

Approval: 9th Senate Meeting

Course Number: CE 201

Course Name: Surveying: Traditional and Digital

Credits: 2-0-2-3

Prerequisites: None

Intended for: UG

Distribution: Discipline Core

Semester: Odd/Even

Preamble: Surveying is the major component of Civil Engineering which helps the student to have the basic understating of scale, maps and dimension measurements etc. Surveying has been carried out since ages in various disciplines and has evolved a lot. Earlier the distance were measured using tapes and chains which now has been changed to satellite technology or GPS systems. Traditionally this course is taught in two parts, but keeping the vision of IIT Mandi, this course has been modified and prepared in such a way that the student has the understanding of the traditional methods of surveying as well as he will gain the insight about the current digital technology.

Course Outline: The course is designed in such a way that the student will learn about survey equipments in the theory classes and in the same semester they will have the hands-on experience. Since the lab and the theory comprise a total of 3 credits in the 2-0-1 credit system within the same semester. Hence the laboratory for the survey course is focused on the recent equipments and instruments that are being used in the field of surveying.

The course covers the basics of surveying and map preparations, importance of scale and measurements in the initial lectures. Then the topics related to survey equipments both traditional (which are no more used in the surveying) and digital (which are being used these days including Total Stations and Differential GPS). Along with the theory classes, practicals and hands-on experience will be given to the students. These laboratory experiments will give the students exposure to the new and recent instruments. They will be shown the old techniques as demonstration, and the new techniques of using total station as well as GPS and DGPS will be taught to them. So that the students will learn more about total stations, GPS, DGPS surveys which are more accurate, fast and precise.

Modules:

1. Introduction to surveying: Understanding and need, Reconnaissance survey, compass survey, linear measurements. **(2 contact hours)**
2. Type of maps, scales and uses, coordinate and map projection, plotting accuracy, toposheet numbering. **(4 contact hours)**
3. Surveying equipment, levels, compass, theodolites, tachometer, EDM, total Stations and other instruments. **(16 contact hours)**

- a. Levelling and contouring: types of instruments and their classifications, types and application of different methods, cross sections and gradient calculations.
 - b. Theodolites: Types and classification of different theodolites, applications
 - c. Total Station: Types, classification & applications
 - d. GPS & DGPS
4. Measurement of Distance, Direction and Elevation. **(3 contact hours)**
 5. Theory of error, adjustment of triangulation nets and level nets. Tachometry, Triangulation **(3 contact hours)**

List of experiments:

1. Chain & tape Surveying: Distance measurements
2. Measurements of area using chain and tape.
3. Leveling: Profiling using Theodolite.
4. Leveling: Trigonometric using Theodolite.
5. Measurement of Area using Theodolite
6. Error estimation and calculations.
7. Total Station: Basic and Settings
8. Measurement of Area using Total Station
9. Profiling using Total Station.
10. GPS and DGPS survey and its basics and settings
11. Measurement of area and profiling using DGPS

Survey Camp: Reconnaissance and establishing the stations; Base line measurements, Triangulation readings on various stations; computation and preparation of triangulation map; contouring; preparation of map; preparation of report.

Geology Camp: Reconnaissance of the area; Elementary geological field mapping of rock formations and structural details; Geomorphic processes Preparation of report.

Text Books:

- a) B. C. Punmia, A.K. Jain and A.K. Jain, 'Surveying, Vol-I and Vol-II', Laxmi Publication Pvt., 1996.
- b) G. W. Schofield, 'Engineering Surveying', Butterworth, Heinemann, New Delhi, 6th Ed., 2007.
- c) Arora, K.R., 'Surveying, Vol. I, II and III', Standard Book House, 1995.
- d) T. P. Kanetkar and S. V. Kulkarni, 'Surveying and Levelling, Vol-I and Vol-II', Pune Vidyarthi Griha Prakshan, 1972.
- e) Leick, A., 'GPS Satellite Surveying', John Wiley, 2004.

Reference Books:

- a) R.N. Colwell (Editor-in-Chief), 'Manual of Remote Sensing, Vol. I & II', American Society of Photogrammetry, Falls Church, Virginia, 1983.
- b) Anderson, J.M. and Mikhail, E.M., 'Surveying: Theory and Practice', McGraw Hill, 1998.

- c) Kaplan, E.D. and Hegarty, C.J., 'Understanding GPS: Principles and Applications', Artech House, 2006.
- d) Ahmed El-Rabbany, 'Introduction to GPS: The Global Positioning System', Artec House, London, 2002.
- e) Jay Farrell, 'Aided Navigation: GPS with High Rate Sensors: GPS with High Rate Sensors', McGraw Hill, New York, 2008.