Program : **Diploma in Civil Engineering**	
Course Code : **3011**	Course Title: **Advanced Surveying**
Semester : **3**	Credits: **3**
Course Category: **Program Core**	
Periods per week: **4 (L:3, T:1, P:0)**	Periods per semester: **60**

Course Objectives:

- To impart the knowledge about the concept of contouring.
- To familiarize students the different uses and methods of theodolite traversing and the steps involved in plotting a traverse.
- To make them familiar with the working principles and applications of Total station, remote sensing, GIS, GPS etc.

Course Prerequisites:

Topic/Description	Course code	Course Title	Semester
Basic knowledge in mathematics		Engineering Mathematics	1, 2
Knowledge of levelling, calculation of angles etc		Basic Surveying	3

Course Outcomes

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Make use of contour maps for volume computation	15	Applying
CO2	Apply Theodolite survey in field.	16	Applying
CO3	Outline the working principles and applications of electronic theodolite and total station.	13	Understanding
CO4	Summarize the applications of Remote sensing, GPS and GIS in survey works.	14	Understanding
	Series test	2	

CO - PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3						
CO3				2			
CO4							3

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Make use of contour maps for volume computation**		
M1.01	Explain contour and determine volumes using contour	4	Applying
M1.02	Identify the different types of theodolites, their parts and functions	4	Remembering
M1.03	Determine horizontal angle using different methods	4	Understanding
M1.04	Outline the uses of theodolite	3	Understanding
Contents: Contour - Characteristics of contours - methods of contouring, interpolation of contours - tracing contour gradient - uses of contours- Marking alignments of road, railway and canal in a contour map. Capacity of reservoirs using contour maps. Measurement of area & volume using contour. 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.			
CO2	**Apply Theodolite survey in field.**		
M2.01	Outline the different methods of traversing	4	Understanding
M2.02	Prepare Gales traverse table	4	Applying
M2.03	Determine distances and elevations by tacheometry	4	Applying
M2.04	Describe setting out simple curves	4	Understanding
	Series Test - I	1	

Contents:

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 traverse 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.

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 tacheometry - systems of tacheometric measurements. Stadia systems and tangential system

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.

CO3	**Outline the working principles and applications of electronic theodolite and total station.**		
M3.01	Explain the working and components of electronic theodolite	3	Understanding
M3.02	Explain the working principle and components of Total station	3	Understanding
M3.03	Describe traversing using total station	4	Understanding
M3.04	Describe data gathering and processing using application software	3	Understanding

Contents:

Electronic Theodolites - component parts -set up- working principles -temporary adjustments

Total stations - uses-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.

CO4	**Summarize the applications of Remote sensing, GPS and GIS in survey works.**		
M4.01	Outline principles and applications of remote sensing	3	Remembering

M4.02	Describe working principles of GPS and its applications.	3	Understanding
M4.03	Outline principles of GIS and its applications	4	Understanding
M4.04	Explain the fundamentals of Photogrammetry and its applications.	4	Understanding
	Series Test - II	1	

Contents:

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.

Introduction to Drone surveying, Global navigation satellite system (GNSS)

Text /Reference:

T/R	BookTitle/Author
T1	B.C.Punmia : Surveying - II; Laxmipublications
R2	T.P.Kanetkar& Kulkarni Surveying and Levelling (Vol I&Vol II; Jain book depot 2
R3	Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
R4	Patel .A.N: Remote Sensing Principles & Applications; Scientific Publishers 6
R5	NITTTR, Chennai : AICTE Continuing Education module on Geographical information systems

Online resources:

Sl.No	Website Link
1	http://nptel.ac.in/courses
2	http://www.vlab.co.in/ba-nptel-labs-civil-engineering