

**COURSE TITLE** : SURVEYING – II  
**COURSE CODE** : 3022  
**COURSE CATEGORY** : B  
**PERIODS/WEEK** : 6  
**PERIODS/SEMESTER** : 108  
**CREDITS** : 5

### TIME SCHEDULE

MODULE	TOPIC	PERIODS
I	Theodolite	21
	Test I	1
II	Theodolite traversing	29
	Test II	1
III	Heights, distances and Tacheometry	29
	Test III	1
IV	Modern Surveying	25
	Test IV	1
	<b>TOTAL</b>	<b>108</b>

#### **Rationale**

*The knowledge of surveying is advantages in many phases of engineering. The earliest surveys were made in connection with land surveying. Surveying and levelling is an important subject for all civil engineers engaged in the field work. They are either called to prepare plans and maps or to use them to prepare the civil engineering projects on to set out the works using the maps In the field of topographic surveying, one notable contribution of electronics has been the total station. With the introduction of GIS, total station and GPS in advanced surveying the preparation of a map with contour lines has become very easy.*

### OBJECTIVES

Up on completion of the course the student should be able:

#### **1.1.0 To Appreciate the Theodolite.**

- 1.1.1 To identify the different types of theodolites, their parts and functions
- 1.1.2 To know the temporary adjustments and terms.
- 1.1.3 To list the fundamental lines and their relationship
- 1.1.4 To study horizontal angle measurement by repetition and reiteration method
- 1.1.5 To list the steps involved in setting out angles using a theodolite
- 1.1.6 To know the permanent adjustments.

#### **2.1.0 To apply the principles of Theodolite traversing.**

- 2.1.0 To explain the method of conducting traverse survey in the field using the theodolite
- 2.1.1 To compute the co-ordinates and distribute the error of closure
- 2.1.2 To study the Bowditch's and Transit rules, Preparation of Gales table and to determine the area of a traverse
- 2.1.3 To find out the omitted measurements.

#### **3.1.0 To apply the principle of trigonometry for determining the elevation of stations**

- 3.1.1 To study vertical angle measurements.

- 3.1.2 To explain the principle of trigonometric levelling.
- 3.1.3 To Apply the principle of tacheometric survey to find elevations of stations.
- 3.1.4 To explain the principle of stadia tacheometry.
- 3.1.5 To list the steps involved in taking the stadia observation in the field to find the elevation of stations.
- 3.1.6 To explain the principle of tangential tacheometry.
- 3.1.7 To compute the elevations using tangential tacheometry.
- 4.1.0 To compute the curve elements.**
  - 4.1.1 To list the procedure for setting out circular curves by chain and tape/theodolite.
  - 4.1.2 To understand compound, reverse, transition and vertical curves.
- 4.2.0 To get exposure to modern surveying equipments**
  - 4.2.1 To identify the different parts of equipments like electronic theodolite, total station, distomat, laser level and GPS.
  - 4.2.2 To understand remote sensing and its application in civil engg field.
  - 4.2.3 To explain the fundamentals of GPS, receiving, observation and the transformation of GPS results.
  - 4.2.4 To understand and to explain the application of GIS in Civil Engg.,
  - 4.2.5 To understand photogrammetry aerial and terrestrial.
  - 4.2.6 To appreciate the applications of photogrammetry.

## CONTENT DETAILS

### MODULE – I: THEODOLITE

Types of theodolites – Transit and non transit, vernier and micrometer, digital 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 Bow ditch and transit rules. Gales table preparation, computation of areas of a closed traverse from independent co-ordinates

Omitted measurements – different cases such as length of one leg missing, bearing of one leg missing, length and bearing of one leg missing, length of one leg and bearing of other leg missing, length of two adjacent sides 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.

– EDM optical theodolite method –

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

#### **REFERENCE BOOKS**

1. Surveying and Levelling (Vol I& Vol II) – T.P.Kanetkar & S.V. Kulkarni #
2. Surveying – II – B.C.Punmia
3. Surveying – S.K.Hussain
4. A textbook of surveying – P.B.Shahai [Vol.I and Vol. II (Oxford and IBH Publishing Co.,)]
5. Remote Sensing Principles & Applications – Patel.A.N, Scientific Publishers – Jodhpur
6. AICTE Continuing Education module on – TTTI, Chennai – 113  
Geographical information systems
7. Surveying – A.Bannister, S.Raymond.
8. Advanced Surveying – Sathish Gopi *etal*
9. Surveying and leveling (Vol I& Vol II) – S.S.Bhavikatti  
(I.K.International publishing house)

# Can be treated as a **text book**