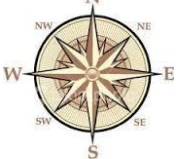


Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

	Course Title: SURVEYING - I		
	Credits (L:T:P) : 4:0:0	Total Contact Hours: 52	Course Code: 15CE21T
	Type of Course: Lectures, Self Study & Quiz	Credit : 04	Core/ Elective: Core
CIE- 25 Marks		SEE- 100 Marks	

Prerequisites: Knowledge of Basic Science and Mathematics in Secondary Education.

Course Objective:

1. To provide knowledge of basic Principles of surveying.
2. To develop the techniques of taking measurements and plotting the details.
3. Interpretation of data collected analyze and evaluate for the purpose of design, estimation

On successful completion of the course, the students will be able to:

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Interpret the basics in surveying and chain surveying.	<i>R/U/Ap</i>	1,2,3,4,8.	10
CO2	Explain the principles of compass surveying and its applications.	<i>R/U/Ap</i>	1,2,3,4,5,8.	10
CO3	Illustrate the basics in levelling, types of levelling instruments and methods of levelling	<i>R/U/Ap</i>	1,2,3,4,8.	10
CO4	Discover the types of levelling, errors and its applications.	<i>U/Ap</i>	1,2,3, 5,7,8,10	10
C05	Explain the concept of contour, its uses and methods of contouring.	<i>R/U</i>	1,2,3,5.	05
C06	Compute area and volume of irregular figures.	<i>U/Ap</i>	1,2,3.	07
C07	Perform suggested activity related to surveying, exploring in groups and able to present it.	<i>U/Ap/Ay/C</i>	1 to 10	*
		Total sessions		52

Legend- R; Remember U: Understand Ap: Application Ay: Analysis C:Creation

*** Related to Student activity beyond classroom hours.**

Programme outcome Attainment Matrix

Course	Programme Outcome									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
	Basic knowledge	Discipline knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & Sustainability	Ethics	Individual and Team work	Communication	Life long learning
SURVEYING-I	3	3	3	3	3	1	3	2	1	2

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Contents

UNIT	COURSE CONTENTS	HOURS
1	INTRODUCTION Definition and objectives of surveying, primary divisions, classifications, and principle.	10
	CHAIN SURVEYING Purpose, Accessories, Principles of chain surveying, Different operations, Ranging, Cross staff survey simple problems, Plotting the chain survey, adopting suitable conventions, Errors & corrections in chain surveying, (without numerical problems)	
2	COMPASS SURVEYING Introduction and purpose, Bearing & its type, Problems on bearings, Compass and its type, Dip and declination, Simple problems, Local attraction, Open and closed traverse, checks, Errors	10
3	LEVELLING – Terms used in leveling, types of levels, Bench marks, Temporary adjustments of level Concept of B.S, I.S, F.S, C.P, H.I and remarks, Simple leveling and differential leveling Reduction of levels i) Plane of collimation method ii) Rise and fall methods Problems on reduction of levels.	10

4	LEVELLING – APPLICATION Different types of leveling - fly leveling, check leveling, profile leveling, cross sectioning, Plotting of longitudinal and cross section, Errors in leveling and precautions, Setting grade stakes and setting out grades for sewers and problems on it.	10
5	CONTOURING Concepts of contour and terms used in contouring, characteristics of contour, uses of contours, Methods of contouring, Interpolation by arithmetical method, calculation of capacity of the reservoir.	05
6	AREAS & VOLUMES Computation of Area of Irregular figures using Trapezoidal & Simpson's rule - problems. Volumes of Irregular solids- using Trapezoidal & Prismoidal Rule - Problems on Embankment & Cutting	07
7	CASE STUDY	

Course Delivery: The course will be delivered through lectures and Power point presentations/ Video



SUGGESTED ACTIVITIES

The topic should be related to the course in order to enhance his knowledge, practical skill and lifelong learning, communication, modern tool usage.

1. Prepare a spread sheet(Microsoft Excel) of Rise and fall method showing the calculation by using formula bar and present it
2. Prepare a spread sheet (Microsoft Excel) of Height of instrument method showing the calculation by using formula bar and present it
3. Compute the area of Nehru ground or any area/agriculture field by cross staff survey and present it
4. Compute the area of Nehru ground/ any area/agriculture field by Compass survey and present it
5. Chain triangulation
6. Find the volume of excavation of a drainage
7. Conduct a experiment to overcome obstacles in chaining and ranging.
8. Conduct a open traverse in chain surveying and represent the sign conventions in the field book.
9. Conduct a closed traverse in chain surveying and represent the sign conventions in the field book calculate area.
10. New Road survey
11. Survey conducted for Widening of existing road
12. Compute the capacity of reservoir/pond near by your locality
13. Sensitivity of bubble used in levelling

14. Two Peg Test
15. Three Wire Levelling
16. Permanent Adjustments of a Dumpy Level
17. Block levelling for sloped ground level and compute the volume of earth work excavation required to construct a building.
18. Layout Plan of Existing Campus
19. Contour Map of Existing Campus
20. Carryout reciprocal levelling and make a presentation
21. Presentation on Precise levelling, Digital levelling, Digital ground model, Data logger, Triangular grid model, Units of measurements used in survey from history
22. Select an irregular area/hillock conduct a block levelling and calculate the volume of earth and present it.
23. Explore and use surveying software's and present it.
24. Select an irregular area/hillock conduct a direct contouring and calculate the volume of earth and present it.

NOTE:

1. Students should select any one of the above or other topics relevant to the subject approved by the concerned faculty, individually or in a group of 3 to 5. Students should mandatorily submit a written report and make a presentation on the topic. The task should not be repeated among students. Report will be evaluated by the faculty as per rubrics. Weightage for 5 marks Internal Assessment shall be as follows: (Unsatisfactory **1**, Developing **2**, Satisfactory **3**, Good **4**, Exemplary **5**)

2. Reports should be made available along with bluebooks to IA verification officer

Example of model of rubrics / criteria for assessing student activity

Dimension	Students score				
	(Group of five students)				
	STUDENT 1	STUDENT 2	STUDENT 3	STUDENT 4	STUDENT 5
Rubric Scale	Unsatisfactory 1 , Developing 2 , Satisfactory 3 , Good 4 , Exemplary 5				
1.Literature	5				
2.Fulfill team's roles & duties	2				
3.Conclusion	3				
4.Conversions	4				
Total	14				
Average=(Total /4)	14/4=3.5=4				
Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks One activity to attain last CO (course outcome) may be given to a group of FIVE students					

Note: Dimension should be chosen related to activity and evaluated by the course faculty

Rubric Model- Example only:

Dimension	Rubric Scale				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary
1.Literature	Has not included relevant info	Has included few relevant info	Has included some relevant info	Has included many relevant info	Has included all relevant info needed
2. Fulfill team's roles & duties	Does not perform any duties assigned	Performs very little duties	Performs partial duties	Performs nearly all duties	Performs all duties of assigned team roles
3.Communication	Poor	Less Effective	Partially effective	Effective	Most Effective
4.Conversions	Frequent Error	More Error	Some Error	Occasional Error	No Error

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)		Max Marks	Evidence collected	Course outcomes
Direct Assessment meth	CIE*	IA	Students	Three test (average of three tests)	Test 1	20	Blue books	1,2
					Test 2			3,4
					Test 3			5,6
		Suggested activity		05	Reports	1 2 3 4,5,6,7		
	SEE*	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6	
Indirect Assessment	Student Feedback on course			Students	Middle of the course		Feedback forms	1, 2,3, Delivery of course
	End of Course Survey		End of the course			Questionnaires	1,2,3, 4,5,6,7 Effectiveness of Delivery of instructions & Assessment Methods	

*CIE – Continuous Internal Evaluation *SEE – Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Weightage of Marks and blue print of marks for SEE

Unit	Major Topics	Hours Allotted	Questions to be set for SEE			Marks weightage	weightage (%)	A*	B*
			Cognitive Levels						
			R	U	Ap				
1	Introduction and chain surveying	10	30% 8	30% 8	40% 12	28	19	1	2
2	Compass surveying	10	30% 8	30% 8	40% 12	28	19	1	2
3	Leveling	10	35% 10	30% 8	35% 10	28	19	2	2
4	Leveling application	10	18% 5	35% 10	47% 13	28	19	2	2
5	Contouring	7	33% 6	33% 6	34% 7	19	13	2	1
6	Areas and volumes	5	0% 0	65% 9	35% 5	14	10	1	1
Total		52	37	49	59	145	100	9	10

A*-SEE QUESTIONS TO BE SET FOR (05MARKS) in PART – A

B*- SEE QUESTIONS TO BE SET FOR (10MARKS) in PART – B

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

Sl. No	Bloom's taxonomy	% in Weightage
1	Remembering and Understanding	61
2	Applying the knowledge acquired from the course	39

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks		
Ex: I test/6 th week of sem 10-11 Am	I/II SEM	SURVEYING-I	20		
	Year:	Course code:15CE21T			
Name of Course coordinator : CO's:_____			Units:___		
Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks	
Ex: I test/6 th week of sem 10-11 Am	II SEM	SURVEYING-I	20	
	Year: 2015-16	Course code:15CE21T		
Name of Course coordinator :				
Units:1, CO: 1,2.				
Note: Answer all questions				
Question	M	C L	C O	PO
1 Define surveying. State the objects of surveying.	4	R	1	1,2,3,4,8.
2 Explain the following terms : a) Base line b) Check line c) Tie line.	3	U	1	1,2,3,4,8.
3 What is meant by local attraction? How it is detected and eliminated?	5	R/ U	2	1,2,3,4,5,8.
4 Plot the following details of a field and calculate the area, all measurements being taken in metres. <div style="text-align: center; margin-left: 100px;"> B0 8 5C A4 15 18 3D 30E </div>	8	A	1	1,2,3,4,8.
			2	1,2,3,4,5,8.
OR.				
The following bearings were observed with compass. Calculate the interior angles.				
Line	Fore bearing	Back bearing		
AB	60° 30'	240° 30'		
BC	122° 0'	302° 0'		
CD	46° 0'	226° 0'		
DE	205° 30'	25° 30'		
EA	300° 0'	120° 0'		



TEXT BOOKS

1. Surveying and Levelling Vol- I & II by B C Punmia
2. Surveying and Levelling by T P konetkar& S V Kulkarni
3. Plane Surveying by Dr.Alak De
4. Surveying and Levelling by S SBhavikatti
5. Surveying by Duggal
6. Surveying by R Agor
7. Fundamentals of Surveying by S K Roy
8. Surveying and Levelling by N NBasak

E-links

1. www.elearning.com/survey
2. <http://nptel.ac.in/video.php?subjectId=105104101>
3. <http://media.sakshat.ac.in/NPTEL-IIT-Videos/>
4. http://nptel.iitk.ac.in/courses/Civil_Eng/IIT%20Roorkee/Surveying.htm
5. <http://nptel.iitk.ac.in/>

Model Question Paper

Code: **15CE21T**

Second Semester Diploma Examination

SURVEYING-I

Time: **3 hours]**

[Max. Marks: 100

- Note:** 1. Answer any **SIX** questions from **Section-I**, Each question carries **5** marks
2. Answer any **SEVEN** questions from **Section-II**, Each question carries **10** marks

SECTION- I

1. Define surveying. State the objects of surveying.
2. Draw a suitable convention signs of hill, chain line, stream, benchmark,.
3. Compare Prismatic compass with surveyors compass
4. At a place the bearing of sun is measured at local noon and found to be $175^{\circ} 15'$. What is the magnitude and direction of magnetic declination of the place?
5. Define the following terms
i) Level line ii) Parallax iii) change point
6. Explain the temporary adjustments of a Dumpy level
7. What are the uses of taking L/S & C/S?
8. What are the different sources of errors in levelling?
9. What is Contour interval? List the factors affecting it.

SECTION- II

1. a) What is Reconnaissance survey and state its importance?
b) Plot the following details of a field and calculate the area, all measurements being taken in metres.

	0	
	8	5
4	15	
	18	3
	30	

2. a) Differentiate between Check line and Tie line?

b) What is Reconnaissance survey and state its importance?

3. a) Compare WCB system and R.B. system.

b) Convert the following W.C.B to R.B

i) 10° ii) $45^{\circ} 15'$ iii) $135^{\circ} 45'$ iv) $315^{\circ} 15'$ v) $215^{\circ} 15'$

4. The following bearings were observed in running a closed traverse.

Line	Fore bearing	Back bearing
AB	$75^{\circ} 05'$	$254^{\circ} 20'$
BC	$115^{\circ} 20'$	$296^{\circ} 35'$
CD	$165^{\circ} 35'$	$345^{\circ} 35'$
DE	$224^{\circ} 50'$	$44^{\circ} 05'$
EA	$304^{\circ} 50'$	$125^{\circ} 05'$

At what station do you suspect local attraction? Determine the corrected bearings

5. a) The following consecutive readings were taken with a dumpy level: 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 BM of elevation 132.135. Enter the readings in level book form and reduce the levels. Apply the usual checks. Find also the difference in level between the first and the last points

b) Explain the method of block levelling.

6. a) Compare Rise & fall Method with Collimation method.

b) Calculate the reduce level by Rise and Fall method on a continuous sloping ground with four meter levelling staff at common interval of 30m.

0.855(onA),1.545,2.335,3.115,3.825,0.455,1.380,2.055,2.855,3.455,0.585,1.015, 1.850, 2.755,3.845 (on B);The reduced level of A was 380.500. Make the entries in a level book and apply usual checks.

7. In running Fly levels from a BM. Of RL. 384.705m the following readings were obtained :

BS: 3.215, 1.030, 1.295, 1.855

FS: 1.225, 3.290, 2.085

From the last position of the instrument, Six pegs at 25.00m intervals are to be set out on a uniformly falling gradient of 1 in 100, the first peg is to have RL of 384.500m. Work out the staff readings required for setting the top of the pegs on the given gradient.

8. Four sight rails are to be erected over points A,B,C and D 50m apart in a straight line. The invert level of sewer at d is 74.500m. The sewer is on a gradient of 1 in 200 rising from D to A. The RL of pegs on the surface of ground are 76.300, 75.500, 74.850, and 75.650 respectively from A to D. The height of sight rail at d is 1.5m. find the suitable height of the boning rod and height of the sight rail above the pegs at A, B, and C

9. a) Mention any three uses of contour.

b) The areas within the contour lines at the site of reservoir and face of the proposed dam are as follows.

Contour (m)	Area (m ²)
100	1000
103	128000
106	16600
109	18800
112	24400
115	30600
118	38400

If 100.00m is the bottom level and 118.00m is the maximum water level of the reservoir, calculate the capacity of reservoir using trapezoidal formula and Prismoidal formula.

10.A road of constant RL 120.00m runs from North to South. The GL along the centre line of the road are as follows:

Chainage	R.L.
0	117.50
30	116.25
60	115.95
90	116.65
120	117.20
150	117.85
180	115.70

Assuming no transverse slope, find the volume of earth work for a road of formation width 8.00m with side slopes 1.5 :1 by;

- i) Trapezoidal method ii) Prismoidal method

Model Question Bank

CO1: Able to understand the basics in surveying and chain surveying.

LEVEL: REMEMBER QUESTIONS

1. What are the principles of surveying
2. What is the Principles of chain surveying,
3. Draw a suitable convention signs of hill, chain line, stream, benchmark

LEVEL: UNDERSTANDING QUESTIONS

1. Explain the principles of surveying.

LEVEL: APPLICATION QUESTIONS

1. Plot the following details of a field and calculate the area, all measurements being taken in metres.

	0	
	8	5
4	15	
	18	3
	30	

CO2:. Understand the principles of compass surveying and its applications.

LEVEL: REMEMBER QUESTIONS

1. State any four instrumental and personnel errors in prismatic compass survey.
2. What are the sources of errors in compass survey and what precautions will you take to eliminate them.

LEVEL: UNDERSTANDING QUESTIONS

1. Explain the temporary adjustments of Compass.
2. Explain prismatic compass with a neat sketch
3. Explain i) True Bearing and Magnetic bearing ii) Dip and Declination
4. Compare Prismatic compass with surveyors compass
5. Differentiate between i) fore bearing and back bearing ii) closed traverse and open traverse
6. What is meant by local attraction? How it is detected and eliminated?

LEVEL: APPLICATION QUESTIONS

1. Convert the following fore bearing to Back. Bearing
2. 125° 15' b) N30° E c) 360° d) S45° 45'W e) N 25° 45'E
3. Compare WCB system and R.B. systems
4. Convert the following W.C.B to R.B
 - a. 10° ii) 45° 15' iii) 135° 45' iv) 315° 15' v) 215° 15'
5. Convert the following RB to WCB
6. i) N 30° 15' W ii) N 45° 45' E iii) S 15° 15' W iv) S 25° 15' E
7. The following bearings were observed in running a closed traverse.

8. Line	9. Fore bearing	10. Back bearing
11. AB	12. 75° 05'	13. 254° 20'
14. BC	15. 115° 20'	16. 296° 35'
17. CD	18. 165° 35'	19. 345° 35'
20. DE	21. 224° 50'	22. 44° 05'
23. EA	24. 304° 50'	25. 125° 05'

- a. At what station do you suspect the local attraction? Determine the corrected bearings
8. The following bearings were observed with compass. Calculate the interior angles.

7. Line	8. Fore bearing	9. Back bearing
10. AB	11. $60^{\circ} 30'$	12. $240^{\circ} 30'$
13. BC	14. $122^{\circ} 0'$	15. $302^{\circ} 0'$
16. CD	17. $46^{\circ} 0'$	18. $226^{\circ} 0'$
19. DE	20. $205^{\circ} 30'$	21. $25^{\circ} 30'$
22. EA	23. $300^{\circ} 0'$	24. $120^{\circ} 0'$

9. At a place the bearing of sun is measured at local noon and found to be $175^{\circ} 15'$. What is the magnitude and direction of magnetic declination of the place?

10. In an old survey made when the declination was $4^{\circ}W$, the magnetic bearing of a given line was 210° . The declination in the same locality is now $10^{\circ}E$. What is the true and present magnetic bearing of the line?

CO3:. Able to understand the basics in levelling, types of levelling instruments and methods of levelling

LEVEL: REMEMBER QUESTIONS

1. Define the following terms used levelling i) Level surface ii) level line iii) datum
2. What are the different types of levelling staff?

LEVEL: UNDERSTANDING QUESTIONS

1. Explain the temporary adjustments of a dumpy level?
2. Comparison of HI method & Rise & Fall method of computing the levels?
3. Explain the special methods of spirit levelling.

LEVEL: APPLICATION QUESTIONS

1. The following consecutive readings were taken with a dumpy level: 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 BM of elevation 132.135. Enter the readings in level book form and reduce the levels. Apply the usual checks. Find also the difference in level between the first and the last points.
2. Calculate the reduce level by Rise and Fall method on a continuous sloping ground with four meter levelling staff at common interval of 30m.
0.855(onA),1.545,2.335,3.115,3.825,0.455,1.380,2.055,2.855,3.455,0.585,1.015, 1.850, 2.755,3.845 (on B);The reduced level of A was 380.500. Make the entries in a level book and apply usual checks.

CO4:. Able to understand the types of levelling, errors and its applications.

LEVEL: REMEMBER QUESTIONS

What are the uses of taking L/S & C/S?

LEVEL: UNDERSTANDING QUESTIONS

1. What are the different sources of errors in levelling? How are they eliminated?

LEVEL: APPLICATION QUESTIONS

1. During the fly levelling operation the following observations were made :
Back sight: 0.650, 2.155, 1.405, 2.655, 2.435
Fore sight: 2.455, 1.305, 0.5555, 2.405

The first back sight was taken on a BM of RL 100.500m. From the last back sight it is required to set four pegs each at a distance of 30m on a falling gradient of 1 in 100. Calculate the RL of these four pegs. Apply the check.

2. Four sight rails are to be erected over points A, B, C and D 50m apart in a straight line. The invert level of sewer at d is 74.500m. The sewer is on a gradient of 1 in 200 rising from D to A. The RL of pegs on the surface of ground are 76.300, 75.500, 74.850, and 75.650 respectively from a to D. The height of sight rail at d is 1.5m. find the suitable height of the boning rod and height of the sight rail above the pegs at A, B, and C.

CO 5: Concept of contour, its uses and methods of contouring.

LEVEL: REMEMBER QUESTIONS

1. What is Contour? What are the uses of Contour maps?
2. What is Contour interval? List the factors affecting it.

LEVEL: UNDERSTANDING QUESTIONS

1. Explain the characteristics of contours with sketches
2. Mention the methods of locating Contours. Explain the method of locating contour by cross-sections
3. What is interpolation of contours? Explain arithmetical method of interpolating contours.

LEVEL: APPLICATION QUESTIONS

1. The areas within the contour lines at the site of reservoir and face of the proposed dam are as follows.

Contour (m)	Area (m ²)
100	1000
103	128000
106	16600
109	18800
112	24400
115	30600
118	38400

If 100.00m is the bottom level and 118.00m is the maximum water level of the reservoir, calculate the capacity of reservoir using trapezoidal formula and Prismoidal formula.

CO 6: Able to compute area and volume of irregular figures.

LEVEL: REMEMBER QUESTIONS

1. Write the formula to calculate the area of an irregular figure by
 - a. Trapezoidal Rule
 - b. Simpson's Rule
2. Write the formula to calculate the volume of an irregular figure by
 - a. Trapezoidal Rule
 - b. Prismoidal Rule

LEVEL: UNDERSTANDING QUESTIONS

1. Differentiate between Trapezoidal Rule and Simpson's Rule.

LEVEL: APPLICATION QUESTIONS

1. A road of constant RL 120.00m runs from North to South. The GL along the centre line of the road are as follows:

Chainage	R.L.
0	117.50
30	116.25
60	115.95
90	116.65
120	117.20
150	117.85
180	115.70

Assuming no transverse slope, find the volume of earth work for a road of formation width 8.00m with side slopes 1.5 :1 by;

- ii) Trapezoidal method
- iii) Prismoidal method.