



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Branch: Civil

Subject Code: BE04006011

Subject Name: Surveying

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|-------------------------|--------------------------|
| w. e. f. Academic Year: | 2024-25 |
| Semester: | 4 |
| Category of the Course: | Professional Core Course |

| | |
|----------------------|--|
| Prerequisite: | Introduction to Basics of Civil Engineering |
| Rationale: | To develop concepts of various types of land surveying and prepare contour maps. The development of a basic understanding about surveying, traversing and use of different types of surveying instruments to solve real life problems related to infrastructural planning and land use is necessary for civil engineers. |

Course Outcomes:

| Sr. No. | CO statement | Marks% weightage |
|---------|---|------------------|
| CO-1 | Conduct Plane table, Theodolite traversing, Trigonometric leveling and hydrographic surveying at identified site. | 30 |
| CO-2 | Apply the concept of Tacheometry and Geodetic survey in difficult and hilly terrain. | 25 |
| CO-3 | Analyze the problems of computation of area and volume, setting out curves using surveying knowledge. | 25 |
| CO-4 | Apply principles of theory of error for correction of measurements done using advanced tools | 20 |

Teaching and Examination Scheme:

| Teaching / Learning Scheme (in Hours per semester) | | | | | Total Credits | Assessment Pattern and Marks | | | | | Total Marks |
|---|---|----|------|--------------------------------|---------------|------------------------------|-------------|----------------------|-----------|---------|-------------|
| L | T | P | PBL* | Total no of hours per semester | | Theory | | Tutorial / Practical | | | |
| | | | | | | ESE (E) | PA / CA (M) | PA/CA (I) | TW/SL (I) | ESE (V) | |
| 45 | 0 | 30 | 45 | 120 | 4 | 70 | 30 | 20 | 30 | 50 | 200 |

* Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.



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Content:

| Sr. No. | Content | Total Hrs |
|--------------|---|-----------|
| 1 | Plane Table Survey: Principle, setting up the plane table, methods of plane tabling, advantages and disadvantages, sources of errors. | 5 |
| 2 | Theodolite Traversing: Methods of traversing, closed and open traverse, closing error, computation of latitudes and departures, Omitted measurements, balancing of traverse, Gale's table, Traverse area. | 7 |
| 3 | Tachometric Surveying: Introduction, principle and methods of tacheometry, stadia constants, anallactic lens, field work in tacheometry, contour maps using tacheometry, Subtense bar, Tangential method. Trigonometric levelling: Indirect levelling, heights and distances Geodetic Surveying: Introduction, triangulation, principle of triangulation, triangulation stations, base line and its site selection, well-conditioned triangles, strength of figure, inter-visibility of triangulation stations | 12 |
| 4 | Curves: Introduction, designation of curve, classification of curves, Elements of a simple circular, methods of setting out a simple circular curve, elements of a compound and reverse curves, transition curve, types of transition curves, types of vertical curves, setting out of combined curve. | 7 |
| 5 | Areas and Volumes: Introduction, computation of area using different methods, Use of Planimeter, computations of volume using different methods, determination of capacity of reservoir. | 5 |
| 6 | Theory of Errors: Introduction, types of errors, definitions, laws of accidental errors, laws of weights Hydrographic Surveying: Introduction, Sounding, Methods of Locating soundings Total Station Surveying: Introduction, horizontal & vertical angle measurements, setting up the total station, various field applications of total station surveying, data transfer mechanism and further process, advantages. GPS observables and data processing, Precision analysis and high precision GPS, Applications of GPS. Drone survey. | 9 |
| TOTAL | | 45 |



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Suggested Specification table with Marks (Theory):

| Distribution of Theory Marks | | | | | |
|------------------------------|---------|---------|---------|---------|---------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 40 | 40 | 10 | 10 | 00 | 00 |

R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

| Title | Author/s | Publication |
|---|--------------------------------|--------------------------------------|
| Surveying and levelling | N. N. Basak | Tata McGraw Hill, New Delhi |
| Surveying - Volume I,II&III | Dr. K.R.Arora | Standard Book House, New Delhi |
| Surveying, Volume-I, II & II | B.C.Punmia | Laxmi Publications, New Delhi |
| Surveying and Levelling, Volume -I & II | T.P. Kanetkar and S.V Kulkarni | Pune Vidyarthi Griha Prakashan, Pune |
| Surveying and Levelling | R.Subramanian | Oxford University Press, New Delhi |
| Surveying, Volume-I, II | S. K. Duggal | Tata McGraw Hill, New Delhi |
| | | |

List of Experiments:



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- Plane table traversing by intersection and radiation methods.
- Height determination of hill, tower or flag on temple using trigonometric leveling.
- Theodolite traversing and plotting of traverse by applying corrections in Gale's traverse table.
- Tacheometry Contour Survey Project.
- Setting out simple circular curves by different methods.
- Setting out combined curve (Transition - Circular – Transition).
- Computation of area of submergence and storage volume from contour maps for reservoir projects.
- Total Station Survey.
- GPS survey with handheld device.

Suggested Course Practical/Assignment List: Students should follow the DTE laboratory manual for assignments and practical

Major Equipment: Theodolite, plane table, Total station

List of Open Source Software/learning website: <http://nptel.ac.in/>

● **List of suggested activities for Problem Based Learning:**

| Sl. No. | Name of the activity | No. of hours | Evaluation Criteria |
|---------|--|--|---|
| 1. | Industry visit –visit of survey site of surveying of civil engineering projects. | Visit = 5h, Report preparation = 5h Total = 10h | Based on report submitted. Report should contain observations and calculations based on industry/ lab data. |
| 2. | Technical Video based learning related to topics of the surveying performed of tunneling, railway and roadway alignments. | Duration of video = 5h Report preparation = 5h Total = 10h | Report /presentation based on the video learning outcomes. |
| 3. | Assignment writing. Numerical based assignment related to topics of the surveying course | 5 assignments of 2h each. Total = 10h | Based on the assignment submitted. |
| 4. | Problem solving/Coding using any programming language or application of software related to surveying of civil engineering projects. | 5 small coding-based assignments of 2h each. Total = 10h | Based on the coding solution submitted. |
| 5. | Self-learning on-line courses related to application of surveying tools for civil engineering projects. | Minimum duration of the course should be 10h. | Examination based assessment at the end of course. Based on the |



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| | | | certificate produced. |
| 6. | Complex problem solving related to challenges infield during surveying. | Maximum 2 problems. Study of the problem and solution finding, Total = 10h | Based on the depth of the solution submitted. |
| 7 | Videos on safety aspects of workers working for different types of surveying at every stage | Duration of video = 5h Report preparation = 5h Total = 10h | Based on quiz/report submitted |
| 8 | Poster/chart/power point presentation on topics related to advanced surveying techniques and tools | Duration = 6 h | Based on poster/chart preparation and presentation skills |
| 9. | Group Discussion on emerging/trending technical topics related to advanced surveying techniques and tools | Duration = 02 h each | Based on performance in group discussion, technical depth, knowledge etc. |
| 10 | Real world case studies-based learning for state-of-the-art/new technology in surveying | Duration of data collection/study = 5h Report preparation = 5h Total = 10h | Based on in-depth study, technical depth, data collected, fact finding, etc. |
| 11. | Use of Professional software for analysis of surveying data | Duration = 10 h | Depending on the complexity of the Application/Software |
| 12. | Workshop/seminar attended related to surveying of civil engineering structures | Duration = 4 hrs. per Workshop and 2 hrs. per seminar attended. Maximum 10 hrs. | Based on report submitted of summary and outcome of workshop/seminar attended |
