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Basic Surveying — Complete Syllabus

BTEUP Diploma in Civil Engineering • 3rd Semester • Session 2026-27

Subject 3.2 (Theory) + 3.3 (Lab) • Total 200 Marks • 3 Credits

About this document: Basic Surveying appears twice in the 3rd semester — as a theory paper (3.2) and as a lab (3.3). Both are covered here, completely, in the official order.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
3.2	Basic Surveying	Theory	1 - 0	1	Theory 40	Theory 60 (3 hrs)	100
3.3	Basic Surveying Lab.	Practical	0 - 4	2	Practical 60	Practical 40 (3 hrs)	100
Basic Surveying Total				3	100	100	200

What This Subject Aims To Do

To understand the types of surveying work required, the equipment and methods used for different surveys, and the use and operational details of various surveying equipment — so that you can select the right survey for a situation, measure areas with chain and tape, run a compass traverse, level ground for contour maps, and measure areas with a digital planimeter.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
1	Overview and Classification of Survey	2	10%
2	Chain Surveying	3	25%
3	Compass Traverse Survey	3	25%
4	Levelling and Contouring	4	25%
5	Measurement of Area and Volume	2	15%

Unit 1 — Overview and Classification of Survey (2 Periods, 10%)

Topics: Survey — purpose and use; types of surveying — primary and secondary; classification: plane, geodetic, cadastral, hydrographic, photogrammetry and aerial; principles of surveying; scales: engineer's scale, Representative Fraction (RF) and diagonal scale.

Unit 2 — Chain Surveying (3 Periods, 25%)

Topics: Instruments used in chain survey: types of chains, tapes, arrow, ranging rod, line ranger, off-set rod, open cross staff, optical square; chain survey station, base line, check line, tie line, offset, tie station; ranging: direct and indirect ranging; methods of chaining, obstacles in chaining and ranging; errors in length: instrumental error, personal error, error due to natural cause, random error, tape corrections; principles of triangulation; types of offsets: perpendicular and oblique; conventional signs, recording of measurements in a field book.

Unit 3 — Compass Traverse Survey (3 Periods, 25%)

Topics: Compass traversing — open, closed; technical terms: geographic/true magnetic meridians and bearings, Whole Circle Bearing system and Reduced Bearing system and examples on conversion of given bearing to another bearing (from one form to another), fore bearing and back bearing, calculation of internal and external angles from bearings at a station, dip of magnetic needle, magnetic declination; components of prismatic compass and surveyor compass and their functions, methods of using prismatic compass — temporary adjustments and observing bearings; local attraction, methods of correction of observed bearings — correction at station and correction to included angles; methods of plotting a traverse and closing error, graphical adjustment of closing error.

Unit 4 — Levelling and Contouring (4 Periods, 25%)

Topics: Basic terminologies: level surfaces, horizontal and vertical surfaces, datum, bench marks — GTS, permanent, arbitrary and temporary — reduced level, rise, fall, line of collimation, station, back sight, fore sight, intermediate sight, change point, height of instruments; types of levels: dumpy, tilting, auto level, digital level; components of dumpy level and its fundamental axes, temporary and permanent adjustments of level; types of levelling staff: self-reading staff and target staff; reduction of level by line of collimation and rise and fall method; levelling types: simple, differential, fly, profile and reciprocal levelling; curvature and refraction correction; contour, contour intervals, horizontal equivalent; uses of contour maps, characteristics of contours, methods of contouring: direct and indirect.

Unit 5 — Measurement of Area and Volume (2 Periods, 15%)

Topics: Components and use of digital planimeter; measurement of area using digital planimeter; measurement of volume of reservoir and earthwork calculation from contour map.

Practical Work

- Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
- Undertake reciprocal ranging and measure the distance between two stations.
- Determine area of open field using chain and cross staff survey.
- Measure fore bearing and back bearing of survey lines of open traverse using prismatic compass.
- Measure fore bearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.
- Undertake survey project with chain and compass for closed traverse for minimum 5 sides around a building and plot the traverse on A1 size imperial drawing sheet for data collected in survey project mentioned in practical 6.
- Undertake simple leveling using dumpy level / auto level and leveling staff.
- 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 and set up gradient.
- Undertake fly leveling with double check using dumpy level / auto level and leveling staff.
- Undertake survey project with leveling instrument for profile leveling and cross-sectioning for a road/canal/railways length of 500 m with cross-section at 30 m interval.
- Plot the L-section with minimum 3 cross-sections on A1 size imperial sheet for data collected in survey project mentioned in practical 10.

- Undertake survey project for plotting contour map using block contouring method for a block of 150 m x 150 m with grid of 10 m x 10 m.
- Plot the contours on A1 size imperial drawing sheet for data collected in survey project mentioned in practical 12. (In the PDF this item is split across two numbered lines, 13 and 14.)

Reference Books (as listed in the syllabus)

- Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
- Basak, N. N., Surveying and Leveling, McGraw Hill Education, New Delhi.
- Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi Gruh Prakashan.
- Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
- Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
- Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press, New Delhi.
- D.V.Gupta, Vikram Singh, Land Surveying-I, Asian Publishers, Muzaffarnagar, ISBN no. 978-93-5502-121-2.
- Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning, New Delhi.
- Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.
- Arora K R, Surveying Vol. I, Standard Book House.

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Source: BTEUP 2nd Year curriculum (folder2627), approved in C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text.

Please confirm with your own polytechnic for any local changes.