

**COURSE TITLE : SURVEYING- II**

**COURSE CODE : 3012**

**COURSE CATEGORY : B**

**PERIODS/WEEK : 6**

**PERIODS/SEMESTER: 90**

**CREDITS : 6**

**TIME SCHEDULE**

<b>Module</b>	<b>Topics</b>	<b>Period</b>
1	Study of theodolite Angle measurement Area calculation and plotting	24
2	Preparation of Gale's traverse table Tangential tacheometry	23
3	Height & Distance Tacheometry	22
4	Curves, Types, Setting of curves Modern survey instruments Detailed study of Total station GIS and GPS	21
<b>TOTAL</b>		<b>90</b>

**COURSE OUTCOME**

<b>Sl.</b>	<b>Sub</b>	<b>Student will be able to</b>
<b>1</b>	1	Use theodolite and enter data in the field book and plot
	2	Use tacheometer for finding the horizontal and vertical distances
	3	Set out simple curves
<b>2</b>	1	Understand the modern survey instruments
	2	Use total station for surveying and setting out of buildings
	3	Understand GIS and GPS

**SPECIFIC OUTCOME**

Upon completion of the study, the student should be able to:

**MODULE- I**

**1.1.0 Understand the Theodolite.**

1.1.1 Identify the different types of theodolites, their parts and functions

1.1.2 State the important axis of theodolite and their inter relations

1.1.3 Define the terms used in the theodolite survey

- 1.1.4 Explain the temporary adjustments of theodolite
- 1.1.5 Explain the different methods of horizontal angle measurement (general, repetition and reiteration ) and their relative advantages and disadvantages.
- 1.1.6 List the uses of theodolite.
- 1.1.7 List the steps involved in setting out angles using a theodolite
- 1.1.8 Measure deflection angle
- 1.1.9 Explain the methods of prolonging a straight line
- 1.1.10 Measure the magnetic bearing of a line
- 1.1.11 Perform the permanent adjustments of theodolite.

## MODULE -II

### 2.1.0 Apply the principles of Theodolite traversing.

- 2.1.1 List the types of traverse
- 2.1.2 List the different methods of traversing using theodolite
- 2.1.3 Explain the methods of traversing by the observation of bearing, loose needle method and fast needle method
- 2.1.4 State the different types of fast needle method
- 2.1.5 Explain the method of traversing by included angle.
- 2.1.6 Calculate the whole circle bearing using measured included angle.
- 2.1.7 Describe the types of co-ordinates- consecutive and independent co-ordinates.
- 2.1.8 Calculate the consecutive co-ordinates – from the length and bearing
- 2.1.9 Calculation of closing errors
- 2.1.10 Explain the methods of balancing the traverse- Bowditch's rule and transit rule.
- 2.1.11 Calculate the corrections to consecutive co-ordinates
- 2.1.12 Calculate the independent co-ordinates
- 2.1.13 Explain Gales traverse table

### 2.2.0 Understand the computation of area of closed traverse

- 2.2.1 Describe the methods of computation of area
- 2.2.2 Calculate the area of closed traverse by co-ordinate method

### 2.3.0 Find out the omitted measurements when

- 2.3.1 Length of one leg is missing
- 2.3.2 Bearing of one leg is missing
- 2.3.3 Length and bearing of one leg are missing
- 2.3.4 Length/bearing of two adjacent legs are missing
- 2.3.5 Length/bearing of two legs (not adjacent) are missing

## MODULE- III

### 3.1.0 Apply the principle of trigonometry for determining the elevation of stations

- 3.1.1 Study vertical angle measurements.
- 3.1.2 Explain the principle of trigonometric levelling.
- 3.1.3 Find the elevation of a tall object whose base is accessible.
- 3.1.4 Find the elevation of a tall object whose base is inaccessible, instrument at same level and at different level.

- 3.1.5 Find the elevation of tall object (base inaccessible)- instruments in the same plane and different plane.
- 3.2.0 Apply the principle of tacheometric survey to find elevations of stations.
- 3.2.1 State the classification of tacheometry
- 3.2.2 Explain the principle of stadia tacheometry.
- 3.2.3 Derive the fundamental distance formula of stadia tacheometry
- 3.2.4 State the constants of stadia tacheometry
- 3.2.5 Explain the determination of stadia constants
- 3.2.6 Describe analytic lens, advantages and disadvantages
- 3.2.7 Derive expression for horizontal distance and reduced level- line of sight horizontal-  
Line of sight horizontal and staff held vertical
- 3.2.8 Find the horizontal distance, reduced level and level difference from the given data by  
Stadia tacheometry (line of sight horizontal, inclined and staff held vertical)
- 3.2.9 Explain the principle of tangential tacheometry
- 3.2.10 Describe the cases of tangential tacheometry
- 3.2.11 Compute the horizontal distance and elevation using tangential tachometry

#### **MODULE - IV**

##### **4.1.0 Comprehend on curves**

- 4.1.1 Explain the different types of curves- simple curve, compound curve, transition curve and vertical curves
- 4.1.2 Explain transition curve
- 4.1.3 Calculate the elements of simple circular curve.
- 4.1.4 Explain the different methods of setting out circular curves-offsets from long chord, offsets from long tangent, offsets from chord produced, rankines method.
- 4.1.5 Calculate the data required to set out circular curve

##### **4.2.0 Understand the modern surveying equipments**

- 4.2.1 Identify the different parts of equipments like electronic theodolite, total station and GPS.
- 4.2.2 Enumerate the uses and advantages of Electronic Theodolite, Total station and GPS
- 4.2.3 Explain the prism mode and non-prism mode of Total station
- 4.2.2 Explain remote sensing and its application in civil engineering field.
- 4.2.3 Explain the fundamentals of GPS, receiving, observation and the transformation of GPS results.
- 4.2.4 Explain GIS and its application in Civil Engineering.
- 4.2.5 Describe the photogrammetry- aerial and terrestrial.
- 4.2.6 Enumerate the applications of photogrammetry.

#### **CONTENT DETAILS**

#### **MODULE – I**

##### **THEODOLITE**

Types of theodolites – Transit and non transit, vernier and micrometer, different parts of a transit theodolite. Temporary adjustments of a theodolite, technical terms used in theodolite surveying –

fundamental lines and relationship between them. Measurement of horizontal angles – repetition and reiteration methods – other uses of theodolite such as measurement of magnetic bearing of a line, deflection angle and prolongation of straight lines. Permanent adjustment of a theodolite – object of permanent adjustment – order of permanent adjustment.

## **MODULE – II**

### **THEODOLITE TRAVERSING**

Types of traverses – open and closed traverses – method of theodolite traversing – method of included angles – methods of deflection angles – measurement of bearing of a traverse leg by direct method and back bearing method. Calculation of consecutive co-ordinates, independent co-ordinates – problems related – permissible error in angular and linear measurements – calculation of closing error, balancing of consecutive co-ordinates by Bowditch and transit rules. Gales travers table preparation, computation of areas of a closed traverse from independent co-ordinates. Omitted measurements – different cases such as when the length of one leg is missing, bearing of one leg is missing, length and bearing of one leg are missing, length of one leg and bearing of other leg are missing, length of two adjacent sides are missing – problems related.

## **MODULE – III**

### **HEIGHT AND DISTANCE; TACHEOMETRY**

Height and distance – Reading vertical angle – finding elevation of objects – base of the object accessible and inaccessible – instrument in same plane and different plane – problems related Principles of tacheometry – constants of tacheometer – determination of the constants – systems of tacheometric measurements. Stadia systems and tangential system – theory of stadia tacheometry. Relations on staff held vertical and normal to the line of sight. Determination of distance and elevation – problems related. anallactic lens – advantages – disadvantages – problems with anallactic lens. Tangential tacheometry – principle – method – tacheometric traversing- tacheometric contouring.

## **MODULE – IV**

### **CURVES**

Curves– different types – elements of a simple curve – designation of a curve – setting out simple curves by offset method – from long chord, long tangents , chord produced. Rankines method of deflection angles – problems related- description of transition curves. Requirement of transition curves – length of transition curves for roads – introduction to vertical curves – geometrics of a vertical curve.

### **TOTAL STATIONS, GPS AND GIS**

Electronic Theodolites – Total stations – component parts –set up– working principles – maintenance of EDM instruments –temporary adjustments –measurement with total station, traverse with total station, Survey station description-data gathering components-data processing components- error sources and controlling errors-field coding-field controlling-Modem for data transfer- readings with prism mode and non prism mode. Remote sensing – Introduction and applications in Civil Engineering. Global positioning system (GPS) – fundamentals, GPS receivers, GPS observations, transformation of GPS results.

Geographical information systems (GIS) – map definitions, map projections data entry importance, use and application of GIS in Civil Engineering. Introduction to Photogrammetry, aerial, terrestrial, applications of photogrammetry

### **REFERENCE BOOKS**

1. T.P.Kanetkar & Kulkarni : Surveying and Levelling (Vol I & Vol II) ; Jain book depot
2. B.C.Punmia : Surveying – II ; Laxmi publications
3. K.R Arora : Surveying - ; Standard Book House
4. P.B.Shahai : A textbook of surveying [Vol. I and Vol. II] ; Oxford and IBH Publishing Co.
5. Patel .A.N : Remote Sensing Principles & Applications ; Scientific Publishers
6. Lillesand : Remote sensing and image interpretation ; Wiley
7. SathishGopi : Advanced Surveying ; Pearson
8. CL Kocher : Text book of Surveying ; [Dhanpat Rai Publishing Co \(p\)](#)
9. N N Basak : Surveying ; TataMcgraw Hill
10. S.S.Bhavikatti : Surveying and leveling (Vol. I & II) ; I.K.International publishing house
11. NITTR, Chennai : AICTE Continuing Education module on Geographical information systems