

SURVEYING

Subject Code: **CE305ES**

Regulations: **R17 - JNTUH**

Class : II Year B.Tech CE I Semester



Department of Civil Engineering

BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY

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SURVEYING (CE305ES) COURSE PLANNER

I. COURSE OVERVIEW:

Surveying is the technique, profession, science and art of making all essential measurements to determine the relative position of points or physical and cultural details above, on, or beneath the surface of the Earth, and to depict them in a plan or map. In their objective, surveyors use elements of mathematics

(geometry and trigonometry), physics, engineering and law. Surveyors measure certain dimensions that generally occur on the surface of the Earth. Surveying equipment, such as levels and theodolites, are used for accurate measurement of angular deviation, horizontal, usable form, or to establish the position of points or details. These points are usually on the surface of the earth, and they are often used to establish land maps and boundaries for ownership or governmental purposes. To accomplish vertical and sloped distances. With computerization, electronic distance measurement (EDM), total stations, GPS surveying and laser scanning have supplemented (and to a large extent supplanted) the traditional optical instruments.

II. PREREQUISITE(S):

Level	Credits	Periods/Week	Prerequisites
UG	4	4	Basic Mathematics

III. COURSE OBJECTIVES:

At the end of the course, the students will be able to:

1. In this course we can know the basic of civil engineering for planning an area.
2. To calculate the unknown area of the earth's surface. By mathematical formulas.
3. The graduate can assist land survey in various surveying and mapping projects.
4. Their technical skills and knowledge will enable them to perform their work duties with a commitment to quality, time line, and continuous improvement.
5. To understand the mathematical formulas for survey in different types such as plane table survey, compass survey and chain survey.
6. To develop professional and ethical attitude, effective communication skills, leadership, teamwork skill, multidisciplinary approach and an ability to measure the area and distance from starting station to end station.
7. Graduates will exhibit an interest in life long learning.
8. To gain experience of doing independent work by the surveying methods

IV. COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

1. To understand the use of three basic surveying **tools: the tape, the level, and the (Theodolite).**
2. To apply geometric and trigonometric principles to basic surveying calculations.
3. To become efficient in keeping accurate, legible and complete notes in a well-prepared field book.
4. To understand field procedures in basic types of surveys, and the responsibilities of a surveying team.
5. To acquire an awareness of the limitations of the basic surveying instruments and the possible errors that could arise.
6. To apply drawing techniques in the development of a topographic map.
7. Demonstrate knowledge of professional and ethical responsibilities.
8. To understand the different methods of calculation of areas and volumes of an irregular boundaries.
9. To understand the different methods of calculation of heights and distances using angular measurements.
10. Develop confidence for self education and ability for life-long learning in field works.

11. Can participate and succeed in competitive examinations like GATE, PGECET.

V. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	An ability to apply knowledge of computing, mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer-based systems to real-world problems (fundamental engineering analysis skills)	S	Assignments, Tutorials.
PO2	An ability to design and conduct experiments, as well as to analyze and interpret data (information retrieval skills)	H	Assignments, Tutorials,
PO3	An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability (Creative Skills)	H	Assignments, Tutorials, Exams
PO4	An ability to function effectively on multi-disciplinary teams (team work)	S	--
PO5	An ability to analyze a problem, identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution (Engineering problem solving skills)	H	Assignments, Exams
PO6	An understanding of professional, ethical, legal, security and social issues and responsibilities (professional integrity)	S	--
PO7	An ability to communicate effectively both in writing and orally (speaking / writing skills)	S	--
PO8	The broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society (engineering impact assessment skills)	S	Assignments, Exams.
PO9	Recognition of the need for, and an ability to engage in continuing professional development and life-long learning (continuing education awareness)	H	Assignments and Exams
PO10	A Knowledge of contemporary issues (social awareness)	H	Assignments and Exams
PO11	An ability to use current techniques, skills, and tools necessary for computing and engineering practice (practical engineering analysis skills)	H	Assignments and Exams

PO12	An ability to apply design and development principles in the construction of software and hardware systems of varying complexity (software hardware interface)	N	--
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N-None

S-Supportive

H-Highly Related

VI. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	UNDERSTANDING: Graduates will have an ability to understand, analyze and solve problems using basic mathematics and apply the techniques related to irrigation, structural design, etc.	H	Assignments, Tutorials, Exams
PSO2	ANALYTICAL SKILLS: Graduates will have an ability to design civil structures, using construction components and to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety manufacturability and reliability and learn to work with multidisciplinary teams.	H	Projects
PSO3	BROADNESS: Graduates will have an exposure to various fields of engineering necessary to understand the impact of other disciplines on civil engineering blueprints in a global, economic, and societal context and to have necessary focus for postgraduate education and research opportunities at global level.	S	Guest Lectures

VII. SYLLABUS:

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass - Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

UNIT - II

Levelling and Contouring

Leveling- Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes

Areas - Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes - Computation of areas for level section and two level sections with and without

transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT - IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves, Introduction to compound curves.

UNIT - V

Modern Surveying Methods: Total Station and Global Positioning System. : Basic principles, classifications, applications, comparison with conventional surveying.

Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS

SUGGESTED BOOKS:

TEXT BOOKS

1. Chandra A M, "Plane Surveying" and "Higher Surveying" New age International Pvt.Ltd., Publishers, New Delhi, 2002.
2. Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. New Delhi, 2004.

REFERENCE BOOKS

1. Surveying and Leveling by R. Subramanian, Second Edition Oxford University Press – 2012
2. Surveying Theory and Practice Seventh edition by James M. and Andeson Edward M. Mikhail TATA McGraw Hill.
3. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill- 2000.
4. "Advanced Surveying Total Station GIS and Remote Sensing by Satheesh Gopi, R. Sathi Kumar and N.Madhu.

NPTEL WEB COURSE:

<http://nptel.ac.in/courses/105104101/>

NPTEL VIDEO COURSE:

<http://nptel.ac.in/courses/105104101/#>

RELEVANT SYLLABUS FOR GATE

Importance of surveying, principles and classifications, mapping concepts, coordinate system, map projections, measurements of distance and directions, leveling, theodolite traversing, plane table surveying, errors and adjustments, curves

RELEVANT SYLLABUS FOR IES

Classification of surveys, scales, accuracy; Measurement of distances - direct and indirect methods; optical and electronic devices; Measurement of directions, prismatic compass, local attraction; Theodolites - types; Measurement of elevations - Spirit and trigonometric levelling; Relief representation; Contours; Digital elevation modelling concept; Establishment of control by triangulations and traversing - measurements and adjustment of observations, computation of coordinates; Field astronomy, Concept of Global Positioning System; Map preparation by plane tabling and by Photogrammetry; Remote Sensing concepts, Map substitutes

VIII. COURSE PLAN:

Lecture No.	Week	Unit	Learning Objective	Topics to be covered	References
1	1	1	INTRODUCTION:- Objective of survey and primary division.	To know about surveying	T2:24.6 T2:24.8
2	1	1	Principles of survey, Classification of survey.	To understand about the principles and classification of surveying	T2:24.7
3	1	1	Use of chain survey & terminology instruments used in it.	To know about chain survey	T7:12.14
4	1	1	Types of chains, errors while using it.	To learn about types of chains and uses	T4:3.10
5	2	1	Problems on error due to chain.	To know the problems in chain survey	T2:24.6
6	2	1	Ranging, traversing using chain..	To understand the ranging of area which is calculated	T7:12.14
7	2	1	Types in compass, principle and objective.	To know about the compass survey and its principles	T4:3.10
8	2	1	Terms, terminology and adjustments in it.	To learn how to adjust the compass survey	T4:3.11 T4:3.12
9	3	1	Types of bearings	To understand about bearings and its types	T1:16.2
10	3	1	Plane table survey objective	To learn about plane table survey	T1:16.5
11	3	1	Methods of plane table survey	To understand about different methods of plane table survey	T1:16.6.2
12	3	1	Methods of plane table survey	To understand about different methods of plane table survey	T1:16.6.2
13	4	1	Error in plane table survey, Problem solving	To know the errors and problems in plane table survey	T2:26.9
14	4	1	Error in plane table survey, Problem solving	To know the errors and problems in plane table survey	T2:26.9

15	4	2	Different methods distance measurement	To understand about measurements and types in measuring	T2:26.11
16	4	2	Problems	To know the problems in measurements	T1:16.7
17	5	2	Chaining on un even ground	To understand the chaining on irregular grounds	T2:26
18	5	2	Errors in chain	To know the errors in chain measurement	T2
20	5	2	Obstacles in chaining	To know the area between to shores of river by chaining and tape measurement	T2:20.9 T2:20.10
21	5	2	Obstacles in chaining	To know the area between to shores of river by chaining and tape measurement	T2:20.9 T2:20.10
22	6	2	Azimuth, bearings	To learn about azimuth, bearings	T4:5.13 T2:34.2
23	6	2	Measurement of angles	To know the measurements of angles in an area which we are plotting	T2:21.1- 21.2
24	6	2	Dip & declination	To know about the dip & declination	T:21.3- T:21.4
25	7	2	Dip & declination	To know about the dip & declination	T:21.3- T:21.4
26	7	2	problems	To calculate the area by different formal and solving the problems and measuring the areas	T2:21.5- 21.6
27	7	2	problems	To calculate the area by different formal and solving the problems and measuring the areas	T2:21.5- 21.6
28	7	3	LEVELING:- Introduction on leveling, terminology and their definitions.	To understand about leveling and its terminology	T4:7.1- 7.3
29	8	3	Instruments	To know about the instruments used for leveling	T3:27.2
30	8	3	Temporary adjustments in leveling	To know the adjustments in temporary method	T3:27.9
31	8	3	Permanent adjustments and focusing	To know the adjustments in permanent method	T3:27.9
32	8	3	Permanent adjustments and focusing	To know the adjustments in permanent method	T3:27.9
33	9	3	Methods of leveling	To learn methods of leveling	T3:27.10
34	9	3	Steps in leveling and	To know the steps and	T3:27.11

			problems	problems in leveling	
35	9	3	Steps in leveling and problems	To know the steps and problems in leveling	T3:27.11
36	9	4	CONTOURING:- Introduction on contour	To know about the contouring	T4:10.6
37	1 0	4	characteristics	To learn the characteristics of contouring	T4:10.7
38	1 0	4	Methods of locating contour	To know different methods	T4:10.8
39	1 0	4	Contour gradient	To understand the contour gradient	T4:10.9
40	1 0	4	Use of Contour	To know the uses and functions of contour	T4:10.11
41	1 1	4	COMPUTATION OF AREAS AND VOLUMES:- Introduction and methods	To know the computation of areas & volumes	T5:11.1
42	1 1	4	Introduction and methods	To know the computation of areas & volumes	T5:11.1
43	1 1	4	Computation of area using different methods of regular and irregular areas & problems on each type	To learn in different methods for different areas and volumes	T5:11.2
44	1 1	4	Computation of area using different methods of regular and irregular areas & problems on each type	To learn in different methods for different areas and volumes	T5:11.2
45	1 2	4	Calculation of volume of different type pits	To know the calculation of different types of pits	T5:11.3
46	1 2	4	A level section, two level section and respective problems	To know the different levels and their problems	T5:11.
47	1 2	4	A level section, two level section and respective problems	To know the different levels and their problems	T5:11.
48	1 2	4	Volume of a reservoir	To calculate the volume of reservoir for storage of water for drinking and irrigation	T5:11.5
49	1 3	5	THEODOLITE:- Description	To learn about theodolites and its description	T5:11.1
50	1 3	5	Terminology	To know about terminology	T5:11.2
51	1 3	5	Temporary adjustments	To understand about temporary adjustments	T5:11.3
52	1 3	5	Permanent adjustments	To understand about permanent adjustments	T5:11.5

53	1 4	5	Permanent adjustments	To understand about permanent adjustments	T5:11.5
54	1 4	5	Measuring horizontal angles	To know about the measuring horizontal angles	T5:11.7
55	1 4	5	Measuring horizontal angles	To know about the measuring horizontal angles	T5:11.7
56	1 4	5	Uses of theodolites	To understand the uses of theodolites	T5:11.8
57	1 5	5	Errors in theodolites	To know about the errors of theodolites	T5:11.10
58	1 5	5	Trigonometric leveling	To know about the trigonometric leveling of theodolites	T5:11.11
59	1 5	5	Leveling in different conditions depend on ground and respective	To know about the leveling in different conditions depend on ground and respective	T5:11.15
60	1 5	5	Leveling in different conditions depend on ground and respective	To know about the leveling in different conditions depend on ground and respective	T5:11.15
61	1 6	5	Problems on Trigonometric leveling	To know about the Problems on trigonometric leveling	T5:11.19
62	1 6	5	Problems on Trigonometric leveling	To know about the Problems on trigonometric leveling	T5:11.19
63	1 6	5	All the problems explanation	To understand total problems	T5:11.22
64	1 6	5	All the problems explanation	To understand total problems	T5:11.22

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Objectives	Program Outcomes												Program Specific		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O1	PSO 2	PS O3
I	S	H											H		S
II	H	S											H	S	
III				H			S						H	S	
IV											S		S	H	
V			H	S						S			S	H	S
VI								S	S			S			S
VII															
VIII															

X. QUESTION BANK: (JNTUH)

UNIT – I**SHORT ANSWER QUESTIONS.**

S.N	Question	Blooms Taxonomy Level	Program Out come
1.	Define Surveying	Understanding	1
2.	State the Principle of surveying	Understanding	1
3.	State the two Primary division of surveying	Understanding	1
4.	What are the different types of chains	Understanding	1
5.	State the types of errors in chain	Understanding	1
6.	What are the different types of tapes	Understanding	1
7.	What are the different types of compasses	Understanding	1
8.	Define Magnetic Bearing	Understanding	2
9.	Define Arbitrary Bearing	Understanding	2
10.	Define Magnetic Meridian	Understanding	2
11.	Define local attraction	Understanding	2
12.	Define magnetic Dip	Understanding	2
13.	Define magnetic Declination	Understanding	2
14.	What is local Attraction	Understanding	3
15.	Define Surveying	Understanding	3

LONG ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Out come
1	What is the Principle of surveying	Understanding & remembering	1
2	Give the classification of surveying in brief based upon Nature of field	Understanding & remembering	1
3	Give the classification of surveying in brief based upon purpose/objectives	Understanding & remembering	1
4	Give the classification of surveying in brief based upon Instruments used	Understanding & remembering	1
5	A 20m chain used for a survey was found to be 20.10m at the beginning and 20.30m at the end of the work. The area of the plot drawn to a scale of 1 cm = 8m was measured with the help of a planimeter and	Analyze & Apply	2
6	A 30m chain used for a survey was found to be 20.10m at the beginning and 20.50m at the end of the work. The area of the plot drawn to a scale of 1 cm = 6m was measured with the help of a planimeter and	Analyze & Apply	2

7	A 20m chain was found to be 10cm too long after chaining a distance of 1500m. It was found to be 18cm too long at the end of the day's work after chaining a total distance of 2900m. Find the true distance if the chain was corrected before the commencement of the work.	Analyze & Apply	2
8	A line was measured with a steel tape which is exactly 30m long at 18°C and found to be 452.343m. The temperature during measurement was 32°C . Find the true length of the line. Take coefficient of thermal expansion of tape $^{\circ}\text{C} = 0.0000117$	Analyze & Apply	2
9	The area of the field was found to be 4000m^2 we measured with a chain	Analyze & Apply	2
10	The area of the field was found to be 6000m^2 we measured with a chain	Analyze & Apply	2
11	The distance between the points measured along a slope is 428m find the horizontal distance between them if i) The angle of slope between the points is 8° ii) The difference in level is 62m iii) The slope is 1 in 4	Analyze & Apply	2

UNIT – II

SHORT ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Out come
1	Define Leveling	Understanding	4
2	Define level surface	Understanding	4
3	Define horizontal plane	Understanding	
4	Define Horizontal line	Understanding & remembering	4
5	Define vertical line	Understanding & remembering	4
6	Define Datum	Understanding & remembering	4
7	Define Bench Mark	Understanding & remembering	4
8	Define Mean Sea level	Understanding & remembering	4
9	State any two methods of leveling	Understanding & remembering	4
10	What are the checks in Rise and Fall method	Understanding & remembering	4
11	What are the checks in height of instrument method	Understanding & remembering	4

LONG ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy	Program Out come
1	Eight readings were taken with a level in sequence as follows: 1.585, 1.315, 2.305, 1.225, 1.325, 1.065, 1.815 and 2.325. The level was shifted after the third and sixth readings. The second change point was a bench mark of elevation 186.975. Find the reduced levels of the remaining stations. Use the rise and fall method	analyze & Apply	4
2	The following staff readings were obtained during a leveling work with the instrument being shifted after the 4th, 7th and 10th. Readings: 2.305, 0.940, 0.865, 1.325, 2.905, 1.185, 1.205, 2.015, 1.365, 0.985 and 1.785. Find the reduced levels of the remaining points if the RL of the second turning point is 100.00	analyze & Apply	4
3	The following ten readings were taken with a level, the instrument being shifted after the fifth and eighth readings: 1.315, 0.965, 2.345, 1.1.05, 0.875, 1.155, 1.305, 1.675, 1.345 and 1.875. The RL of the first turning point is 100.000. Find the reduced levels of the remaining points by the height of collimation method.	analyze & Apply	4
4	Define the terms i) Level surface ii) Datum iii) Bench mark iv) Mean sea level	analyze & Apply	4
5	Explain briefly about the different types of leveling instruments	analyze & Apply	4
6	The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eight readings 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 meters. Enter the above readings in a page of a level book and calculate the R L of points if the first reading was taken with a staff held on a bench mark of 432.384m	analyze & Apply	4
7	Classify the different type of errors in leveling	analyze & Apply	4

8	The following staff readings were observed successively with level, the instrument having moved after the second, fourth and eighth readings 0.875, 1.235, 2.310, 1.385, 2.930, 3.125, 4.125, 0.120, 1.875, 2.030, 3.765 The first reading was taken with the staff held upon a benchmark of elevation 132.135 apply usual checks	analyze & Apply	4
9	Write the temporary adjustments of a level	analyze & Apply	4
10	The following ten readings were taken with a level, the instrument being shifted after the fifth and eighth readings: 1.315, 0.965, 1.345, 1.1.05, 0.875, 1.155, 1.305, 1.675, 1.345 and 1.875. The RL of the first turning point is 100.000. Find the reduced levels of the remaining points by the Rise and fall method.	analyze & Apply	4
11	Write a note on interpolation of contours	Understandi	4
12	Write a note on Uses and advantage s of contours	Understandi ng	4

UNIT – III

SHORT ANSWER QUESTIONS.

S. No	Question	Blooms Taxonomy	Pro gra
1	What is an equilateral conditioned triangle	Understanding	5
2	What is a Base line	Understanding	5
3	What is a tie line	Understanding	
4	What is a check line	Understanding	5
5	Write the formula for an area using mid-ordinate rule	Understanding	5
6	Write the formula for an area using average ordinate rule	Understanding & remembering	5 4
7	Write the formula for an area using trapezoidal rule	Understanding & remembering	6 4
8	Write the formula for an area using simpson's rule	Understanding & remembering	6
9	Write the formula to calculate volume using Meridian distance method	Understanding & remembering	6
10	Write the formula to calculate volume using Double Meridian distance Method	Understanding & remembering	6

LONG ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy	Program Out
1	Discuss the following methods of computation of area of a tract with straight but irregular boundaries. i) Mid-ordinate rule ii) Average - ordinate rule iii) Trapezoidal rule	Understanding	5
2	The following perpendicular offsets were taken at 10m intervals from a survey line to an irregular boundary 3.25,5.60,4.20,6.65,8.75,6.20,3.25,4.20,5.65 calculate the area enclosed between the survey line , the irregular boundary line , and the first and last offsets, by the application of i) Trapezoidal rule ii) Simpson's rule	analyze & Apply	5
3	A series of offsets were taken from a chain line to a curved boundary line at intervals of 15m in the following order 0,2.65,3.80,3.75,4.65,3.60,4.95,5.85m compute the area between the chain line, the curved boundary line and the end offsets by i) Trapezoidal rule ii) Simpsons rule	analyze & Apply	5
4	A railway embankment is 10m wide with side slope 1.5 to1 assume the ground to be level in a direction traverse to the centre line, calculate the volume contained in a length of 120m, the centre height at 20m intervals being in meters 1.2, 4.7, 3.8, 4.0, 1.8, 2.8, 2.5 solve using Prismoidal rule	Analyze & Apply	6
5	A railway embankment is 10m wide with side slope 1.5 to1 assume the ground to be level in a direction traverse to the centre line, calculate the volume contained in a length of 120m, the centre height at 20m intervals being in meters 2.2, 3.7, 3.8, 2.0, 3.8, 3.8, 2.5 solve using Trapezoidal rule	Analyze & Apply	6
6	A railway embankment is 10m wide with side slope 1.5 to1 assume the ground to be level in a direction traverse to the centre line, calculate the volume contained in a length of 120m, the centre height at 20m intervals being in meters 1.8, 3.7, 4.8, 4.0, 2.8, 2.8, 3.5 solve using Prismoidal rule	Analyze & Apply	6
7	Draw the sketch of a two level section, and derive an expression for the area of cross-section	Understanding	5

8	Explain the method of computation of volume by the	Understanding	5
9	How would you determine the capacity of a reservoir from the contour plan	Understanding	5
10	Calculate the side widths and cross-sectional area of an embankment having the following dimensions.	Apply & Evaluate	5

UNIT – IV

SHORT ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Out come
1	Define transit theodolite	Understanding & remembering	7
2	Define Non-transit theodolite	Understanding & remembering	7
3	Define is vertical axis	Understanding & remembering	7
4	Define horizontal axis	Understanding & remembering	7
5	Define line of sight or line of collimation	Understanding & remembering	7
6	Define axis of level tube	Understanding & remembering	7
7	Define centring	Understanding & remembering	7
8	Define transiting	Understanding & remembering	7
9	Define swinging of telescope	Understanding & remembering	7
10	Define face left observation	Understanding	8

LONG ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy	Program Out come
1	Draw neat sketch of a vernier theodolite. Describe its main parts and their functions	Understanding	7
2	Explain the temporary adjustments of theodolite	Understanding	7
3	Explain the procedure for the reiteration method of measuring horizontal angles.	Understanding	7
4	Explain briefly the methods used to locate	Understanding	7
5	Explain the steps involved in measuring	Understanding	8

6	Explain briefly the possible instrumental errors in theodolite work and the precautions that should be taken to eliminate them.	Understanding	8
7	What is mean by face left and face right of theodolite? How would you change face? What instrumental errors are eliminated by face left and face right observations?	Understanding	8
8	Define the terms i) transit theodolite ii) Non-transit theodolite iii) vertical axis iv) horizontal axis	Understanding	8
9	Define the terms i) transiting ii) swinging of telescope iii) face left observation iv) face Right observation	Understanding	8
10	Define triangulation method in detail	Understanding	8

UNIT – V

SHORT ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy Level	Program Out
1	Define Tachometry	Understanding & remembering	9
2	Write the formula for to calculate horizontal distance if staff held	Understanding & remembering	9
3	Write the formula for to calculate vertical distance if staff held vertical	Understanding & remembering	9
4	What is a simple curve	Understanding & remembering	9
5	What is a compound curve	Understanding & remembering	9
6	What is a reverse curve	Understanding & remembering	9
7	What is forward tangent	Understanding & remembering	9
8	What is backward tangent	Understanding & remembering	9
9	What is long cord in a curve	Understanding & remembering	9
10	What is point of tangency	Understanding & remembering	9

LONG ANSWER QUESTIONS.

S.No	Question	Blooms Taxonomy	Program Out
1	Write short notes on electronic theodolite	Understanding	9
2	Explain briefly the working principle of electronic theodolite	Understanding	9
3	Describe briefly the advantages of electronic theodolite	Understanding	9
4	Describe briefly the salient features of total station	Understanding	9
5	Explain functioning and capabilities of a total station	Understanding	9
6	Describe briefly the advantages of total station	Understanding	9
7	Write a brief note on GPS.	Understanding	9
8	Explain briefly how GPS works to determine the position coordinates	Understanding	9
9	Write briefly about the applications of GIS.	Understanding	9
10	Write short notes on GIS.	Understanding	9
11	State the type of curves and explain the components of a simple curve	Understanding	9

XI. OBJECTIVE QUESTIONS: JNTUH**UNIT – I**

- During chaining along a straight line, the leader of the party has 4 arrows in his hand while the follower has 6. Distance of the follower from the starting point is
a) 4 chains b) 6 chains c) 120 m d) 180m
- A metallic tape is made of
a) steel b) invar c) linen d) cloth and wires
- For a well-conditioned triangle, no angle should be less than
a) 20° b) 30° c) 45° d) 60°
- The angle of intersection of the two plane mirrors of an optical square is
a) 30° b) 45° c) 60° d) 90°
- The allowable length of an offset depends upon the
a) degree of accuracy required
b) method of setting out the perpendiculars and nature of ground
c) scale of plotting d) all of the above
- Which of the following angles can be set out with the help of French cross staff?
a) 45° only b) 90° only c) either 45° or 90° d) any angle
- Which of the following methods of offsets involves less measurement on the ground?
a) method of perpendicular offsets b) method of oblique offsets
c) method of ties d) all involve equal measurement on the ground
- The permissible error in chaining for measurement with chain on rough or hilly ground is
a) 1 in 100 b) 1 in 250 c) 1 in 500 d) 1 in 1000

9. The correction for sag is
 - a) always additive b) always subtractive
 - c) always zero d) sometimes additive and sometimes subtractive
10. Cross staff is an instrument use d for
 - a) measuring approximate horizontal angles b) setting out right angles
 - c) measuring bearings of the lines d) none of the above
11. Normal tension is that pull which
 - a) is used at the time of standardising the tape
 - b) neutralizes the effect due to pull and sag
 - c) makes the correction due to sag equal to zero
 - d) makes the correction due to pull equal to zero
12. Which of the following is not use d in measuring perpendicular offsets?
 - a) line ranger b) steel tape c) optical square d) cross staff
13. If the length of a chain is found to be short on testing, it can be adjusted by
 - a) straightening the links b) removing one or more small circular rings
 - c) closing the joints of the rings if opened out d) all of the above
14. The maximum tolerance in a 20 m chain is
 - a) ± 2 mm b) ± 3 mm c) ± 5 mm d) ± 8 mm
15. For accurate work, the steel band should always be use d in preference to chain because the steel band
 - a) is lighter than chain b) is easier to handle
 - c) is practically inextensible and is not liable to kinks when in use
 - d) can be easily repaired in the field

UNIT – II

1. Theodolite is an instrument use d for
 - a) Tightening the capstan-headed nuts of level tube
 - b) Measurement of horizontal angles only c) Measurement of vertical angles only
 - d) Measurement of both horizontal and vertical angles
2. The process of turning the telescope about the vertical axis in horizontal plane is known as
 - a) transiting b) reversing c) plunging d) swinging
3. Size of a theodolite is specified by
 - a) the length of telescope b) the diameter of vertical circle
 - c) the diameter of lower plate d) the diameter of upper plate
4. Which of the following is not the function of levelling head?
 - a) to support the main part of the instrument b) to attach the theodolite to the tripod
 - c) to provide a means for leveling the theodolite d) none of the above
5. A telescope is said to be inverted if its
 - a) Vertical circle is to its right and the bubble of the telescope is down
 - b) Vertical circle is to its right and the bubble of the telescope is up
 - c) Vertical circle is to its left and the bubble of the telescope is down
 - d) Vertical circle is to its left and the bubble of the telescope is up
6. The cross hairs in the surveying telescope are place d
 - a) Midway between eye piece and objective lens
 - b) Much closer to the eye-piece than to the objective lens
 - c) Much closer to the objective lens than to the eye piece
 - d) Anywhere between eye-piece and objective lens

7. For which of the following permanent adjustments of theodolite, the spire test is used?
 - a) Adjustment of plate levels
 - b) Adjustment of line of sight
 - c) Adjustment of horizontal axis
 - d) Adjustment of altitude bubble and vertical index frame
8. The adjustment of horizontal cross hair is required particularly when the instrument is used for
 - a) leveling
 - b) prolonging a straight line
 - c) measurement of horizontal angles
 - d) all of the above
9. Which of the following errors is not eliminated by the method of repetition of horizontal angle measurement?
 - a) error due to eccentricity of verniers
 - b) error due to displacement of station signals
 - c) error due to wrong adjustment of line of collimation and trunnion axis
 - d) error due to inaccurate graduation
10. The error due to eccentricity of inner and outer axes can be eliminated by
 - a) reading both verniers and taking the mean of the two
 - b) taking both face observations and taking the mean of the two
 - c) double sighting
 - d) taking mean of several readings distributed over different portions of the graduated circle
11. Which of the following errors can be eliminated by taking mean of both face observations?
 - a) Error due to imperfect graduations
 - b) Error due to eccentricity of verniers
 - c) Error due to imperfect adjustment of plate levels
 - d) Error due to line of collimation not being perpendicular to horizontal axis
12. Which of the following errors cannot be eliminated by taking both face observations?
 - a) Error due to horizontal axis not being perpendicular to the vertical axis
 - b) Index error i.e. error due to imperfect adjustment of the vertical circle vernier
 - c) Error due to non-parallelism of the axis of telescope level and line of collimation
 - d) None of the above

UNIT – III

1. Which of the following methods of theodolite traversing is suitable for locating the details which are far away from transit stations?
 - a) measuring angle and distance from one transit station
 - b) measuring angles to the point from at least two stations
 - c) measuring angle at one station and distance from other
 - d) measuring distance from two points on traverse line
2. Subtense bar is an instrument used for
 - a) leveling
 - b) Measurement of horizontal distances in plane areas
 - c) Measurement of horizontal distances in undulated areas
 - d) Measurement of angles
3. Horizontal distances obtained by thermometric observations
 - a) require slope correction
 - b) require tension correction
 - c) require slope and tension corrections
 - d) do not require slope and tension corrections
4. The number of horizontal cross wires in a stadia diaphragm is
 - a) one
 - b) two
 - c) three
 - d) four
5. If the intercept on a vertical staff is observed as 0.75 m from a tacheometer, the horizontal distance between tacheometer and staff station is
 - a) 7.5 m
 - b) 25 m
 - c) 50 m
 - d) 75 m
6. For a tacheometer the additive and multiplying constants are respectively

- a) 0 and 100 b) 100 and 0 c) 0 and 0 d) 100 and 100
7. If the focal length of the object glass is 25 cm and the distance from object glass to the trunnion axis is 15 cm, the additive constant is
a) 0.1 b) 0.4 c) 0.6 d) 1.33
8. Overturning of vehicles on a curve can be avoided by using
a) compound curve b) vertical curve c) reverse curve d) transition curve
9. Different grades are joined together by a
a) compound curve b) transition curve c) reverse curve d) vertical curve
10. The process of determining the locations of the instrument station by drawing resectors from the locations of the known stations is called
a) radiation b) intersection c) resection d) traversing

UNIT IV

1. An ideal vertical curve to join two gradients, is
a) Parabolic b) circular c) hyperbolic d) elliptical
2. One of the tachometric constants is additive, the other constant, is
a) subtractive constant b) multiplying constant c) dividing constant d) indicative constant.
3. Closed contours of decreasing values towards their centre, represent
a) a depression b) a saddle or pass c) a hill d) a river bed.
4. Hydrographic surveys deal with the mapping of
A. large water bodies B. heavenly bodies C. mountainous region
D. canal system E. movement of clouds.
5. If h is the difference in level between end points separated by l , then the slope correction
 $\frac{h^2}{2l} + \frac{h^4}{8l^3}$ is . The second term may be neglected if the value of h in a 20 m distance is less than
a) $\frac{1}{2}$ m b) 1 m c) 2 m d) 3 m
6. An ideal vertical curve to join two gradients, is
A. circular B. parabolic C. elliptical D. hyperbolic E. none of these.
7. Pick up the correct statement from the following :
A. the eyepiece plays no part in defining the line of sight
B. the diaphragm plays no part in defining the line of sight
C. the optical centre of the objective plays no part in defining the line of sight D. none of these.
8. The intercept of a staff
a) is maximum if the staff is held truly normal to the line of sight.
b) is minimum if the staff is held truly normal to the line of sight.
c) decreases if the staff is tilted away from normal
d) increases if the staff is tilted towards normal.
9. The radius of curvature of the arc of the bubble tube is generally kept
A. 10 m B. 25 m C. 50 m D. 100 m
10. If S is the length of a subchord and R is the radius of simple curve, the angle of deflection between its tangent and sub-chord, in minutes, is equal to
A. $573 S/R$ B. $573 R/S$ C. $171.9 S/R$ D. $1718.9 R/S$ E. $1718.9 S/R$.
11. The real image of an object formed by the objective, must lie
A. in the plane of cross hairs B. at the centre of the telescope
C. at the optical centre of the eye-piece D. anywhere inside the telescope.

UNIT IV

1. The sensitivity of a bubble tube can be increased by
 - a) increasing the diameter of the tube
 - b) decreasing the length of bubble
 - c) increasing the viscosity of liquid
 - d) decreasing the radius of curvature of tube
2. With the rise of temperature, the sensitivity of a bubble tube
 - a) decreases
 - b) increases
 - c) remains unaffected
 - d) none of the above
3. Refraction correction
 - a) completely eliminates curvature correction
 - b) partially eliminates curvature correction
 - c) adds to the curvature correction
 - d) has no effect on curvature correction
4. The R.L. of the point A which is on the floor is 100 m and back sight reading on A is 2.455 m. If the fore sight reading on the point B which is on the ceiling is 2.745 m, the R.L. of point B will be
 - a) 94.80 m
 - b) 99.71 m
 - c) 100.29 m
 - d) 105.20 m
5. Which of the following angles can be set out with the help of French cross staff?
 - a. 45° only
 - b. 90° only
 - c. either 45° or 90°
 - d. any angle
6. If the true bearing of a line AB is 269° 30', then the azimuth of the line AB is
 - a. 0° 30'
 - b. 89° 30'
 - c. 90° 30'
 - d. 269° 30'
7. For a well-conditioned triangle, no angle should be less than
 - a. 20°
 - b. 30°
 - c. 45°
 - d. 60°
8. In the quadrantal bearing system, a whole circle bearing of 293° 30' can be expressed as
 - a) W23°30'N
 - b) N66°30'W
 - c) S113°30'N
 - d) N23°30'W
9. The angle of intersection of the two plane mirrors of an optical square is
 - a) 30°
 - b) 45°
 - c) 60°
 - d) 90°
10. Local attraction in compass surveying may exist due to
 - a. incorrect levelling of the magnetic needle
 - b) loss of magnetism of the needle
 - c) friction of the needle at the pivot
 - d) presence of magnetic substances near the instrument
11. In the prismatic compass
 - a. the magnetic needle moves with the box
 - b. the line of the sight does not move with the box
 - c. the magnetic needle and graduated circle do not move with the box
 - d. the graduated circle is fixed to the box and the magnetic needle always remains in the N-S direction
12. Select the incorrect statement.
 - a. The true meridians at different places are parallel to each other.
 - b. The true meridian at any place is not variable.
 - c. The true meridians converge to a point in northern and southern hemispheres.
 - d. The maps prepared by national survey departments of any country are based on true meridians.

XII. GATE QUESTIONS:

1. The length of a chain is measured from
 - a. centre of one handle to centre of other handle
 - b) outside of one handle to outside of other handle
 - c. outside of one handle to inside of other handle
 - d. inside of one handle to inside of other handle

2. The maximum tolerance in a 20 m chain is
 - a. 2 mm b)3 mm c)5 mm d)8 mm
3. Which of the following methods of offsets involves less measurement on the ground?
 - a. method of perpendicular offsets b)method of oblique offsets
 - c) method of ties d)all involve equal measurement on the ground
4. The permissible error in chaining for measurement with chain on rough or hilly ground is
 - a. 1 in 100 b)1 in 250 c)1 in 500 d)1 in 1000
5. For accurate work, the steel band should always be used in preference to chain because the steel band
 - a. is lighter than chain b)is easier to handle
 - b. is practically inextensible and is not liable to kinks when in use
 - c. can be easily repaired in the field
6. Normal tension is that pull which
 - a. is used at the time of standardising the tape
 - b. neutralizes the effect due to pull and sag
 - c. makes the correction due to sag equal to zero
 - d. makes the correction due to pull equal to zero
7. The correction for sag is
 - a. always additive b)always subtractive
 - c)always zero d)sometimes additive and sometimes subtractive
8. For a line AB
 - a. the forebearing of AB and back bearing of AB differ by 180°
 - b. the forebearing of AB and back bearing of BA differ by 180°
 - c. both (a) and (b) are correct. D)none is correct
9. Cross staff is an instrument used for
 - a. measuring approximate horizontal angles b)setting out right angles
 - c)measuring bearings of the lines d)none of the above
10. The horizontal angle between the true meridian and magnetic meridian at a place is called
 - a. Azimuth b)declination c)local attraction d)magnetic bearing
11. The prismatic compass and surveyor's compass
 - a. give whole circle bearing (WCB) of a line and quadrantal bearing (QB) of a line respectively
 - b. both give QB of a line and WCB of a line c)both give QB of a line
 - d)both give WCB of a line
12. If the magnetic bearing of the sun at a place at noon in southern hemisphere is 167° , the magnetic declination at that place is
 - a. 77° N b) 23° S c) 13° E d) 13° W
13. A negative declination shows that the magnetic meridian is to the
 - a. eastern side of the true meridian. b. western side of the true meridian
 - a. southern side of the true meridian d. none of the above
14. A metallic tape is made of
 - a. Steel b. invar c. linen d. cloth and wires
15. The allowable length of an offset depends upon the
 - a. degree of accuracy required
 - b. method of setting out the perpendiculars and nature of ground
 - c. scale of plotting

- d. all of the above
16. The length of a chain is measured from
- centre of one handle to centre of other handle
 - outside of one handle to outside of other handle
 - outside of one handle to inside of other handle
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17. The maximum tolerance in a 20 m chain is
- 2 mm
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 - 5 mm
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18. Which of the following methods of offsets involves less measurement on the ground?
- method of perpendicular offsets
 - method of oblique offsets
 - method of ties
 - all involve equal measurement on the ground
19. The permissible error in chaining for measurement with chain on rough or hilly ground is
- 1 in 100
 - 1 in 250
 - 1 in 500
 - 1 in 1000

XIII. WEBSITES:

- www.microsurvey.com
- www.quicktapsurvey.com
- www.engineeringsurveyor.com
- www.cesurveys.com
- www.sesltd.uk.com
- www.survey-solutions.co.uk
- www.lcmsurveying.com
- www.engsurveys.com
- www.flatsurv.com
- www.insite-eng.com
- <http://www.asce.org>

XIV. EXPERT DETAILS:

1. Dr. Jayata Kumar Josh
Geomatics Engineering Section, Department of Civil Engineering.
Indian Institute of Technology, Roorkee
2. Dr. Swarna Subba Rao
Surveyor General of India, Department of Science & Technology

XV. JOURNALS

1. New Cadastral System Approach for Planning Sustainability in Malaysia
2. International journal of geomatics and geosciences.
3. International journal of advances in remote sensing and GIS.
4. Development of spatial decision support system for water harvesting structures using remote sensing inputs
5. GIS based visualization of groundwater levels and its significance
6. Development of spatial decision support system for water harvesting structures using remote sensing inputs.
7. Journal of Surveying Engineering

XVI. LIST OF TOPICS FOR STUDENT SEMINARS

1. Theodolite surveying method
2. Total Station method of surveying
3. GIS applications

XVII. CASE STUDIES / SMALL PROJECTS

1. Plane Table surveying of a test area
2. Theodolite surveying of a test area
3. Total Station surveying of a test area