**19CE2103 –SURVEYING**

**(Civil Engineering)**

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| **Course Category**  | Professional Core | **Credits** | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical** | 2-1-0 |
| **Prerequisite**  | Engineering Mathematics - II | **Sessional Evaluation**  | 40 |
| **Semester End Exam. Evaluation** | 60 |
| **Total Marks** | 100 |

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| **Course Objectives** | 1. To apply knowledge of mathematics, science and engineering for understanding measurement techniques and basic equipment used in land surveying.
2. To understand the operation of automatic level to perform differential and profile leveling, record observations, mathematically reduce and check levelling measurements, interpolation and plotting of contours.
3. Understand various methods of angular measurements and perform traverse computations.
4. To understand basics of curve setting and various methods of computing areas and volumes.
5. To understand the principles and usage of total station and GPS in surveying.
6. To apply the knowledge of surveying for setting-out works.
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| **Course Outcomes** | CO1 | Apply chain and plane table surveyingprinciples to record observations and make necessary calculations. |
| CO2 | Apply various methods of levelling, understand the basic principles of contouring and uses of contour maps. |
| CO3 | Calculate azimuths, latitudes and departures, error of closure; adjust latitudes and departures and determine coordinates for a closed traverse using a prismatic compass and theodolite. |
| CO4 | Calculate, design and layout horizontal and vertical curves. Calculate areas and volumes from survey data using mathematical principles. |
| CO5 | Operate a total station to measure distance, angles, and to calculate differences in elevation. Make GPS measurements and relate them to conventional surveying. |
| CO6 | Carryout setting-out for laying pipeline and tunneling. |

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| **Course Content** | **UNIT – I****BASICS OF SURVEYING**: Definition, principles, purpose of surveying, basic measurements – linear and angular; chain surveying - principle, methods and applications; pacing, ranging, chaining and selection of survey stations and lines; well-conditioned triangle, field book entries, scales-types and uses, plan and map – comparison; cross staff survey; plane table survey - principle, methods and errors.**UNIT – II****LEVELLING** – Definition, principles, methods and classification of levelling, recording observations and reduction of levels, calculation of gradient and plotting longitudinal and cross sections.**CONTOURING** – Contour interval, characteristics, uses; methods of locating contours, interpolation of contours.**UNIT – III****ANGULAR MEASUREMENTS**: Compass surveying, bearings, meridians, directions, included angles, local attraction, dip and deflection. Theodolite surveying - measurements of horizontal and vertical angles, deflection angles. Traversing – methods, types, computations and checks for traverse. Tacheometry - principle, methods and determination of tacheometric constants.**UNIT – IV****CURVES:** Types of curves, elements, methods of setting out of horizontal and vertical curves (only simple curves for examination).**AREAS and VOLUMES**: Area calculation- plotting of survey work, methods of area and volume computations, minor instruments.**UNIT –V****MODERN FIELD SURVEY SYSTEMS**: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems-Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.**UNIT – VI****CONSTRUCTION SURVEYS:** Introduction-staking out buildings-pipelines and sewers-highways-culverts. Bridge surveys-determining the length of a bridge-locating centres of piers- surface surveys and tunnel alignment-underground surveys-connection of surface and underground surveys-levelling in tunnels. |

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| **Textbooks and reference books:** | **TEXTBOOKS:**1. N. N.Basak, “*Surveying and leveling*”,McGraw Hill Education (India) Pvt. Ltd,2ndEdition, 2014.
2. Dr. K.R. Arora “*Surveying Vol-I, II and III*”,Standard Book House, 17thEdition, 2019.
3. B. C. Punmia, Ashok K Jain and Arun K Jain, “*Surveying Vol.I”* Laxmi Publications,2016.

**REFERENCE BOOKS:**1. C. Venkatramaiah, “*Text Book of Surveying*” Universities Press, revised edition, 2011.
2. T.P.Kanetkar and S.V.Kulkarni, “*Surveying and Levelling*”, Pune VidyarthiGrihaPrakashan publishers, 2010.
3. A. M. Chandra “*Plane Surveying*”,New Age International Ltd. Publishers, 3rdEdition, 2018.
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**CO-PO Mapping:**3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

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|   | **a** | **b** | **c** | **d** | **e** | **f** | **g** | **h** | **i** | **j** | **k** | **l** |
| **CO1** | 3 | 2 | 1 | 2 | 1 | 1 | - | - | 1 | 2 | 2 | 1 |
| **CO2** | 3 | 3 | 2 | 2 | 2 | 1 | - | - | 1 | 2 | 2 | 1 |
| **CO3** | 3 | 3 | 1 | 2 | 1 | - | - | - | 1 | 1 | 1 | 2 |
| **CO4** | 3 | 3 | 2 | 2 | 1 | 1 | - | - | 1 | 2 | 2 | 2 |
| **CO5** | 3 | 3 | 3 | 2 | 2 | - | 1 | 1 | 1 | 2 | 3 | 2 |
| **CO6** | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 2 |