Course Code	20CE22P	**Semester**	II
Course Title	BASIC SURVEYING	**Course Group**	Core
No. of Credits	4	**Type of Course**	Lecture & Practice
Course Category	PC	**Total Contact Hours**	6 Hrs Per Week 78 Hrs Per Semester
Prerequisites	BASICS OF MATHEMATICS & UNITS AND MEASUREMENTS	**Teaching Scheme**	(L:T:P)-1:0:2
CIE Marks	60	**SEE Marks**	40

1. COURSE SKILL SET

The aim of the course is to help student to attain the following industry identified competency through various teaching –learning experiences

5 **Perform the fundamental tasks and computations in the field of Surveying.**

2. INSTRUCTIONAL STRATEGY

4. Students should be exposed to different tools and equipment used in respective tasks, Operational safety and Procedure to be followed to complete the tasks. Emphasis should be given on instrument handling, selection of suitable methods.
5. Focus should be on precise measurements, calculations and their interpretation.

3.COURSE OUT COMES

On successful completion of the course, the students will be able to demonstrate industry oriented CO's associated with the above mentioned competency:

CO1	Perform conversion of measuring units.
CO2	Identify different surveying instruments, tools and their applications.
CO3	Handle survey instruments, taking measurements, computation and interpretation.
CO4	Carryout different types of chain, tape, compass, levelling surveying tasks.
CO5	Identify errors and apply corrections suitably.

4. COURSE CONTENT

The following topics/subtopics to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNITS	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 INTRODUCTION	Introduction to surveying occupation 1)Definition, Objectives, and purposes of surveying. 2)Primary divisions and classifications of surveying 3)Principles of Surveying, Units and measurements (Linear and angular)	1.1 Responsibility of surveyor, Future possible progression and career development provisions on completion of the course. 1.2 Classifications based on nature of field, purpose of survey and instruments used. 1.3 Conversion of units (simple problems) Errors in surveying: Types-Mistakes, systematic and accidental.	02-00-04 (02 class of 3Hr duration)
UNIT-2 CHAIN SURVEY	- Describe the procedure of finding the distance between two inter-visible and non inter-visible survey stations. - Explain the method of ranging and measuring the length of the given survey line with examples. - Explain the corrections in measurement of distance with the chain in a given situation. - Compute area of given open field by using chain and cross staff. - Select type of chaining for given situation. - Applications of EDM & Rodometer in surveying.	2.1 Chain survey Instruments: Metric Chain details with neat sketch, engineers chain, guntur chain, revenue chain.Tapes-metallic tape and steel Tape. Arrow, Tapes, Ranging rod, Ranging poles,Offset rod, Open cross staff and wooden cross staff. 2.2 Ranging: Direct Ranging (I.By naked Eye II.using Line Ranger) and Indirect Ranging. 2.3 Chaining on flat ground and Chaining on sloping ground-by stepping method only. 2.4 Chain triangulation: Chain survey Station, Base line, Checkline, Tie line, Offset, Tie station. Selection of survey stations. Method of Chaining, obstacles in chaining; simple problems. Types of offsets: I. Perpendicular and Oblique. II.Short and Long offsets. 2.5 Errors in length: Instrumental error, personal error, error due to natural cause, random error- No numerical problems. 2.6 Location Sketch of survey station and running measurements of building.	05-00-10 (05 class of 3 Hr duration)

		2.7 Conventional Signs Recording of measurements in a field book.	
UNIT-3 COMPASS SURVEY	- Carry out the traversing in a given situation by using compass and chain. - Convert the given whole to reduced bearing and vice versa to find the included angle with examples. - Explain construction and functions of given parts of the given type of compass. - Determine correct bearings from the given observed bearings. - Explain the methods used to plot a traverse in the given situation. - Adjust the closing error of the traverse for the given data.	3.1 Technical Terms:Bearings-True, Magnetic and Arbitrary bearing. Geographic/True,Magnetic and Arbitrary Meridians. Systems of bearing-Whole circle bearing system and Reduced Bearing system-Examples on conversion of given bearing to another (from one to another) 3.2 Components of Prismatic Compass and their Functions, Method of using Prismatic Compass- temporary adjustments and observing bearings. 3.3 Compass traversing: Open and Closed traversing. Fore Bearing and Back Bearing, Calculation of interior and exterior angles from bearings at a station (For both WCB & RB systems) 3.4 Magnetic dip and declination: simple problems on declination. 3.5 Local attraction, sources of local attraction, detection of local attraction, Methods of correction of observed bearings-Correction at station. 3.6 plotting a traverse and finding closing errors. 3.7 Errors in compass: Instrumental, Personal and natural cause.	08-00-16 (08 class of 3 Hr duration)
	- Explain the given terms related to leveling. - Describe construction and use of the given leveling instrument.	4.1 Terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary. 4.2 Instruments used for levelling:Types of levels: Dumpy, Auto level, Digital	

UNIT-4 LEVELLING	- Explain the given temporary adjustments of a typical dumpy level. - Describe methods of reduction of levels by height of collimation and rise and fall method in the given situation with necessary checks. - Select type of leveling for the given work with examples and justification. - Compute the missing readings from the given observed readings.	level, Components of Dumpy Level and its fundamental axes,Temporary adjustments of Level. Levelling staff: Telescopic staff and target staff. 4.3 Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, intermediate sight, Change point, Height of instruments. Observing the staff reading & recording in level book. Leveling Types: Simple, Differential, Fly, Profile and Reciprocal Leveling. 4.5 Methods to find the R. L. in Level Book by H.I & Rise and Fall Methods with necessary checks. 4.7 Computation of missing readings. 4.8 Errors in Leveling	11-00-22 (11class of 3 Hr duration)

NOTE:

***1.*After one hour of lecture, two hours of practice should be conducted batch wise on the respective contents**
2. All students should wear uniforms as specified, white round hat and Shoes.
3.Everyone is strongly advised to take care of his/her health and safety. When working, always be alert about your surroundings.
4.Set up the instruments in the safest possible location. Setting up the instrument should result in saving survey time as well. Safety always overrules the time saving.
5.Avoid contact of instruments with electrical supply lines, especially ranging rods and leveling staff.
6.Do not make sudden movements that might confuse a motorist and cause evasive action that can result in injury to the motorist and/or to students.
7.Avoid interrupting traffic as much as possible.

Sl. No.	Practical Outcomes/Practical exercises	Unit No.	PO	CO	L:T:P Hrs.
1	Units of measurements and Conversion of units.	1	1,7	1	0:0:2
2	Effective communication and signs used in survey practice.	1	1,7	2,3	0:0:2
3	Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.	2	1,2,34	2,3,4	0:0:2
4	Undertake reciprocal ranging and measure thedistance between two stations using EDM or RODOMETER	2	1,2,34	2,3,4	0:0:2
5	Set out perpendicular to the main survey line by different methods.	2	1,2,34	2,3,4	0:0:2

6	Determine area of regular polygons (Trapezium,Pentagon,Hexagon) using chain and cross staff survey	2	1,2,34	2,3,4	0:0:2
7	Undertake ranging when the chain line passes through different obstacles.	2	1,2,34	2,3,4	0:0:2
8	Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.	3	1,2,34	2,3,4	0:0:2
9	Measure Fore Bearing and back bearing of a closed traverse of 5 sides (Regular Pentagon) and correct the bearings and included angles for the local attraction.	3	1,2,34	2,3,4,5	0:0:2
10	Measure Fore Bearing and back bearing of a closed traverse of 6 sides (Regular Hexagon) and correct the bearings and included angles for the local attraction.	3	1,2,34	2,3,4,5	0:0:2
11	Measure Fore Bearing and back bearing of a closed traverse of 3 sides (Irregular Triangle) and correct the bearings and included angles for the local attraction.	3	1,2,34	2,3,4,5	0:0:2
12	Measure Fore Bearing and back bearing of a closed traverse of 4 sides (Irregular Quadrilaterals) and correct the bearings and included angles for the local attraction.	3	1,2,34	2,3,4,5	0:0:2
13	Measure distance between two survey stations using compass when two stations are inaccessible.	3	1,2,34	2,3,4	0:0:2
14	Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building.(Compulsory)	3	1,2,34	2,3,4,5	0:0:2
15	Plot the traverse on a drawing sheet for data collected in the Survey Project mentioned at practical No.15.	3	1,2,34	3	0:0:2
16	Perform setting and temporary adjustments of Dumpy level/Auto level	4	1,2,34	2,3,4	0:0:2
17	Take level of various points and recording it in a level book	4	1,2,34	2,3,4	0:0:2
18	Undertake simple leveling and using dumpy level/ Auto level and leveling staff.	4	1,2,34	2,3,4	0:0:2
19	Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and leveling staff.	4	1,2,34	2,3,4,5	0:0:2
20	Undertake fly leveling with double check using dumpy level/Auto level and leveling staff to establish a Temporary BM.	4	1,2,34	2,3,4,5	0:0:2
21	Find RL of given point by taking Inverted Staff Reading	4	1,2,34	2,3,4,5	0:0:2
22	Undertake Profile leveling and cross-sectioning for a given road length and interval.	4	1,2,34	2,3,4,5	0:0:2
23		4	1,2,34	2,3,4,5	0:0:2

24	Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval. (Compulsory).	4	1,2,34	2,3,4,5	0:0:2
25	Plot the L-section with minimum 3 cross-sections on A1 size drawing sheet for data collected in Survey Project mentioned at practical No.23 & 24	4	1,2,34	3	0:0:2
26		4	1,2,34	3	0:0:2
				Total Hours	**0:0:52=52**

5.MAPPING OF CO's WITH PO's

CO's	Course Outcome	PO Mapped	Experiment Linked	Cognitive Level R/U/A
CO1	Perform conversion of measuring units.	PO1,PO7	1,2	U,A
CO2	Identify different surveying instruments, tools and their applications.	PO1,PO2,PO3,PO4	3 TO 26	A
CO3	Handle survey instruments, taking measurements, computation and interpretation.	PO1,PO2,PO3,PO4	3 TO 26	A
CO4	Carryout different types of chain, tape, compass, leveling surveying tasks.	PO1,PO2,PO3,PO4	3 TO 26	A
CO5	Identify errors and apply corrections suitably.	PO1,PO2,PO3	9,10,11,12,14,19, 20,21,22,23,24	A

Course	CO's	Programme Outcomes (PO's)						
		1	**2**	**3**	**4**	**5**	**6**	**7**
BASIC SURVEYING	CO1	3	0	0	0	0	0	3
	CO2	3	3	3	3	0	0	0
	CO3	3	3	3	3	0	0	0
	CO4	3	3	3	3	0	0	0
	CO5	3	3	3	0	0	0	0
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

SUGGESTED SPECIFICATION TABLE FOR CIE QUESTION PAPER DESIGN:

Sl No	Unit Title	Teaching Hours	Distribution of theory Marks			
			R	U	A	Total Marks
1	**Introduction**	02	02	-	-	02
2	**Chain Survey**	05	-	-	04	04
3	**Compass Survey**	08	-	-	06	06
4	**Leveling**	11	-	-	08	08
	TOTAL	**26**	**02**	**00**	**18**	**20**

6. SUGGESTED LEARNING RESOURCES:

1. Surveying and Levelling volume I-Kanetkar, T. P.; Kulkarni, S. V. -Pune Vidyarthi Gruh Prakashan,Pune; ISBN:978-81-858-2511-3
2. Surveying and Levelling-Basak, N. N. -McGraw Hill Education, New Delhi ISBN 93-3290-153-8
3. Surveying-Saikia, M D.; Das. B.M.; Das. M.M. -PHI Learning, New Delhi ISBN: 978-81-203-3985-9
4. Fundamentals of Surveying and Levelling-Subramanian, R. -Oxford University Press.Delhi, ISBN: 0-19-945472-8
5. Survey I -Duggal, S. K. -McGraw Hill Education, New Delhi, ISBN: 978-00-701-5137-6
6. Textbook of Surveying-Rao, P. Venugopala Akella, Vijayalakshmi -PHI Learning, New Delhi ISBN: 978-81-203-4991-9
7. Surveying I-Punmia, B.C,Jain, Ashok Kumar Jain, Arun Kumar-Laxmi Publications., New Delhi. ISBN: 8-17-008853-4
8. Surveying and Levelling, Volume 1 -Bhavikatti, S. S. -I. K. International, New Delhi ISBN: 978-81-906-9420-9
9. Textbook of Surveying-Venkatramaiah, C -Universities Press.New Delhi ISBN: 978-81-737-1021-6

SOFTWARE/LEARNING WEBSITES

Sl NO	PARTICULARS/CONTENT	E-LINKS/E-CONTENT	LAUGUAGE
1	Classification of surveying	https://www.youtube.com/watch?v=-JgCfsooiu0	English
2	Chain Surveying(Theory)	https://www.youtube.com/watch?v=itB45jrCPp0	English

3	Survey Stations	https://www.youtube.com/watch?v=RXARsCjBNlU	Hindi
4	Direct Ranging	https://www.youtube.com/watch?v=x8FaSZCPbM8	English
5	Indirect Ranging	https://www.youtube.com/watch?v=6oIyMP2iO5s	English
6	Chain Triangulation	https://www.youtube.com/watch?v=wbd-Ib2xc0Y	English
7	Chain Triangulation	https://www.youtube.com/watch?v=J7wiM6X5qt4	English
8	Basic Construction of Regular polygon	https://www.youtube.com/watch?v=TAHczLeIUTc	Graphical
9	Obstacles occur in chain survey-obstacle to Ranging	https://www.youtube.com/watch?v=-hzoS5CQsJw	English
10	Measuring Horizontal Distance by the Direct Method: Chaining on Sloping Grounds	https://www.youtube.com/watch?v=dwNHZbZ40AQ	English
11	Errors and correction in chain surveying	https://www.youtube.com/watch?v=GOL8e3JaS7U	English
12	Types of Cross Staff	https://www.youtube.com/watch?v=w0OBpHLQv7w	English
13	Block Cross Staff	https://www.youtube.com/watch?v=Ik7wKksW11k	English
14	Perpendicular offset and oblique offset, some guidelines- Chain Surveying	https://www.youtube.com/watch?v=SLB6d4RHgMw	English/Hindi
15	Parts of Prismatic Compass	https://www.youtube.com/watch?v=-kDpvQop__k	English
16	Difference b/w surveyor & prismatic compass	https://www.youtube.com/watch?v=5DsCSxKkGws	English
17	Whole circle bearing & Quadrantal bearing	https://www.youtube.com/watch?v=iLQYLoc4ja4	English
18	Conducting a CLOSED TRAVERSE(Irregular polygon) in surveying	https://www.youtube.com/watch?v=pGS2YX30nI8	English
19	Open traverse	https://www.youtube.com/watch?v=6NA3Y79Pf38	English
20	Closing error in surveying and it's correction	https://www.youtube.com/watch?v=Ww7EcE3w_x4	English
21	Local attraction and its correction	https://www.youtube.com/watch?v=2EYQDwcizcE	English

22	Auto Level	https://www.youtube.com/watch?v=j8poe2vvD2Q	English
23	Temporary adjustment of a dumpy level	https://www.youtube.com/watch?v=V95S5drWU6M	English
24	How to read leveling staff	https://www.youtube.com/watch?v=7L3jaOvhoZk	English
25	Differential Levelling	https://www.youtube.com/watch?v=rY4XIgSueUs	English
26	Inverted Leveling	https://www.youtube.com/watch?v=xKfb6wOeoc4	English
27	Steps involved in field data entry and cross staff survey for estimation of area	https://www.youtube.com/watch?v=RThEISUJBXg	English
28	How to Shift Dumpy Level	https://www.youtube.com/watch?v=jIxCx0oSWOY	English
29	Reciprocal leveling	https://www.youtube.com/watch?v=bru-lpQtodg	English
30	Fly leveling	https://www.youtube.com/watch?v=_SiSn_tcXZA	English
31	Profile leveling	https://www.youtube.com/watch?v=dOxlLPET77U	English
32	Profile leveling	http://www.engr.mun.ca/~sitotaw/Site/Fall2007_files/Lab4_Lecture4_Prof_leveling.pdf	PDF
33	Measuring Horizontal Distance by the Indirect Method: Using the Clinometer	https://www.youtube.com/watch?v=Dm1NtRiFgYo	English
34	Surveying & Leveling	http://ecoursesonline.iasri.res.in/course/view.php?id=523	E-Content
35	Surveying & Leveling	http://ecoursesonline.iasri.res.in/course/view.php?id=36	E-Content

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Note: the following activities or similar activities for assessing CIE (IA) for 10 marks (Any one)

5) Each student should conduct different activities compulsorily.

1	Visit any construction site and make a report on different types of conventional and modern surveying equipment used.
2	Collect the information of survey instruments available in the market with specifications.
3	Perform reconnaissance survey for alignment of road.
4	Determine the RLs of the existing structures like lintels, chajja, slab, and beam.

8.COURSE ASSESSMENT AND EVALUATION CHART

Sl NO	Assessment	Duration	Max Marks	Conversion
1.	CIE Assessment 1 (Written Test -1-theory) - At the end of 3rd week	60 minutes	20	Average of two written tests 20 marks
2.	CIE Assessment 2 (Written Test -2-theory) - At the end of 13thweek	60 minutes	20	
3.	CIE Assessment 3 (Skill test) - At the end of 5th week	3 Hrs	20	Average of three skill tests 20 marks
4.	CIE Assessment 4 (Skill test) - At the end of 7th week	3 Hrs	20	
5.	CIE Assessment 5 (Skill test) - At the end of 9th week	3 Hrs	20	
6.	CIE Assessment 6 (Student activity)- At the end of 11th week	-	20	20 marks
7.	Total Continuous Internal Evaluation (CIE) Assessment			60 marks
8.	Semester End Examination(SEE) Assessment (Practical Test)	3 Hrs	100	40 marks
			Total Marks	**100 marks**

9. RUBRICS FOR SKILL TEST / PRACTICAL TEST (Both CIE & SEE) EVALUATION

Sl No	Parameter to be Observed	Marks Allotted
1	Safety measures	10
2	Setting and operation	25
3	Preparation of experimental set up	10
4	Observations and Recording	25
5	Interpretation of result and Conclusion	20
6	Viva	10
	Total	**100**

10.MODEL RUBRICS FOR ACTIVITY (10marks)(CAN BE MODIFIED)						
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	4	8	12	16	**20**	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	16
Fulfil team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	12
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	16
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	16
Average / Total Marks: (16+12+16+16)/4						**15 marks**

11.MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED:

Sl No	Equipment Name	No
1.	Metric Chain made from galvanized mild steel wires 4mm in dia, brass handles with swivel joints, brass tallies provided at every 5 m length of chain - 20 and 30m.	05
2.	Metallic tape-, Steel tape, Invar satisfying IS 1269 (Part 1 and Part 2) : 1997 specifications	05
3.	Pegs of length 400 mm and c/s area of 50 mm x 50 mm.	50
4.	Arrows 400 mm long and made up of good quality hardened and tempered steel wire of 4 mm in diameter.	50
5.	Metallic Ranging rods of 2 m length, circular or octagonal in cross section of 30 mm diameter, Lower shoe of 150 mm long. Painted in black, white and red stripes of 200 mm each.	50
6.	Line ranger, optical square confirming to IS: 7999 – 1973specifications	50
7.	Open cross staff consisting of 4 metal arms with vertical slits for sighting through.	05
	Surveyor compass.	05
8.	Prismatic compass confirming to IS 1957-1961 with stand, made in Gunmetal material having diameter of 85-110 mm and the least count of 30minutes.	05
9.	Dumpy level confirming to IS: 9613 – 1986 with stand and internal focusing telescope of standard make.	05
10.	Automatic levels confirming to IS: 9613 – 1986 with stand and internal focusing telescope of standard make.	05
11.	EDM and	05
12.	Rodometre	05