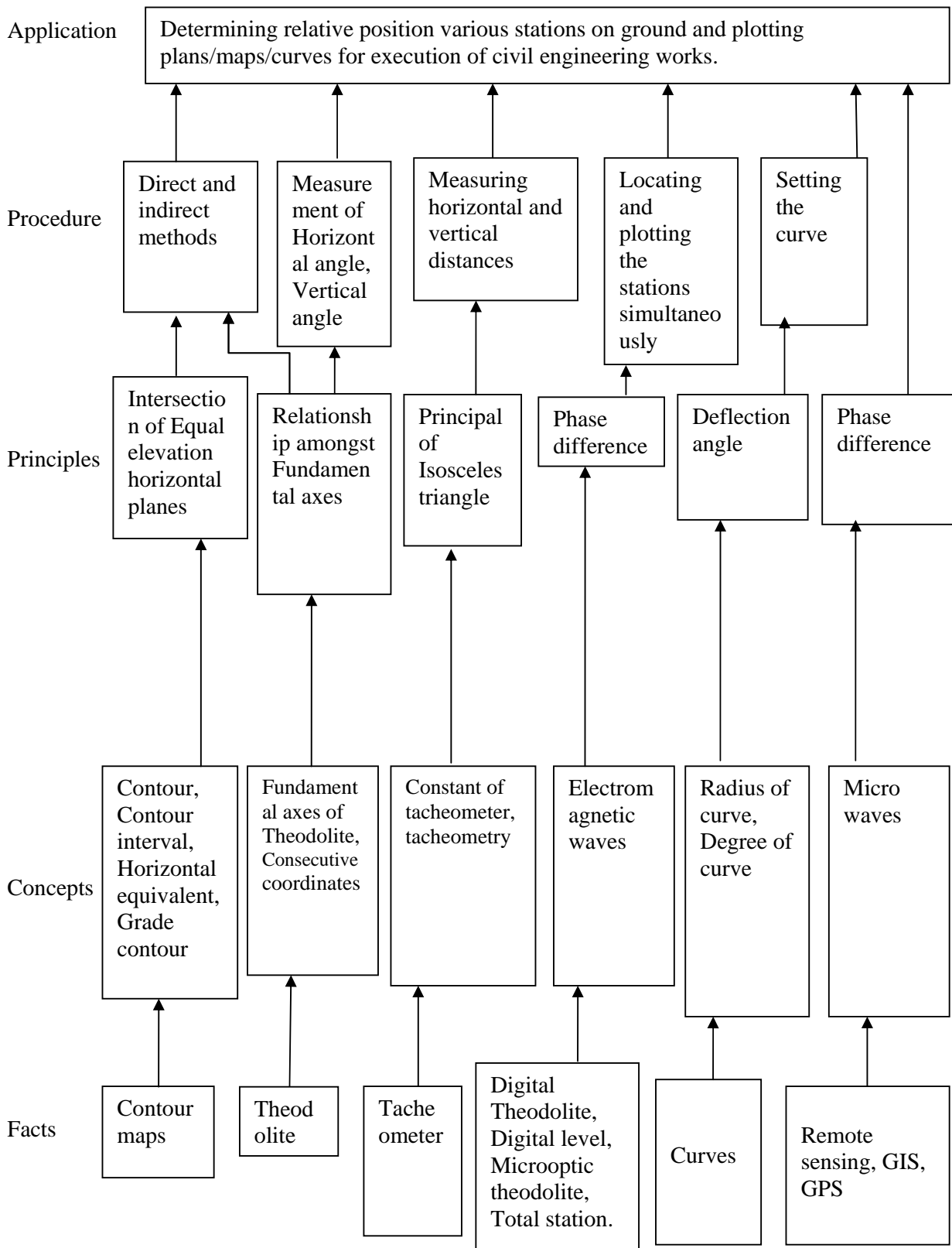
With the use of planimeter student will able to calculate area of contour and volume occupied. It is intended to abreast with new technology for which study and use of Total station becomes inevitable.

Geographical Information System (GIS) is rapidly used in technological field which intend to assess real-world problems. GIS backed by modern computers allow us to benefit from visual power of maps. It is the time demand to nurture civil engineers with latest surveying technology.

General objectives**Students will be able to:**

1. Understand handling and use of various survey instruments for field observations.
2. Understand linear and angular measurements
3. Select suitable instruments and appropriate method of survey.
4. Understand the preparation of maps from the field observations.
5. Interpret survey maps.

Learning Structure:



Contents: Theory

Topic and Contents	Hours	Marks
<p>Topic 1. Contouring Specific objectives :</p> <ul style="list-style-type: none"> ➤ State the meaning of contour, contour interval and horizontal equivalent. ➤ Carry out contouring by direct and indirect method ➤ Interpret features of ground from contour map <p>Contents:</p> <ul style="list-style-type: none"> • Concept of contour, contour interval and horizontal equivalent. Factors affecting contour interval, Characteristics of contours, Interpretation of ground features from contour map, Uses of contour map. • Methods of contouring, Direct method and Indirect method (block contouring, Longitudinal and cross sectioning) Interpolation of contour and its methods, • Concept of grade contour, Establishing grade contour on ground, Locating grade contour on contour map. 	06	14
<p>Topic 2. Area and Volume Measurement Specific objectives :</p> <ul style="list-style-type: none"> ➤ Measure the area of plans/maps. ➤ Compute the volume <p>Contents:</p> <ul style="list-style-type: none"> • Instruments used for measuring the area- Polar Planimeter and Digital Planimeter. Polar Planimeter- Component parts and procedure of measurement of area. Simple numerical problems. • Digital planimeter- Component parts and procedure of measurement. • Computation of volume from contour maps by Trapezoidal and Prizmoidal formulae, Simple numerical problems. 	04	10
<p>Topic 3. Theodolite Survey Specific objectives :</p> <ul style="list-style-type: none"> ➤ Use the theodolite for measurement of horizontal angle, deflection angle, magnetic bearing and vertical angle ➤ Carry out theodolite traversing ➤ Carry out calculations for Gale's traverse table. <p>3.1(06) Types of theodolite, uses of theodolite, Component parts of transit theodolite and their functions, Reading the vernier of transit theodolite, Technical terms- Swinging, Transiting, Face left, Face right, Fundamental axes of transit theodolite and their relationship</p> <p>3.2(08) Temporary adjustment of transit theodolite, Measurement of horizontal angle- Direct and Repetition method, Errors eliminated by method of repetition, Measurement of magnetic bearing of a line, Prolonging and ranging a line, Measurement of deflection angle, Measurement of vertical Angle. Permanent adjustment of transit theodolite (only relationship of different axes of theodolite)</p> <p>3.3.....(10) • Theodolite traversing by included angle method and deflection angle method. Check in open and closed traverse, Calculations of bearing from angles, Traverse computation-Latitude, Departure, Consecutive</p>	12	24

<p>cordinates, Independent cordinates, Balancing traverse by Bowditch's rule and Transit rule, Gale's table calculations, Simple numerical problems</p>		
<p>Topic 4. Tacheometry Specific objectives : <ul style="list-style-type: none"> ➤ Use tacheometer to find horizontal and vertical distances ➤ Carry out contour survey by tacheometer Contents: <ul style="list-style-type: none"> • Meaning of tacheometer and tacheometry, Principle of tacheometry, Essential requirement of tacheometer. Tacheometric formula for horizontal distance with telescope horizontal and staff vertical, Field method for determining constants of tacheometer, Determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical, Limitation of tacheometry Simple numerical problems. • Contouring by tacheometer-Method and specific use. </p>	06	12
<p>Topic 5. Modern Survey Instrument Specific objectives : <ul style="list-style-type: none"> ➤ Use the microoptic theodolite for measurement of horizontal and vertical angle ➤ Use the digital theodolite for measurement of horizontal and vertical angle ➤ Use the digital level for finding and recording reduced level. ➤ Use the total station for surveying work Contents: 5.1(10) Component parts and procedure to set and use microoptic theodolite for measurement of horizontal and vertical angle, Component parts and procedure to set and use digital theodolite for measurement of horizontal and vertical angle, Component parts and procedure to set and use digital level or finding and recording reduced level. 5.2(10) Component parts of total station, Minimum inventory required, Set up of total station, Setting a back sight, Azimuth mark, Measurement with total station, General setting required for all stations, Field book recording, Radial shooting, Survey station description by codes, Instrument station entry, Data retrieval, Field generated graphics, Lay out using Total station.</p>	10	20
<p>Topic 6. Curves Specific objectives: <ul style="list-style-type: none"> ➤ List components of simple circular curve ➤ Set simple circular curve by offsets from long chord and Rankine's deflection angle method Contents: <ul style="list-style-type: none"> • Necessity of curve, Classification of curve, Notation of simple circular curve, Designation of curve • Setting simple circular curve by offsets from long chord and Rankine's deflection angle method, Simple numerical problems. </p>	06	12
<p>Topic 7. Remote sensing and GIS Specific objectives: <ul style="list-style-type: none"> ➤ Describe remote sensing process ➤ Identify the components of GIS </p>	04	08

<p>➤ State applications of GPS</p> <p>Contents:</p> <ul style="list-style-type: none"> • Definition of remote sensing, Concept of remote sensing, Types of remote sensing system-Passive system, Active system, Distance of remote sensing, Remote sensing data, Remote sensing processs, Application of remote sensing, Advantages of remote sensing, Limitations of remote sensing • Definition of GIS, Key components of GIS, Application of GIS in Land information, Environmental field. • Introduction to GPS, Application of GPS in civil engineering. 		
Total	48	100

Practicals:

Skills to be developed:

Instructions: Intellectual Skills:

- Understand different instruments for linear measurement and leveling.
- Understand the method of taking observations with the survey instruments.
- Understand specific use of various types of survey instruments.
- Identify the errors of the survey instruments.

Motor Skills:

- Measure distances, Bearings and finding Reduced Levels with various survey instruments.
- Recording of survey field data collected in Field Book and Leveling Book.
- Prepare drawing (plans/maps) using survey data.
- Reading and Interpretation of drawing (plans/maps).

List of Practicals:

- Group size for survey practical shall be about five students.
 - Each teaching staff shall handle maximum two groups.
 - Students shall record the observations in Field Book at field itself.
 - One full day per project is required for project survey work.
 - Drawing and plotting should be considered as a part of practical.
 - Term work shall consists of record of all practicals and projects in field book and drawing sheets for the given projects.
1. Carry out Block contouring of plot 30 m x 30 m with each block 5mx5m
 2. Locate a contour on a field by direct contouring method.
 3. To find area of given contour map with polar planimeter and digital planimeter
 4. Understanding different components of transit theodolite, Temporary adjustment and reading the vernier and recording it.
 5. Measurement of horizontal angle by transit theodolite (direct method)
 6. Measurement of horizontal angle by transit theodolite (repetition method)
 7. Measurement of magnetic bearing by transit theodolite
 8. Measurement of deflection angle by transit theodolite
 9. Measurement of vertical angle by transit theodolite
 10. Find constants of tacheometer
 11. To find horizontal distance and elevation of given object with tacheometer

12. Measure horizontal and vertical angle with micro-optic theodolite
13. Measure horizontal and vertical angle with digital theodolite
14. Use total station for measuring horizontal angle, vertical angle, horizontal distance, sloping distance, vertical distance.
15. Layout with total station
16. Setting curve by offset from long chord method
17. Setting curve by Rankine's deflection angle method

Mini Projects:

1. Carry out Block contouring project for a plot 100mx120m with a block size 10mx10m plot the contours on imperial drawing sheet.
2. Theodolite survey for a closed traverse (5-6) sides and locating the details of buildings. Plotting the Gale's table and traverse on A1 size imperial drawing sheet.
3. Carry out block contouring using total station for a plot of 100x120 meter with block size of 5 m x5m on sloping ground and locate the building layout up to 100 square meter on site. Prepare the contour map and centre line plan on A-1 size imperial sheet.

Learning Resources:**Books :**

Sr. No.	Title	Author	Publisher
1	Surveying and Leveling- 38 th edition.	N.N. Basak	Tata McGraw Hill
2	Surveying- Volume-I, II Third Edition	S.K. Duggal	Tata McGraw Hill
3	Surveying and Leveling-1,II	T.P. Kanetkar and Kulkarni	Pune Vidyarthi Grigh Prakashan
4	Surveying and Leveling-1	Dr. B.C. Punmia	Laxmi Publication
5	Surveying and Leveling	R. Subramanian	Oxford university press
6	Advance Surveying	Satheesh Gopi, N. Madhu	Pearson
7	Remote sensing and GIS	Basudeo Bhatta	Oxford university press
8	Surveying,(seventh edition)	Arthur Bannister	Pearson

Course Name : Diploma in Civil Engineering

Course Code : CC / CI

Semester : Fifth

Subject Title : Theory of Structures

Subject Code : 17964

Teaching and Examination Scheme:

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

NOTE:

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

Rationale:

Civil engineering structures are mainly made-up of column, Beam and Slabs and these structures are subjected to axial as well as eccentric loading. These structures may be determinate or indeterminate in nature. The members like fixed beam, continuous beam, portal frame are indeterminate structures.

The content on calculations of actual shear stresses, bending moments and deflections which are developed in various structural members will be useful in analyzing the forces in these members which is further useful in design of these members. Analysis of member for deflection, combined direct and bending stresses will be useful in safe design of various structural members.

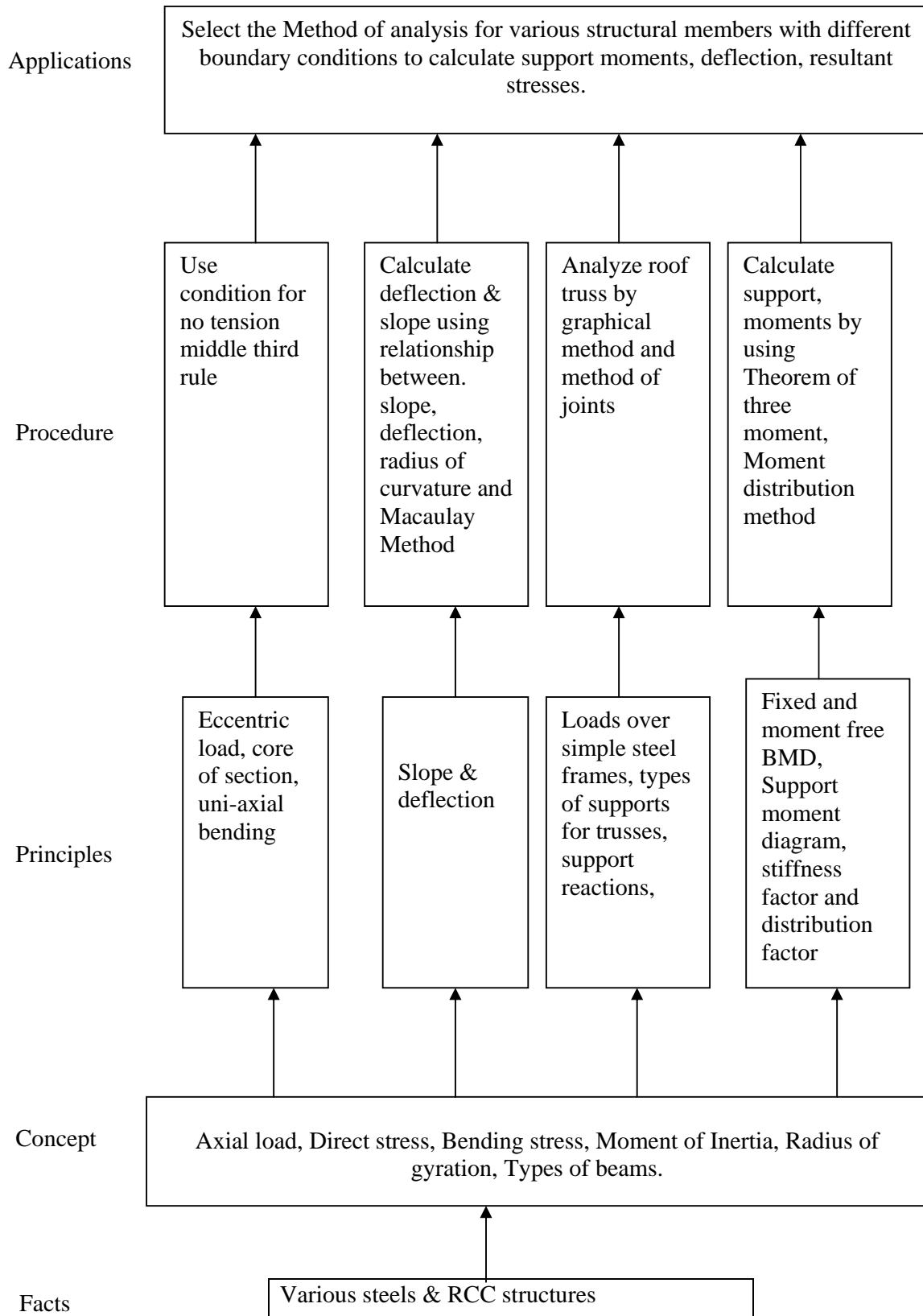
Thus the total contents of this subject forms the basic for the efficient and safe design of steel and RCC structures.

General Objectives:

The students will be able to-

1. Understand the stresses in the members due to eccentric load and wind pressure
2. Understand shear force and bending moment diagram for Fixed and continuous beams for various external loading on them.
3. Understand the shear force and bending moment diagrams for beams subjected to point load and uniformly distributed load.
4. Understand analysis of forces in various members of steel roof trusses for different spans.

Learning Structure:



Theory Content:

Topic and Contents	Hours	Marks
<p>Topic 1: Direct and Bending Stresses Specific Objectives:</p> <ul style="list-style-type: none"> ➤ List direct and eccentric loads on columns. ➤ Write conditions of no tension for beams, columns and pillars. ➤ Draw stress distribution diagram at bases of column, pillars and chimneys subjected to wind pressure. <p>Contents:</p> <p>1.1(12 Marks)</p> <ul style="list-style-type: none"> • Introduction of direct and eccentric loads, • Eccentricity about one principal axis, nature of stresses • Maximum and minimum stresses, resultant stress distribution diagram. • Condition for no tension or zero stress at extreme fiber • Limit of eccentricity, core of section for rectangular and circular cross sections • Middle third rule. <p>1.2(08 Marks)</p> <ul style="list-style-type: none"> • Chimneys subjected to wind, rectangular and circular cross section, wind pressure, coefficient of wind pressure, stress distribution diagram at base. • Walls subjected to horizontal pressure & stress distribution at base. 	10	20
<p>Topics 2: Slope and Deflection Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State meaning of slope and deflection and stiffness of simply supported beams and cantilevers. ➤ Calculate slope and deflection of simply supported and cantilever beam subjected to point load and UDL by Macaulay method. ➤ State relationship between slope and deflection and radius of curvature. <p>Contents:</p> <p>2.1(08 Marks)</p> <ul style="list-style-type: none"> • Concept of slope and deflection, stiffness of beams. • Relation among bending moment, slope deflection and radius of curvature, differential equation (no derivation), double integration method to find slope and deflection of simply supported and cantilever beam. <p>2.2(12 Marks)</p> <ul style="list-style-type: none"> • Macaulay's method for slope and deflection, application to simply supported and cantilever beam subjected to concentrated and uniformly distributed load on entire span,. 	10	20
<p>Topics 3: Fixed Beam Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State meaning of fixity effects and list advantages of fixed beam. ➤ Write the principle of superposition. ➤ Draw BMD and SFD for fixed beams with point load and UDL. <p>Contents: Fixed Beam</p>	06	12

<ul style="list-style-type: none"> • Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam. • Principle of superposition. • Fixed end moments from first principle for beam subjected to UDL over entire span, central point load, Point load other than mid span. • Application of standard formulae in finding moments and drawing S.F. and B.M. diagrams for a fixed beam (Derivation need not be asked in the examination). 		
<p>Topics 4: Continuous Beam</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State the effects of continuity of beams and nature of moments induced. ➤ Write Clapeyron's theorem of three moments (No derivation) ➤ Draw sketches of BMD and SFD for continuous beams. <p>Contents:</p> <p>Continuous Beam</p> <ul style="list-style-type: none"> • Definition, effect of continuity practical example, nature of moments induced due to continuity, concept of deflected shape • Clapeyron's theorem of three moment (no derivation). • Application of theorem maximum up to three spans and two unknown support moment only, Support at same level, spans having same and different moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span. • Drawing SF and BM diagrams for continuous beams. 	08	16
<p>Topics 5: Moment Distribution Method</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ List introduction and sign convention for fixed end moments. ➤ State meaning of carry over factor, stiffness factor and distribution factor. ➤ Draw BMD, SFD with support at same level. <p>Contents:</p> <p>Moment Distribution Method.</p> <ul style="list-style-type: none"> • Introduction, sign convention • Carry over factor, stiffness factor, distribution factor. • Application of moment distribution method for various types of continuous beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia up to three spans and two unknown support moment only, SF and BM diagrams (Supports at same level) • Introduction to portal frames – Types of portal frames (No problems shall be asked on portal frames). 	08	16
<p>Topic 6: Simple Frames</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ List different types of roof trusses. ➤ State conditions for redundant and non- redundant frames. ➤ List types of forces in different members. <p>Contents:</p> <p>Simple Frames</p> <ul style="list-style-type: none"> • Types of trusses (Simple, Fink, compound fink, French roof truss, 	06	16

pratt roof truss, Howe roof truss, North light roof truss, King post and Queen post roof truss) <ul style="list-style-type: none"> • Calculate support reactions for point loads at nodal points. • Calculate forces in different members by using method of joints and Method of sections. • Graphical method of analysis of truss.(No problem in the theory examination) 		
Total	48	100

Tutorial:

Questions from any two old QP shall be given for tutorial on each topic. Students shall solve these problems in a separate note book. The staff member shall assess these work batchwise.

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
01	S. B. Junnarkar	Mechanics of structures Volume-I,II	Charotar Publishing House, Anand
02	S. Ramanrutham	Theory of Structures	Dhanpatrai & Sons, Delhi
03	R. S. Khurmi	Theory of Structures	S.Chand Publications, Delhi
04	G.S. Pandit & S.P.Gupta	Theory of Structures	Tata Mcgraw Hill
05	West	Fundamentals of Structural Analysis	Wiley India

Course Name : Diploma in Civil Engineering

Course Code : CC / CI

Semester : Fifth

Subject Title : Geo Technical Engineering

Subject Code : 17965

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	50@	150

NOTE:

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

Rationale:

Geotechnical engineering is the important for every structure, since all structures rest on soil. The stability of these structures depends upon behavior of soil and bearing capacity of soil to carry loads under different loading conditions. Formation of soil and rocks, defects in rocks, soil behavior, and soil as an engineering material are essential parameter to an engineer. The design of foundation of buildings, dams, towers, embankments, roads, railways, retaining walls, bridges is mainly governed by these above stated parameters.

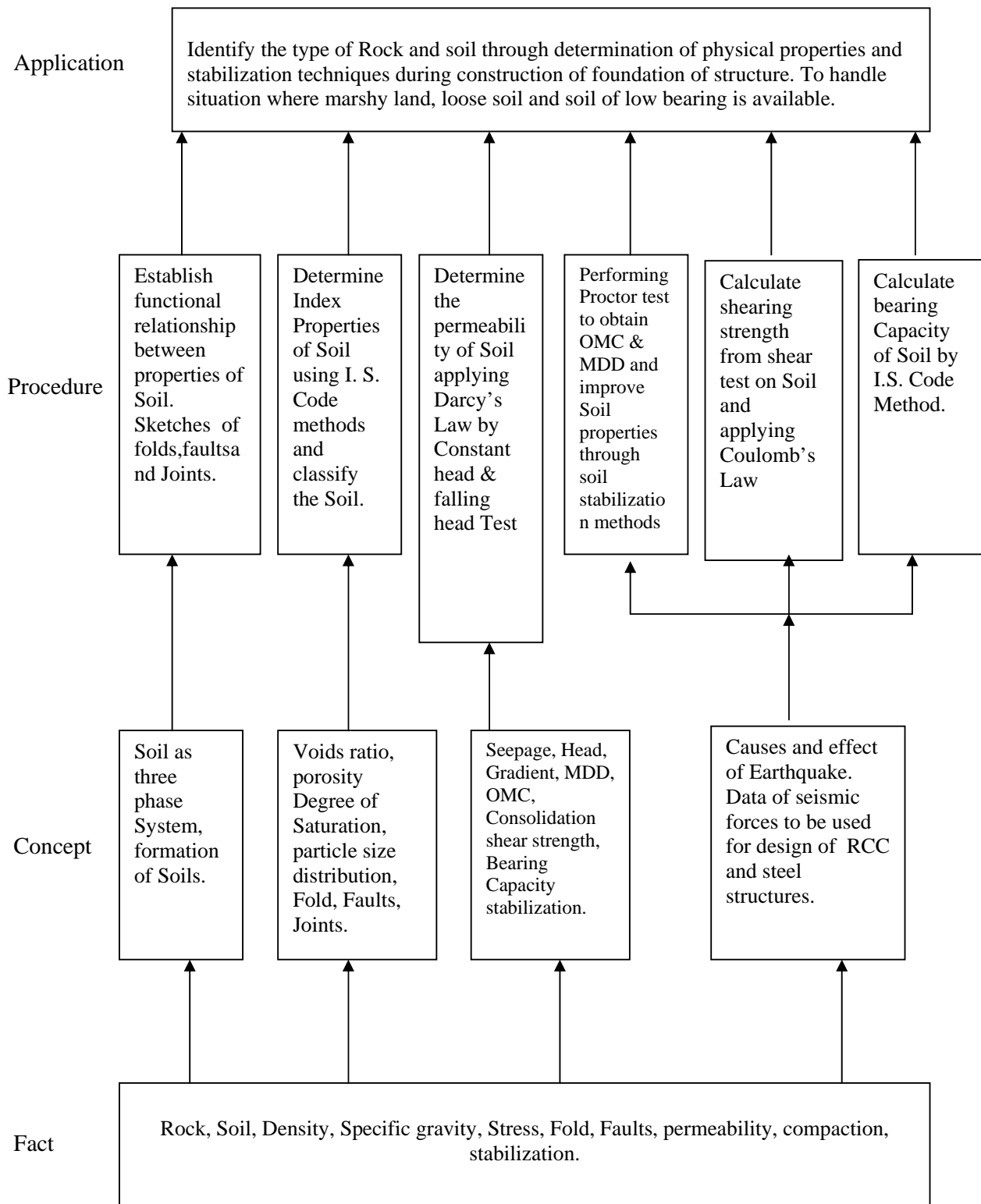
The content of this subject are also useful in designing basement, underground tank and underwater structures. Knowledge of geology, soil characteristics, and stress distribution under loading on soil, bearing capacity of soil is also useful to every engineer in the design, execution and stability analysis of structures.

General Objectives:

Students will be able to

- 1) Know types of rocks and their formation, ground water table, detail investigation, mineralogy, earthquake forces and their effects.
- 2) Understand the structure and sub soil strata of earth.
- 3) Understand the causes and effects of earth quake
- 4) Understand soil properties and interpretation of results of test on soil.
- 5) Understand the suitability of foundation based on soil condition at site.
- 6) Know importance of shear strength, bearing capacity, stability of slopes and techniques of stabilization of soil.

Learning Structure:



Contents: Theory

Topic	Hours	Marks
<p>Topic 1: General geology, mineralogy and petrology.</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State purpose of geology in civil engineering. ➤ Describe different structure and composition of earth. <p>Contents:</p> <ul style="list-style-type: none"> • Introduction of geology, different branches of geology, importance of geology for civil engineering structure and composition of earth. Introduction to mineralogy, physical properties of minerals depending on light and state of aggregation. • Introduction of petrology, definition of a rock, classification based on their genesis (mode of origin), formation, classification and engineering uses of igneous, sedimentary and metamorphic rocks. 	04	06
<p>Topic 2: Structural Geology</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State the meaning of different terms related to structural geology. ➤ State causes and condition of formation of fold, fault and joints. <p>Contents:</p> <ul style="list-style-type: none"> • Structural Geology: Definition, importance, Outcrop, dip, strike, folds- Definition, parts and types, Joints- Definition and classification, Faults- Definition, parts and Types 	02	06
<p>Topic 3: Physical Geology.</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State the effect of weathering on rocks. ➤ Describe the Earth movement and Volcanism. <p>Contents:</p> <ul style="list-style-type: none"> • Introduction of Physical geology, weathering-Definition, Types. Soil- Definition, formation of soil, classification of soils. • Earthquakes-Definition, Terminology-focus, Epicenter, Intensity, Seismograph, Isoseismic lines. Classification of Earthquakes based on focus, origin, Richter's scale. Causes and effect of earthquakes. Record of earthquake, seismic waves Indian earthquakes, earthquake resistant structures 	06	12
<p>Topic 4: Overview Geotechnical Engineering</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State purpose of Soil as construction and Engineering material. ➤ Describe field application of Geo-technical Engineering. <ul style="list-style-type: none"> • IS definition of soil, Importance of soil in Civil Engineering as construction material in Civil Engineering Structures, as foundation bed for structures • Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dams, salient features of earthen dam in Maharashtra and India. 	02	06
<p>Topics 5: Physical Properties of Soil</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State the different physical properties of Soil. ➤ Classify the soil as per IS classification. <p>Contents:</p>	12	26

<p>5.1 Soil Properties (10 Marks)</p> <ul style="list-style-type: none"> • 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. <p>5.2 Consistency Limits of Soil (8 Marks)</p> <ul style="list-style-type: none"> • 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. <p>5.3 Grading of Soils (8 Marks)</p> <ul style="list-style-type: none"> • 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, I.S. classification of soil. 		
<p>Topics 6: Permeability and Shear Strength of Soil. Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State the factors affecting the permeability of soil. ➤ Describe the shear failure of cohesive and Non-cohesive soil. <p>Contents:</p> <ul style="list-style-type: none"> • Definition of permeability, Darcy’s law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head permeability tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems.) • Shear failure of soil, field situation of shear failure, concept of shear strength of soil, components of shearing resistance of soil – cohesion, internal friction. Mohr-coulomb failure theory, Strength envelope, strength Equation for purely cohesive and cohesion less soils. Direct shear test and vane shear test –laboratory methods. 	06	16
<p>Topics 7: Bearing Capacity, Compaction and Stabilization of Soil Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Describe the procedure of test for Bearing Capacity of soil. ➤ State the necessity of compaction and stabilization of soil. <p>Contents:</p> <p>7.1 Bearing capacity and theory of earth pressure (14 Marks)</p> <ul style="list-style-type: none"> • Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure, Introduction to Terzaghi’s analysis and assumptions made effect of water table on bearing capacity. • Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS: 1888 & IS: 2131. • Definition of earth pressure, active earth pressure and passive earth 	16	28

<p>pressure, coefficient of earth pressure, Rankine’s theory and assumptions made for non-cohesive Soils.</p> <p>7.2 Compaction and consolidation (14 Marks)</p> <ul style="list-style-type: none"> • 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 and vibration and Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, difference between compaction and consolidation. • 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, C.B.R. test, meaning of C.B.R. value. • Necessity of site investigation and sub-soil exploration, types of exploration, criteria for deciding the location and number of test pits and bores.Field identification of soil – dry strength test, dilatancy test and toughness test. 		
Total	48	100

Practicals:

Skills to be developed:

Intellectual Skills:

1. Identify type of rocks and mineral.
2. Identify properties of soil.
3. Interpret test results.
4. Understand IS procedure of testing.

Motor Skills:

1. Measure the quantities accurately.
2. Handle the instruments carefully.

List of Practicals:-

1. Identity different rocks specimen.
2. Prepare chart of different mineral families with physical properties.
3. (A) Determine water content of given soil sample by oven drying method as per I.S. 2720 part- II

And

3. (B) Determine specific gravity of soil by pycnometer method as per I.S. 2720 part- III.
4. (A) Determine dry unit weight of soil in field by core cutter method as per I.S. 2720 part- XXIX.

OR

4. (B) Determine dry unit weight of soil in field by sand replacement method as per I.S. 2720 part- XXVIII.
5. Determine Liquid Limit and Plastic Limit of given soil sample as per I.S. 2720 part- V.

6. Determine grain size distribution of given soil sample by mechanical sieve analysis as per I.S. 2720 part- IV.
7. (A) Determine co efficient of permeability by constant head test as per I.S. 2720 part- XVII
OR
7. (B) Determine co efficient of permeability by falling head test as per I.S.
8. (A) Determine shear strength of soil by direct shear test as per I.S. 2720 part- XIII
OR
8. (B) Determine shear strength of soil by vane shear test as per I.S. 2720 part- XXX
9. Determine MDD and OMC by standard proctor test of given soil sample as per I.S. 2720 part- VII.
10. Identify and classify soil by conducting field tests-Visual inspection, Dry strength test, Dilatancy test and Toughness test. (Organize visit to construction site)

Note: For experiments 4, 7 and 8, divide batch in two sub groups and allot experiment 'A' to one sub group and 'B' to other sub group .

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
1	M. T. Maruthesha Reddy	A text book of applied Engineering Geology.	New age International Publishers
2	Dr. R. B. Gupte	A text book of Engineering Geology.	Pune Vidyarthi Griha Prakashan.
3.	Prof. T. N. Ramamurthy & Prof. T. G. Sitharam	Geotechnical Engineering (Soil Mechanics)	S Chand and Company LTD.
4	Dr. B. C. Punmia	Soil Mechanics and Foundation Engineering	Standard Book House, New Delhi.

2. IS, BIS and International Codes:

1. Is 2809-1972-Glossary of Terms and Symbols Relating To Soil Engineering?
2. Is 4410-Part Vii-1968-Engineering Geology
3. Is 1892-1979-Code of Practice For Sub Surface Investigation of Foundation
4. Is 2132-1986-Code of Practice For Thin Walled Tube Sampling
5. Is 2720-Test For Soil
Part 1-1983 to Part 29

1. Websites:

www.totalgte.com, www.igs.org.in, www.gsi.gov.in, www.igsjournal.org,
www.geology.com

Course Name : Diploma in Civil Engineering

Course Code : CC / CI

Semester : Fifth

Subject Title : Hydraulics

Subject Code : 17966

Teaching and Examination Scheme:

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

NOTE:

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

Rationale:

Hydraulics is a branch of engineering science which deals with behavior of liquids at rest as well as in motion. It forms the basis of core engineering subjects like Irrigation Engineering, Bridge Engineering and Inland water transport.

Problems in the field of water supply, irrigation, navigation can be solved by applying principles of Hydraulics.

Physical properties of water will be useful in the analysis of the flow of water through pipes, open channels.

The measurement of flow through pipe and open channel will be useful in the design of water supply system, design of irrigation channels and assessment of water charges for water supply and filed of irrigation.

The measurement of flow in open streams, flow over the spillways will be useful for regulation of flood discharge.

The empirical formulae developed in hydraulics are useful in solving engineering problems.

Thus this subject will help students in the hydraulic design of various civil engineering structures.

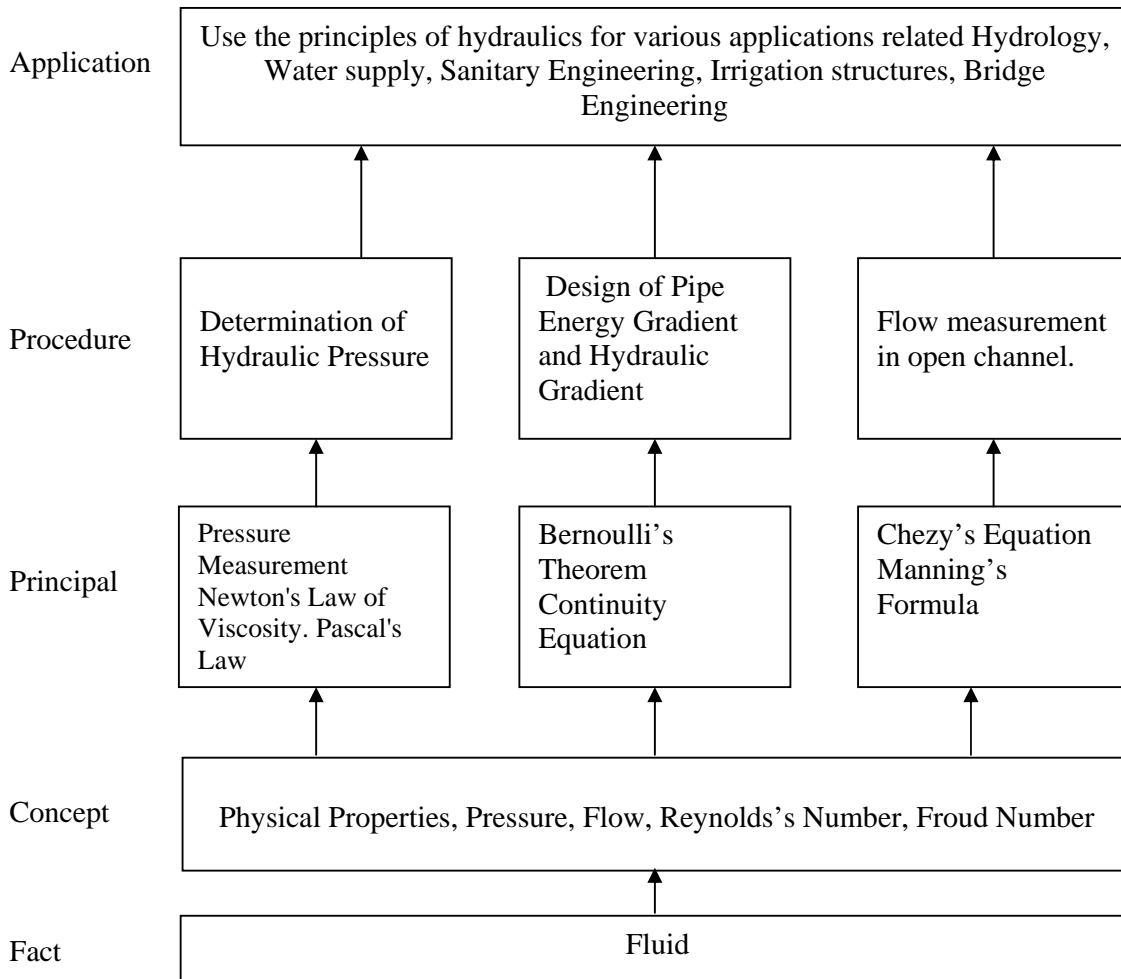
General Objectives:

The students will able to:

1. Understand principles of pressure measuring devices and computation of hydrostatic pressure and center of pressure
2. Identify the types of fluid flow.
3. Estimate the loss of head for flow through pipes.
4. Estimate the diameter of pipes for different arrangements of pipes.

5. Design most economical channel section.
6. Estimate the discharge over weirs and notches.
7. Understand the velocity of flow in open streams as well as in pipes.
8. Decide horse power of pump and selection of pump.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
<p>Topic 1: Properties of fluid Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Differentiate between fluids with solids ➤ List properties of fluids <p>Contents :</p> <ul style="list-style-type: none"> • Definition of fluid, Fluid mechanics and Hydraulics, Hydrostatics, Hydrodynamics. Difference in behavior of liquid with solids, • Application of hydraulics with respect to irrigation and environmental engineering. • Physical properties of fluid and standard values of Mass density, Weight density, Specific volume, Specific gravity, Surface tension and Capillarity, Compressibility, Viscosity, Ideal and Real fluids. Newton's law of viscosity, simple numerical problems. 	04	08
<p>Topic 2: Hydrostatic Pressure Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State principles, laws of hydrostatic pressure ➤ Compute total hydrostatic pressure and centre of pressure on different surfaces <p>Contents :</p> <ul style="list-style-type: none"> • Definition of pressure and its SI Unit. Hydrostatic pressure at a point in fluid, Pascal's law of fluid pressure. Variation of pressure in static liquid, Pressure diagram –concept and use. • Total hydrostatic pressure and center of pressure-Determination of total pressure and center of pressure on vertical, inclined and horizontal plane surfaces in contact with liquid and horizontal plane surfaces in contact with liquid faces of dams, sides and bottom of water tanks sides and bottom of tanks containing two liquids. Vertical surface in contact with liquid on either side. Numerical Problems on all cases above. 	08	12
<p>Topic 3: Measurement of Liquid Pressure in Pipes Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State meaning of liquid pressure, pressure head ➤ State principles and uses of different pressure measuring devices <p>Contents :</p> <ul style="list-style-type: none"> • Concept of pressure, pressure head and its unit, conversion of pressure head of one liquid into pressure head of other liquid. • Devices for pressure measurements in pipe, principles and working of Piezometer, U-tube simple manometers, U-tube differential manometers, Inverted manometers. Numerical problems. on manometers • Bourdon's pressure gauge – construction and principle of working. 	04	12
<p>Topic 4: Fundamentals of Fluid Flow Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Identify type of flow ➤ State the use of Reynolds number ➤ List the components of energy of liquid flow ➤ Write the statement of Bernoulli's theorem as applied to flow of liquid. 	06	12

<p>Contents:</p> <ul style="list-style-type: none"> • Types of flow- Gravity flow, pressure flow.steady and unsteady flow, uniform and non- uniform flow, laminar and turbulent flow. Various combinations of above flows with practical examples. • Reynolds number and its application. Stream line and equi-potential line. Flow net and its use. • Discharge and its unit, continuity equation for liquid flow. • Energy of flowing liquid – datum head, velocity head, pressure head. Bernoulli’s theorem- statement, assumptions, equation.Loss of energy and Bernoulli’s modified equation. Numerical Problems on all above topics. 		
<p>Topic 5: Flow of Liquid Through Pipes Specific Objectives:</p> <ul style="list-style-type: none"> ➤ List various losses in flow through pipes ➤ Estimate loss of head for flow through pipes ➤ List various pipe arrangements and calculate diameter of pipe <p>Contents :</p> <p>5.1 Loss of energy or loss of head in flow through pipe.....06</p> <ul style="list-style-type: none"> • Loss of head due to friction- Darcy-Weisbach Equation. • Moody’s diagram and its use, common range of friction factor for different types of pipe materials. • Minor loss of head in flow through pipe- loss of head due to sudden contraction, sudden expansion, entrance and exit losses. Losses in various pipe fittings. <p>5.2 Different Pipes arrangements and hydraulic gradient line.....10</p> <ul style="list-style-type: none"> • Flow through pipes in series and parallel pipes. • Syphon pipe. • Equivalent pipe - Dupit’s equation. • Hydraulic Gradient Line and Energy Gradient Line • Water Hammer- concept, causes, effects and remedial measures. • Use of Nomograms for design of pipe. Numerical Problems on above topics. 	08	16
<p>Topic 6: Flow Through Open Channel Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Work out discharge through open channel ➤ Design most economical section of channel <p>Contents :</p> <p>6.1 Open channel flow.....04</p> <ul style="list-style-type: none"> • Definitions of open channel flow. • Types of channels- artificial and natural. Different shapes of artificial channels. Geometrical properties of channel sections-wetted area, wetted perimeter, hydraulic radius, hydraulic mean depth. • Types of flow in open channel- steady, unsteady and uniform, non-uniform flow. <p>6.2 Determination of discharge through open channel.....08</p> <ul style="list-style-type: none"> • Chezy’s equation and Manning’s equation. • Most economical channel sections- conditions for most economical rectangular and trapezoidal channel sections. <p>6.3 Hydraulic Jump.....04</p>	07	16

<ul style="list-style-type: none"> Froude's number and its significance. Hydraulic Jump, its occurrence in field, use . <p>Numerical Problems on above all topics</p>		
<p>Topic 7: Flow Measurement Techniques</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> Understand principles and working of flow measuring devices Determine discharge through pipes and open streams <p>Contents :</p> <p>7.1 Discharge measuring devices for pipes.....08</p> <ul style="list-style-type: none"> Venturimeter- component parts, its working, determination of discharge through venturimeter. Flow through orifice-Definition, use, types. Hydraulic Coefficients of orifice (C_d, C_c, C_v), relation between them and their determination, Discharge through small sharp edged circular orifice. <p>7.2 Discharge measuring devices for open channel.....08</p> <ul style="list-style-type: none"> Notches –Types- Rectangular, ‘V’, Trapezoidal notches. Expression for discharge. Weirs- Types, discharge over rectangular sharp crested weir. <p>Velocity area method of discharge measurement --</p> <ul style="list-style-type: none"> Velocity measuring devices-floats, pitot tube, Current meter. Study and use of water meter. <p>Numerical Problems on all above topics</p>	07	16
<p>Topic 8: Pumps and Turbines</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> Identify various types of pumps and their uses in different situations Calculate power for pump <p>Contents :</p> <ul style="list-style-type: none"> Pumps- Definition and types. Suction head, delivery head, static head and manometric head of Pump. Computation of power required for pump. numerical problems. Centrifugal pump, Reciprocating pump, Submersible pump and Jet pump- component parts and their function, principle of working. Selection and choice of pump. Turbine- Types-impulse and reaction, components and their functions, working, selection. 	04	08
Total	48	100

Practicals:

Skills to be developed

- Intellectual Skills:**
- 1) Interpret test results
 - 2) Calculate parameters
 - 3) Interpret graphs

- Motor Skills:**
- 1) Observe and measure different parameters and record accurately
 - 2) Operate the equipments
 - 3) Handle various apparatus
 - 4) Draw graphs

List of Practicals:

1. Measure pressure head and pressure intensity by using piezometer and simple U-tube manometer and demonstrate Bourdon's tube pressure gauge for measurement of positive and negative gauge pressure.
2. Measure pressure difference by using differential U-tube manometer and inverted U tube differential manometer.
3. Calculate total head at different cross sections of a given pipe to verify Bernoulli's theorem.
4. Identify type of flow through a pipe using Reynolds's apparatus.
5. Determine friction factor for given pipes of different diameters using Darcy weisbach equation.
6. Determine minor losses of head due to sudden enlargement, sudden contraction, bend and elbow in pipe.
7. Calculate chezy's and Manning's constant for a given rectangular tilting flume and demonstrate Hydraulic jump.
8. Determine coefficient of discharge for a given Venturimeter.
9. Determine coefficient of discharge for a given rectangular and triangular notch.
10. Determine Hydraulic coefficients for small circular sharp edged orifice.
11. To understand use of water meter.
12. Understand construction and working of centrifugal and reciprocating pumps with the help of model of charts and collect catalogues of pumps and use it for selection of pump for design discharge and head.

Learning Resources:**1. Books:**

Sr. No.	Author	Title	Publisher
01	Dr. P. N. Modi Dr. S. M. Seth	Hydraulics & Fluid Mechanics	Standard Book House, Dehli
02	Dr. R. K. Bansal	Fluid Mechanics & Hydraulic Mechanics	Laxmi Publication New Delhi
03	R. S. Khurmi	A Text Book of Hydraulics, Fluid Mechanics, Hydraulic Machines	S. Chand & Company Ltd. New Delhi
04	S. Ramamurtam	Hydraulics & Fluid Mechanics	Dhanpat Rai & Sons, Delhi
05	S. K. Likhi	Hydraulic Laboratory Manual	T.T.T.I.Chandhigrah
06	Dr. S. K. Ukarande	Fluid Mechanics and Hydraulics	Ane Books Pvt. Ltd. ISBN 9789381162538

2. Models and Charts etc.:

Model of pumps, hydraulic jump and pipe fittings.

3. Websites: 1) www.howstuffworks.com