| Course Type | Course Code | Name of Course | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | CEC 201 | Surveying | 3 | 0 | 0 | 9 |

**Course Objective**

The course deals with the basics of surveying and levelling, concepts of total station and provides knowledge on Photogrammetry and GPS surveying.

**Learning Outcomes**

After studying this course, students should be able to:
- Understand the fundamental principles of surveying and levelling.
- An in-depth knowledge of triangulation, curves and total station survey.
- Understand various applications, concepts of photogrammetry and get acquainted with GPS surveying

| Unit No. | Topics to be covered | Lecture Hours | Learning Outcome |
|---|---|---|---|
| 1 | Surveying: Definition, Classification, Principles, Accuracy and Errors. Measurements: Linear measurements by chain and tape, Angular measurements by compass and theodolite. Traversing: Introduction, Methods of traversing, Plotting traverse survey, Latitude and Departure. Levelling: Types of levels, Principle of levelling, Methods of levelling, Differential levelling, Fly levelling, Curvature and Refraction, Contouring. | 18 | Understanding the basic principles of surveying and studying various methods for horizontal and vertical measurements. |
| 2 | Triangulation: Classification, Strength of the figure, criteria for selection, Towers and signals, Base line measurement, Satellite station. Curves: Introduction, Classification, Simple, Compound and Vertical curves. Total Station: Principle of electronic measurement of distance and angles, Features of total station, Setting-up and orienting a total station, Digital Plans. | 12 | In-depth knowledge of triangulation for establishing accurate ground control points, curves for various purposes. Knowledge on concept of total station survey. |
| 3 | Applications: Measurement of area and volume, Applications and Recent developments in surveying. Aerial Survey: Photogrammetry - Basic principles, Aerial and terrestrial, Flying height and scale, Flight planning for aerial photography, Photo-interpretation, Applications of photogrammetry. GPS surveying: Introduction, Principle, GPS receiver, Differential GPS, GPS surveying techniques, IRNSS- NAVIC, Mapping with GPS | 12 | Understanding the area and volume measurement, applications and recent developments. Knowledge on advanced surveying techniques in terms of Photogrammetry and GPS surveying. |

**Text Books:**

1. Chandra, A.M. (2012). Plane Surveying, 2nd Edition, New Age International (P) Ltd. New Delhi.
2. Chandra, A.M. (2015). Higher Surveying, 3rd Edition, New Age International (P) Ltd. New Delhi.
3. Duggal, S. K. (2017). Surveying: Volume - 1 & 2, 4th Edition, McGraw Hill Education (India). Pvt. Ltd., Chennai.
4. Anderson, J.M. and Mikhail, E.M. (1997). Surveying: Theory and Practice, 7th Edition,

**Reference Books:**

1. Arora, K.R. (2015). Surveying: Volume - 1, 2 and 3, 17th Edition, Standard Book House, New Delhi.
2. Hofmann-Wellenhof, B., Lichtenegger, H. and Collins J. (2001). GPS: Theory and Practice, Springer.
3. Wolf P.R. (2013). Elements of Photogrammetry, Mc Graw Hill India.