Geodetic Engineering

Course Code	21CV32	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	Exam Hours	03

Course objectives:

- Provide basic knowledge about principles of surveying for location, design and construction of engineering projects
- Develop skills for using surveying instruments including, levelling instruments, plane tables, theodolite, compass
- Make students to familiar with cooperative efforts required in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works
- Provide information about new technologies that are used to abstracting the information of earth surface

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. The survey of India topomap has to be shared with students and few exercise must be given
2. The satellite imagery has to be procured and shared with students
3. The manual for conducting field survey has to be provided
4. The online courses available should be shared with students
5. YouTube videos
6. Power point presentations

Module-1

Introduction to Surveying: Importance of surveying in Civil Engineering, Concepts of plane and geodetic surveying Principles of surveying –Plans and maps – Surveying equipment's, Meridians, Bearings, Dip, Declination, Local attraction, Calculation of bearings and included angles. Compass surveying and Plane Table Surveying

Compass surveying: Prismatic and surveyor's compasses, temporary adjustments.

Plane Table Surveying: plane table and accessories, advantages and disadvantages of plane table survey, method of plotting - radiation, intersection, traversing, resection, two point and three point method

Teaching-Learning Process	Chalk and talk, PowerPoint Presentation, YouTube videos

Module-2

Levelling – Principles and basic definitions – Types of Levels – Types of adjustments and objectives – Types of levelling – Simple, Differential, Fly, Reciprocal, Profile, Cross sectioning – Booking of levels – Rise & fall and H. I methods (Numerical)

Areas and volumes: Measurement of area – by dividing the area into geometrical figures, area from offsets, mid ordinate rule, trapezoidal and Simpsons one third rule, area from co-ordinates, introduction to planimeter, digital planimeter. Measurement of volumes-trapezoidal and prismoidal formula.

Teaching-Learning	Chalk and talk, PowerPoint Presentation, YouTube videos

Process	

Module-3
Theodolite Surveying: Theodolite and types, fundamental axes and parts of theodolite, temporary adjustments of transit theodolite, Horizontal and Vertical angle measurements by repetition and reiteration Trigonometric levelling: Single and Double plane for finding elevation of objects Computation of distances and elevations using Tacheometric method.

Teaching-Learning Process	Chalk and talk, PowerPoint Presentation, YouTube videos

Module-4
Curve Surveying: Curves – Necessity – Types, Simple curves, Elements , Designation of curves, Setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine's deflection angle method (numerical problems). Compound curves, Elements, Design of compound curves, Setting out of compound curves (numerical problems). Reverse curve between two parallel straights (numerical problems on Equal radius and unequal radius). Transition curves Characteristics, numerical problems on Length of Transition curve, Vertical curves –Types – (theory).

Teaching-Learning Process	Chalk and talk, PowerPoint Presentation, YouTube videos

Module-5
Photogrammetry and aerial survey: Introduction, definitions, basics principles, methods, importance of scale, height, applications.
Remote sensing: Introduction, Principle of Remote sensing, EMR, types, resolutions, types of satellites, type of sensors, LIDAR, visual and digital image processing and its applications. **Global Positioning System:** Definition, Principles of GPS and applications. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications
Advanced instrumentation in surveying: classification, measuring principles, Electronic theodolite, EDM, Total Station, Drones

Teaching-Learning Process	Chalk and talk, PowerPoint Presentation, YouTube videos

LABORATORY EXPERIMENTS	
1.	Study of various instruments used for surveying, namely chain, tape, Compass,
2.	Dumpy level, Auto-level, Theodolite, Tacheometer, Total station and GPS. To find the distance between two points shown in the field using method of pacing, chaining and taping.
3.	To set regular geometric figures (Hexagon and Pentagon) using chain tape and accessories.
4.	To set regular geometric figures (Hexagon and Pentagon) using prismatic compass, given the bearing of one line.
5.	Study of use of Dumpy level and to determine the different in elevation between two points by differential levelling using Dumpy level
6.	To find the true difference in elevation between two points situated far apart by using Reciprocal levelling.

7.	Trigonometrical levelling: Single plane method and Double plane method
8.	Measurement of horizontal angle using theodolite by: i) Method of Repetition and ii) Reiteration method.
9.	Setting simple circular curve-Instrumental method,
10.	Setting compound curve using theodolite
11.	Plane table : Setting, orientation, radiation, intersection
12.	Demo: Total station, GPS

Course outcome (Course Skill Set)

At the end of the course the student will be able to :
1. Execute survey using compass and plane table
2. Find the level of ground surface and Calculation of area and volumes
3. Operate theodolite for field execution
4. Estimate the capacity of reservoir
5. Interpret satellite imageries

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Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**
1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs **for 20 Marks (duration 01 hours)**
6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to **50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)
1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

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Suggested Learning Resources:

Books
1. Surveying & levelling Vol. I ,II & III, B. C. Punmia, Laxmi Publications; seventeenth edition (2016)
2. Advanced Surveying: Total Station, GPS, GIS & Remote Sensing by Pearson 2017 by GopiSatheesh, R.Sathikumar, N. Madhu
3. Surveying Vol.I& II, S. K. Duggal, McGraw Hill Education; Fourth edition (2017)

4. Surveying and Levelling, R. Subramanian , second edition, 2012, Oxford University Press;
5. Engineering Surveying, Schofield and Breach, 6th edition, Butterworth-Heinemann (Elsevier publication, 2007)
6. Surveying , A Banister, S Raymond, R Baker, 7th edition, Pearson , New Delhi

Web links and Video Lectures (e-Resources):

- NPTEL courses

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning