ENGINEERING SURVEY

ENCE 207

Lecture : 3 **Year : II**
Tutorial : 1 **Part : I**
Practical : 4

Course Objectives:
The objective of this course is to provide knowledge of land measurement and different types of modern survey equipment's and technique for establishment of control points and map making for all agricultural/engineering projects and make them familiar to field procedure of surveying by applying suitable surveying methods.

1 Introduction (2 hours)

1.1 Definition and history of surveying
1.2 Principle of surveying
1.3 Primary divisions and secondary classifications of surveying
1.4 Maps and plan

2 Distance Measurement and Chain Surveying (5 hours)

2.1 Unit and methods of linear measurements
2.2 Significant figures and rounding of numbers
2.3 Accessories for linear measurements
2.4 Methods and distance measurements on fairly levelled ground and sloping ground
2.5 Errors and its types, sources, accuracy, precision and discrepancy
2.6 Scales and its classifications, plotting accuracy, shrunk scale, factors selecting scales
2.7 Introduction to chain surveying, principle and offsets

3 Compass Surveying (4 hours)

3.1 Introduction to meridians
3.2 Bearings, types of bearings and its measurements by different compass
3.3 Calculations of angles and bearings
3.4 Local attraction
3.5 Compass traversing and calculations
3.6 Plotting and graphical adjustment

4 Levelling (6 hours)

4.1 Terms, definition and Importance of leveling
4.2 Principles of leveling fundamental and working

4.3 Equipment's used in leveling
4.4 Temporary adjustment of level
4.5 Booking and calculations of reduced level (RL) for short sight distance
4.6 Equalizing the back sights and fore sights
4.7 Collimation error; two peg test
4.8 Refraction and curvature correction
4.9 Classifications of leveling and criteria for different leveling
4.10 Fly leveling, loop leveling for RL transfer and adjustment
4.11 Reciprocal leveling
4.12 Sources of errors in leveling

5 Modern surveying methods (6 hours)

5.1 Introduction to theodolite
5.2 Temporary adjustment of theodolite.
5.3 Measurement of vertical and horizontal angles
5.4 Errors in measurement of theodolite
5.5 Classification, working principles and errors in EDM
5.6 Working principle, features and components of total station
5.7 Types of electronic data recording facilities
5.8 Operational steps for topographical surveying in the field

6 Traversing (4 hours)

6.1 Introduction, significance and principles of traversing
6.2 Closing errors in traversing
6.3 Traverse computation for closed loop closed and link traverse
6.4 Adjustment of final coordinates of traverse stations, Gales table

7 Tachometry (4 hours)

7.1 Introduction, uses and importance
7.2 Principle of optical distance measurements
7.3 Tachometer and its features
7.4 Different types of tachometric measurement system
7.5 Operation of tachometric observation including booking and plotting of details

8 Contouring (3 hours)

8.1 Contour, contour interval, horizontal equivalent
8.2 Characteristics of contour
8.3 Methods of contouring
8.4 Major (Index contour), minor contour and contour interpolation
8.5 Uses of contour maps

9 Curves (1 hour)

9.1 Types of curves and their uses
9.2 Simple circular curves and their elements

10 Photogrammetry and Global Positioning System (GPS) (5 hours)

10.1 Introduction of Photogrammetry
10.2 Scale of vertical photographs and Relief displacement
10.3 Introduction of unmanned aerial vehicle (Drone)
10.4 Merits, limitations and applications of photogrammetry
10.5 Concept of global navigation satellite system (GNSS) and WGS 84 coordinate system
10.6 Introduction, components and principle of GPS
10.7 Differential GPS and its applications

11 Remote Sensing and Geographic Information System (GIS) (5 hours)

11.1 Introduction to remote sensing and GIS
11.2 Components of remote sensing
11.3 Electromagnetic radiation (EMR)
11.4 EMR interaction with earth surface features
11.5 Active and passive remote sensing
11.6 Basic component of GIS and function of GIS
11.7 Geographical data: Spatial and non-spatial data, raster and vector data,
11.8 Application of remote sensing and GIS to agricultural engineering projects

Tutorial (15 hours)

1. Distance measurements (Construction of diagonal scale and problems related to shrunk scale)
2. Compass surveying (Calculation of bearing to angle and angle to bearing. Computation and correction of bearing for close loop close traverse and link traverse for different cases)
3. Levelling (Calculation of field work by HI method and rise and fall method, problems on missing data, two peg test and reciprocal leveling, fly leveling, profile leveling and loop leveling problems)
4. Modern surveying techniques (Calculation of horizontal and vertical and vertical angles for different set of angles)
5. Traversing (Calculation of consecutive coordinates and balancing of closed circuit traverse and link traverse by Bowditch and transit rule)
6. Tacheometry (Calculation of different problems related to stadia method staff vertical only
7. Contouring (Calculation for arithmetic interpolation of contours and calculation of fixing contour interval)
8. Curves (Calculations for five basic elements of simple circular curves and chain ages of typical points on the curves
9. Relief displacement and tilt displacement problems

Practical **(60 hours)**

1. Horizontal distance measurement on fairly sloping ground by pacing and tape and ranging rods. Demonstration of EDM
2. Compass traversing and detailing by compass and offset method
3. Perform two peg test
4. Fly levelling, profile and X –section levelling
5. Measurement of horizontal and vertical angles by theodolite
6. Two set horizontal angle measurement by total station (Theodolitic EDM mode for traversing closed and link traverse)
7. Detailing by tacheometry: Digital theodolite, EDM mode (TS) and total coordinate mode(TS), demonstration and practice from at least two stations
8. Prepare topographic map including contour
9. Demonstration and use of GPS instrument to determine the coordinates of point
10. Introduction to GIS software

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Marks distribution*
1	2	2
2	5	6
3	4	7
4	6	7
5	6	7
6	4	8
7	4	7
8	3	5
9	1	3
10	5	4
11	5	4
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Bannister, A., Raymond S., Baker R. (1998). Surveying (7th Edition). Pearson.
2. Punmia B. C., Jain A., Kr., Jain A. K. (2005). Surveying VOL I, VOL II & VOL III. Laxmi publication.
3. Agor R. (1980). A Text Book of Surveying and Levelling. Delhi: Khanna publisher.
4. Duggal S. K. (2013). Surveying: Volume 1& 2. Tata McGraw-Hill.
5. Dhakal B. B., Karki B. K. (2019). Engineering Surveying I & II, Second edition. Kathmandu: Heritage publication and distributors.

6. Bajracharya, B., Shrestha, B., Pradhan, S. (2001). GIS for Beginners; Introductory GIS Concepts and Hands-on Exercises. Lalitpur: ICIMOD. doi: 10.53055/ICIMOD.371
7. Lillesand, T., Kiefer, R. W., Chipman, J. (2015). Remote Sensing and Image Interpretation. United Kingdom: Wiley.