

# LESSON PLAN

**Name of the faculty:** Gourav

**Discipline:** Civil

**Semester:** 4th Civil Engineering

**Subject:** soil foundation Engineering.

**Lesson Plan Duration:** 15 week (from feb, 2024 to July, 2024)

**\*\*Work Load (Lecture/Practical) per week (in hours):**Theory-04

Week	Theory		Practical	
	Lecture Day	Topic (including assignment/test)	Practical Day	Topic
1st	1 <sup>st</sup>	Importance of soil studies in civil engineering, geological origin of soils with special reference to soil profile in India	1.	To determine the moisture content of a given soil sample.(G1)
	2 <sup>nd</sup>	Residual and transported soil, alluvial deposits, lake deposits, local soil found in j&k, dunes and loses.	2.	To determine the moisture content of a given soil sample.(G2)

	<b>3<sup>rd</sup></b>	Glacial deposit, black cotton soil and condition in which these deposit are formed and engineering characteristics		
	<b>4<sup>th</sup></b>	Name of organization dealing with soil engineering work in India , soil map of India		
<b>2<sup>nd</sup></b>	<b>1<sup>st</sup></b>	Physical properties of soils; constituent of soil and representation by a phase diagram	<b>1.</b>	Auger boring and standard penetration test.(G-1)
	<b>2<sup>nd</sup></b>	Void ratio, porosity, water content, degree of saturation, specific gravity, unit weight, bulk density	<b>2.</b>	Auger boring and standard penetration test. (G-2)
	<b>3<sup>rd</sup></b>	Dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them		
	<b>4<sup>th</sup></b>	Simple numerical with the help of phase diagram		
<b>3<sup>rd</sup></b>	<b>1<sup>st</sup></b>	Classification and identification of soil-particle size shape and their effect on engineering properties of soil, gradation and influence on engineering properties .	<b>1.</b>	Extraction of disturbed sample for mechanical analysis (G-1)
	<b>2<sup>nd</sup></b>	Relative density and its uses, Behaviour of cohesive soil with change in water content	<b>2.</b>	Extraction of disturbed sample for mechanical analysis (G-2)

	<b>3<sup>rd</sup></b>	Atterberg's limits, definitions uses and practical significance, field identification test of soils.		
	<b>4<sup>th</sup></b>	Soil classification system as per BIS 1498, plasticity chart :procedure for classification of given soil sample		
<b>4th</b>	<b>1<sup>st</sup></b>	Test	<b>3.</b>	Extraction of undisturbed sample (G-1)
	<b>2<sup>nd</sup></b>	Flow of water through soil, concept of permeability and its importance, Darcy's law		Extraction of undisturbed sample (G-1)
	<b>3<sup>rd</sup></b>	Coefficient of permeability, seepage velocity and factors affecting of permeability		
	<b>4<sup>th</sup></b>	Comparison of permeability of different soil as per BIS, measurement of permeability in laboratory		
<b>5th</b>	<b>1<sup>st</sup></b>	Effective stress (concept only), stresses in sub soil.	<b>1.</b>	To determine the field density measurement by sand replacement method(G-1)
	<b>2<sup>nd</sup></b>	Definition and meaning of total stress effective stress and neutral stress	<b>2.</b>	To determine the field density measurement by sand replacement method(G-2)
	<b>3<sup>rd</sup></b>	Principle of effective stress. Importance of effective stress in		

		engineering problem.		
	4 <sup>th</sup>	Deformation of soils, meaning and conditions of occurrence with emphasis on practical significance- consolidation and settlement, creep, plastic flow		
<b>6th</b>	1 <sup>st</sup>	Heaving, lateral movement, freeze and thaw of soil, compression index, coefficient of consolidation	<b>1</b>	To determine the field density measurement by core cutter method (G-1)
	2 <sup>nd</sup>	Degree of consolidation, total settlement, uniform and differential settlement. Rate of settlement and their effects	<b>2</b>	To determine the field density measurement by core cutter method (G-2)
	3 <sup>rd</sup>	Settlement due to construction operations and lowering of water table.		
	4 <sup>th</sup>	Tolerable settlement for different structure as per BIS.		
<b>7th</b>	1 <sup>st</sup>	Test	<b>1.</b>	To determine the liquid limit of a given soil sample (G-1)
	2 <sup>nd</sup>	Assignment-1	<b>2</b>	To determine the liquid limit of a given soil sample (G-2)
	3 <sup>rd</sup>	Shear strength characteristics of soil- concept and significance of shear strength		

	4 <sup>th</sup>	Factors contributing to shear strength of cohesive and cohesion less soils		
8 <sup>th</sup>	1 <sup>st</sup>	Coulomb's law	1.	To determine the plastic limit of a given soil sample (G-1)
	2 <sup>nd</sup>	Example of shear failure in soils.	2	To determine the plastic limit of a given soil sample (G-2)
	3 <sup>rd</sup>	Definition and necessity of compaction.laboratory Compaction test ( standard and modify proctor test as per BIS)		
	4 <sup>th</sup>	Optimum moisture content, maximum dry density, moisture dry density and relationship for typical soils		
9 <sup>th</sup>	1 <sup>st</sup>	Compaction control-density control measurement of field density by core cutter method and sand replacement method.	1.	To determine the particle size distribution by mechanical analysis . (G-1)
	2 <sup>nd</sup>	Moisture control proctor's needle and its uses, thickness control	2.	To determine the particle size distribution by mechanical analysis . (G-2)
	3 <sup>rd</sup>	Job of an embankment supervisor in relation to compaction		
	4 <sup>th</sup>	Purpose and necessity of soil exploration		
10 <sup>th</sup>	1 <sup>st</sup>	Reconnaissance, method of soil exploration,trial	1.	viva

		pits		
	2 <sup>nd</sup>	Boring (auger, wash, rotary, percussion to be briefly detail)	2.	viva
	3 <sup>rd</sup>	Sampling: disturbed and undisturbed and representative sample: selection of type of sample		
	4 <sup>th</sup>	Thin wall and piston sample , area ratio, recovery ratio of soil sample and their significance		
<b>11th</b>	1 <sup>st</sup>	Number and quantity of sample, resetting sealing and preservation of sample.	1.	Determination of optimum moisture content and maximum dry density by standard proctor test (G-1)
	2 <sup>nd</sup>	Presentation of soil investigation results.	2	Determination of optimum moisture content and maximum dry density by standard proctor test (G-2)
	3 <sup>rd</sup>	Concept of bearing capacity, definition and significance of ultimate bearing capacity, net safe bearing and allowable bearing capacity.		
	4 <sup>th</sup>	Guidelines of BIS (IS 6403) for estimation of bearing capacity of soil, factors affecting bearing capacity		
<b>12th</b>	1 <sup>st</sup>	Concept of vertical stress distribution in soils due to foundation loads,	1.	Demonstration of unconfined compression test (G-1)

		pressure bulb		
	2 <sup>nd</sup>	Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity.	2.	Demonstration of unconfined compression test (G-2)
	3 <sup>rd</sup>	Plate load test (no procedure details) and its limitations.		
	4 <sup>th</sup>	Improvement of bearing capacity by sand drain method, use of Geo-synthetics		
<b>13th</b>	1 <sup>st</sup>	Assignment-2	1.	Demonstration of direct shear and vane shear test on sandy soil sample . (G-2)
	2 <sup>nd</sup>	Test	2	Demonstration of direct shear and vane shear test on sandy soil sample . (G-2)
	3 <sup>rd</sup>	Foundation engineering- concept of shallow and deep foundation, type of shallow foundations,		
	4 <sup>th</sup>	Isolated, combined, strip, mat, foundation and their suitability.		
<b>14th</b>	1 <sup>st</sup>	Factors affecting the depth of shallow foundations, deep foundation. Type of piles and their suitability.	1.	Demonstration of permeability test apparatus. (G-1)
	2 <sup>nd</sup>	Pile classification on the basis of material	2.	Demonstration of permeability test apparatus. (G-2)

	<b>3<sup>rd</sup></b>	Pile group and pile cap.		
	<b>4<sup>th</sup></b>	Revision		
<b>15th</b>	<b>1<sup>st</sup></b>	Revision	<b>1.</b>	Viva
	<b>2<sup>nd</sup></b>	Test	<b>2</b>	Viva
	<b>3<sup>rd</sup></b>	Revision		
	<b>4<sup>th</sup></b>	Test		



LESSON PLAN		
<b>Name of the Faculty</b>	Gourav	
<b>Discipline</b>	Civil Engineering	
<b>Semester</b>	4th	
<b>Subject</b>	Irrigation Engineering	
<b>Lesson Plan Duration</b>	15 weeks (from feb, 2024 to July, 2024)	
<b>WorkLoad(Lectures/Practical)perweek(inhours): Lectures-03</b>		
WEEK	THEORY	
	Lecture Day	TOPIC
1st	1	Definition of Irrigation, Necessity of Irrigation
	2	History of Development of Irrigation in India, Major, medium and minor irrigation projects
	3	Principal crops in India and their water requirements , crop seasons - Kharif and Rabi, Assignment
2nd	1	Soil water, soil crop and water relationships, duty, delta and base period, their relationship
	2	Gross cammanded area (GCA), culturable commanded area (CCA), intensity of irrigation, irrigable area
	3	Rainfall, definition rain gauges-automatic and non automatic
3rd	1	Methods of estimating average rainfall ( Arithmetic system) , catchment area runoff
	2	factors affecting runoff, hydrogarph, basic cocept of unit hydrograph
	3	Flow irrigation - its advantages and limitations, Lift irrigation - Tube well and open well irrigation, their advantages and disadvantages
4th	1	Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation
	2	Sprinkler system - classification and component parts
	3	Drip irrigation, suitability of drip irrigation, layout, component parts, advantages, Classification, apurtenancs of a canal and their functions
5th	1	Sessional test-1 and Revision and discussion upto first sessional syllabus.
	2	
	3	
6th	1	sketches of different canal cross sections (unlined)
	2	Various types of canal lining-their related advantages and disadvantages.
	3	sketches of different lined canal x-sections, Breaches and their control

7th	1	Maintenance of lined and unlined canals
	2	Introduction, occurrence of ground water, location and command advantages and disadvantages
	3	Comparison with canal irrigation, Tube wells, explanation of terms: water table, radius of influence, depression head, cone of depression
8th	1	confined and unconfined aquifers, Yield of a well and methods of determining yield of well
	2	Types of tube wells, cavity, strainer and slotted type
	3	Methods of boring, installation of well assembly, development of well, pump selection and installation and maintenance
9th	1	construction of recharge pits and recharge wells and their maintenance.
	2	classification of dams; earthen dams - types, causes of failure;
	3	Water harvesting techniques: Need and requirement of various methods, Run off from roof top and ground surface
10th	1	Sessional test-2 and Revision and discussion upto second sessional syllabus.
	2	
	3	
11th	1	gravity dams - types, cross section of a dam, method of construction
	2	cross section of zoned earthen dams, method of construction, Concept of small and micro dams
	3	concept of spillways and energy dissipators, Canal Head works and regulatory works - Definition, Object, general layout
12th	1	functions of different parts of head works, difference between weir and barrage
	2	Functions and necessity of the following types cross drainage works; aqueduct, super passage
	3	Functions and necessity of the following types cross drainage works; level crossing, inlet and outlet, pipe crossing, Sketches of the above cross drainage works
13th	1	Definitions of following Hydraulic structures with Sketches; Falls, Cross and head regulators
	2	Definitions of following Hydraulic structures with Sketches; Outlets, Canal Escapes
	3	Methods of river training, guidebanks, retired (levees) embankments
14th	1	groynes and spurs, pitched island, cut off
	2	Definition of water logging its causes and effects, detection, prevention and remedies
	3	reclamation of soil, surface and sub surface drains and their layout, Concept and various techniques used for ground water recharge
15th	1	Sessional test-3 and Revision and discussion upto third sessional syllabus.
	2	
	3	

# LESSON PLAN

# LESSON PLAN

**Name of the faculty:** Aman

**Discipline:** Civil

**Semester:** 4th Civil Engineering

**Subject:** Water Supply And Waste Water Engineering

**Lesson Plan Duration:** 15 week (from feb, 2024 to July, 2024)

**\*\*Work Load (Lecture/Practical) per week (in hours):**Theory-04, Practical-02

Week	Theory		Practical	
	Lecture Day	Topic (including assignment/test)	Practical Day	Topic
1 <sup>st</sup>	1 <sup>st</sup>	<b>Chapter-1</b> IntroductionNecessity of water supply system.	1 <sup>st</sup>	To determine turbidity of water sample (G-1)
	2 <sup>nd</sup>	brief description of water supply system	2 <sup>nd</sup>	To determine turbidity of water sample (G-2)
	3 <sup>rd</sup>	<b>Chapter-2</b> Quantity of Water-Water requirement		
	4 <sup>th</sup>	Rate of demand and variation in rate of demand		

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<b>2<sup>nd</sup></b>	<b>1<sup>st</sup></b>	Per capita consumption for domestic industrial, public and	<b>1<sup>st</sup></b>	To determine dissolved oxygen of given sample(G-1)
	<b>2<sup>nd</sup></b>	fire fighting uses as per BIS standards Population Forecasting	<b>2<sup>nd</sup></b>	To determine dissolved oxygen of given sample(G-2)
	<b>3<sup>rd</sup></b>	<b>Chapter-3</b> Quality of Water-Meaning of pure water and methods of analysis of water		
	<b>4<sup>th</sup></b>	Physical, Chemical and bacteriological tests and their significance		
<b>3<sup>rd</sup></b>	<b>1<sup>st</sup></b>	Standard of potable water as per Indian Standard Maintenance of purity of water	<b>1<sup>st</sup></b>	To determine pH value of water(G-1)
	<b>2<sup>nd</sup></b>	Class test	<b>2<sup>nd</sup></b>	To determine pH value of water(G-2)
	<b>3<sup>rd</sup></b>	<b>Chapter-4</b> Water Treatment (brief introduction)Sedimentation - purpose, types of sedimentation tanks		
	<b>4<sup>th</sup></b>	Coagulation flocculation - usual coagulation and their feeding		
<b>4<sup>th</sup></b>	<b>1<sup>st</sup></b>	Filtration - significance, types of filters, their suitability	<b>1<sup>st</sup></b>	To perform jar test for coagulation(G-1)
	<b>2<sup>nd</sup></b>	Necessity of disinfection of water, forms of chlorination,	<b>2<sup>nd</sup></b>	To perform jar test for coagulation(G-2)
	<b>3<sup>rd</sup></b>	break point chlorine, residual chlorine, application of chlorine.		

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	4 <sup>th</sup>	Flow diagram of different treatment units, functions of (i) Aeration, fountain (ii) mixer		
5 <sup>th</sup>	1 <sup>st</sup>	(iii) flocculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber	1 <sup>st</sup>	To determine BOD of given sample(G-1)
	2 <sup>nd</sup>	Sessional week	2 <sup>nd</sup>	To determine BOD of given sample(G-2)
	3 <sup>rd</sup>	Sessional week		
	4 <sup>th</sup>	<b>Chapter-5</b> Conveyance of Water Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes Their suitability and uses, types of joints in		
6 <sup>th</sup>	1 <sup>st</sup>	different types of pipes Appurtenances: Sluice, air, reflux valves,	1 <sup>st</sup>	To determine residual chlorine in water(G-1)
	2 <sup>nd</sup>	relief valves, scour valves, bibcocks, stop cocks, fire hydrants, water meters their working and uses	2 <sup>nd</sup>	To determine residual chlorine in water(G-2)
	3 <sup>rd</sup>	Distribution site: Requirement of distribution, minimum head and rate,		
	4 <sup>th</sup>	methods of layout of distribution pipes Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories		

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<b>7th</b>	<b>1<sup>st</sup></b>	Wastage of water - preventive measures Maintenance of distribution system Leakage detection	<b>1<sup>st</sup></b>	To determine conductivity of water and total dissolved solids(G-1)
	<b>2<sup>nd</sup></b>	<b>Chapter-6</b> Laying out Pipes- Setting out alignment of pipes	<b>2<sup>nd</sup></b>	To determine conductivity of water and total dissolved solids (G-2)
	<b>3<sup>rd</sup></b>	Excavation for laying of pipes and precautions to be taken in laying pipes in black cotton soil		
	<b>4<sup>th</sup></b>	Handling, lowering beginning and jointing of pipes		
<b>8th</b>	<b>1<sup>st</sup></b>	Testing of pipe lines,Back filling Use of boring rods	<b>1<sup>st</sup></b>	To study the installation ofWater meter(G-1)
	<b>2<sup>nd</sup></b>	<b>Chapter-7</b> Building Water Supply- Connections to water main	<b>2<sup>nd</sup></b>	To study the installation ofWater meter(G-2)
	<b>3<sup>rd</sup></b>	Water supply fixtures and installations and terminology related to plumbing		
	<b>4<sup>th</sup></b>	<b>WASTE WATER ENGINEERING- Chapter-8</b> IntroductionPurpose of sanitation,Necessity of systematic collection and disposal of waste		
<b>9th</b>	<b>1<sup>st</sup></b>	Definition of terms in sanitary engineering, Collection and conveyance of sewage	<b>1<sup>st</sup></b>	To study the installation ofConnection of water supply of building with main(G-1)

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	2 <sup>nd</sup>	Conservancy and water carriage systems, their advantages and Disadvantages	2 <sup>nd</sup>	To study the installation of Connection of water supply of building with main(G-1)
	3 <sup>rd</sup>	Surface drains, various types, suitability, Types of sewage: Domestic, industrial, storm water and its seasonal variation		
	4 <sup>th</sup>	<b>Chapter-9</b> Sewerage System- Types of sewerage systems materials for sewers,		
<b>10th</b>	1 <sup>st</sup>	Appurtenance: Location, function and construction features Manholes, drop manholes, tank hole, catch basin, inverted siphon	1 <sup>st</sup>	To study the installation of Pipe valves and bends(G-1)
	2 <sup>nd</sup>	flushing tanks grease and oil traps, storm regulators, ventilating shafts	2 <sup>nd</sup>	To study the installation of Pipe valves and bends(G-2)
	3 <sup>rd</sup>	Sessional week		
	4 <sup>th</sup>	Sessional week		
<b>11th</b>	1 <sup>st</sup>	<b>Chapter-10</b> Laying and Construction of Sewers: Setting out/alignment of sewers		To study the installation of Water supply and sanitary fittings(G-1)
	2 <sup>nd</sup>	Excavations, checking the gradient with boning rods preparation of bedding		To study the installation of Water supply and sanitary fittings(G-2)
	3 <sup>rd</sup>	handling and jointing testing and back filling of sewers/pipes		
	4 <sup>th</sup>	Construction of surface mains and different		

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		sections required		
<b>12th</b>	<b>1st</b>	<b>Chapter-11</b> Sewage characteristics - Properties of sewage IS standards for analysis of sewage Physical, chemical parameter	<b>1st</b>	To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes, D.I. pipes and PVC pipes.(G-1)
	<b>2nd</b>	bacteriological parameters	<b>2nd</b>	To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes, D.I. pipes and PVC pipes.(G-2)
	<b>3rd</b>	<b>Chapter-12</b> Natural Methods of Sewerage Disposal		
	<b>4th</b>	General composition of sewage and disposal methods Disposal by dilution, Self purification of stream		
<b>13th</b>	<b>1st</b>	Disposal by land treatment, Nuisance due to disposal	<b>1st</b>	To demonstrate the laying of SW pipes for sewers(G-1)
	<b>2nd</b>	<b>Chapter-13</b> Sewage Treatment-Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams	<b>2nd</b>	To demonstrate the laying of SW pipes for sewers(G-2)
	<b>3rd</b>	Introduction and uses of screens, grit chambers, detritus tanks,		
	<b>4th</b>	skimming tanks, plain sedimentation tanks,		
<b>14th</b>	<b>1st</b>	primary clarifiers, secondary clarifiers,	<b>1st</b>	Study of water purifying process by visiting a field



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		filterscontrol beds, intermittent sand filters,		lab(G-1)
	<b>2<sup>nd</sup></b>	trickling filters and their working sludge treatment and disposal, oxidation ponds	<b>2<sup>nd</sup></b>	Study of water purifying process by visiting a field lab(G-2)
	<b>3<sup>rd</sup></b>	sBuilding Drainage- Introduction		
	<b>4<sup>th</sup></b>	-Aims of building drainage and its Requirements		
<b>15<sup>th</sup></b>	<b>1<sup>st</sup></b>	Different sanitary fittings Sanitary fittings installationsTraps	<b>1<sup>st</sup></b>	Demonstration of plumbing tools(G-1)
	<b>2<sup>nd</sup></b>	<b>Sessional week</b>	<b>2<sup>nd</sup></b>	Demonstration of plumbing tools(G-2)
	<b>3<sup>rd</sup></b>	<b>Sessional week</b>		
	<b>4<sup>th</sup></b>	Revision		

# LESSON PLAN

**Name of the faculty:** Annu

**Discipline:** Civil Engineering

**Semester:** 4th

**Subject:** Surveying-II

**Lesson Plan Duration:** 15 week (from feb, 2024 to July, 2024)

**\*\*Work Load (Lecture/Practical) per week (in hours):**Theory-03, Pratical-06.

Week	Theory		Practical	
	Lecture Day	Topic (including assignment/test)	Practical Day	Topic
1st	1 <sup>st</sup>	Contouring- Concept of contours, purpose of contouring, contour interval and horizontal equivalent,	1 <sup>st</sup>	Contouring:- Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer (G-1)
	2 <sup>nd</sup>	factors effecting contour interval, characteristics of contours,	2 <sup>nd</sup>	Contouring:- Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer (G-2)
	3 <sup>rd</sup>	methods of contouring: Direct and indirect,		
2nd	1 <sup>st</sup>	use of stadia measurements in contour survey, interpolation of contours; use of contour map,	1 <sup>st</sup>	Preparing a contour plan by method of squares (G-1)
	2 <sup>nd</sup>	Drawing cross section from a contour map;	2 <sup>nd</sup>	Preparing a contour plan by method of squares (G-2)
	3 <sup>rd</sup>	marking alignment of a road, railway and a canal on a contour map		
3rd	1 <sup>st</sup>	computation of earth work and reservoir capacity from a contour map	1 <sup>st</sup>	Preparing a contour plan of a Road/Railway track/Canal by taking cross sections(G-1)
	2 <sup>nd</sup>	Theodolite Surveying-	2 <sup>nd</sup>	Preparing a contour plan of a

		Working of a transit vernier theodolite,		Road/Railway track/Canal by taking cross sections(G-2)
	<b>3rd</b>	axes of a theodolite and their relation		
<b>4th</b>	<b>1st</b>	temporary adjustments of a transit theodolite	<b>1st</b>	Theodolite:-Taking out the Theodilite, mounting on the tripod and placing it back in the box(G-1)
	<b>2nd</b>	concept of transiting, swinging, face left, face right and changing face;	<b>2nd</b>	Theodolite:-Taking out the Theodilite, mounting on the tripod and placing it back in the box(G-2)
	<b>3rd</b>	measurement of horizontal and vertical angles		
<b>5th</b>	<b>1st</b>	Prolonging a line (forward and backward) measurement of bearing of a line	<b>1st</b>	Study of a transit vernier theodolite; temporary adjustments of theodolite (G-1)
	<b>2nd</b>	traversing by included angles and deflection angle method; traversing by stadia measurement,	<b>2nd</b>	Study of a transit vernier theodolite; temporary adjustments of theodolite (G-2)
	<b>3rd</b>	theodolite triangulation, plotting a traverse;		
<b>6th</b>	<b>1st</b>	concept of coordinate and solution of omitted measurements (one side affected),	<b>1st</b>	Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods(G-1)
	<b>2nd</b>	errors in theodolite survey and precautions taken to minimize them;	<b>2nd</b>	Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods(G-2)
	<b>3rd</b>	limits of precision in theodolite traversing.		
<b>7th</b>	<b>1st</b>	Height of objects – accessible and non-accessible bases	<b>1st</b>	Measurement of vertical angles and use of tachometric tables, Measurement of magnetic bearing of a line(G-1)
	<b>2nd</b>	Tacho-metric surveying	<b>2nd</b>	Measurement of vertical angles and use of tachometric tables, Measurement of magnetic bearing of a line(G-2)
	<b>3rd</b>	Tachometry, Instruments to be used in tachometry		

<b>8th</b>	<b>1<sup>st</sup></b>	methods of tachometry,	<b>1<sup>st</sup></b>	Running a closed traverse with a theodolite (at least five sides) and its plotting -Height of objects with and without accessible bases(G-1)
	<b>2<sup>nd</sup></b>	stadia system of tachometry	<b>2<sup>nd</sup></b>	Running a closed traverse with a theodolite (at least five sides) and its plotting -Height of objects with and without accessible bases(G-2)
	<b>3<sup>rd</sup></b>	general principles of stadia tachometry,		
<b>9th</b>	<b>1<sup>st</sup></b>	examples of stadia tachometry and Numerical problems	<b>1<sup>st</sup></b>	Curves-Setting out of a simple circular curve with given data by the following methods -Offsets from the chords produced(G-1)
	<b>2<sup>nd</sup></b>	Curves:Simple Circular Curve,Need	<b>2<sup>nd</sup></b>	Curves-Setting out of a simple circular curve with given data by the following methods -Offsets from the chords produced(G-2)
	<b>3<sup>rd</sup></b>	definition of a simple circular curve; Elements of simple circular curve		
<b>10th</b>	<b>1<sup>st</sup></b>	Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point),	<b>1<sup>st</sup></b>	Curves-Setting out of a simple circular curve with given data by the following methods -One theodolite method(G-1)
	<b>2<sup>nd</sup></b>	tangent point, length of curve, long chord deflection angle, Apex distance and	<b>2<sup>nd</sup></b>	Curves-Setting out of a simple circular curve with given data by the following methods -One theodolite method(G-2)
	<b>3<sup>rd</sup></b>	Mid-ordinate. Setting out of simple circular curve		
<b>11th</b>	<b>1<sup>st</sup></b>	By linear measurements only:Offsets from the tangent, Successive bisection of arcs	<b>1<sup>st</sup></b>	Minor instruments: Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent (G-1)
	<b>2<sup>nd</sup></b>	Offsets from the chord produced,	<b>2<sup>nd</sup></b>	Minor instruments: Demonstration and use of

				minor instruments like Ceylon Ghat Tracer, Tangent (G-2)
	<b>3rd</b>	By tangential angles using a theodolite		
<b>12th</b>	<b>1st</b>	Transition Curve-Need (centrifugal force and super elevation) and definition of transition curve	<b>1st</b>	Minor instruments: Demonstration and use of Clinometer, Pantagraph, Abney level etc(G-1)
	<b>2nd</b>	requirements of transition curve;	<b>2nd</b>	Minor instruments: Demonstration and use of Clinometer, Pantagraph, Abney level etc(G-2)
	<b>3rd</b>	length of transition curve for roads;		
<b>13th</b>	<b>1st</b>	by cubic parabola; calculation of offsets for a transition curve;	<b>1st</b>	Use of planimeter for computing area (G-1)
	<b>2nd</b>	setting out of a transition curve by tangential offsets	<b>2nd</b>	Use of planimeter for computing area (G-2)
	<b>3rd</b>	onlySetting out of a vertical curve		
<b>14th</b>	<b>1st</b>	Introduction to the use of Modern Surveying equipment and techniques such as: EDM or Distomat, Planimeter	<b>1st</b>	Demonstration of digital instruments through field visits to Survey of India and other government agencies (G-1)
	<b>2nd</b>	Total station, Introduction to remote sensing, GIS and GPS	<b>2nd</b>	Demonstration of digital instruments through field visits to Survey of India and other government agencies (G-2)
	<b>3rd</b>	Minor Instruments :Introduction and use of minor		
<b>15th</b>	<b>1st</b>	instruments like Ceylon Ghat Tracer, Clinometer, Pantagraph, Abney Level etc	<b>1st</b>	Total Station (only demonstrations)(G-1)
	<b>2nd</b>	Use of planimeter for computing areas	<b>2nd</b>	Total Station (only demonstrations)(G-2)
	<b>3rd</b>	revision		