**20CE2102 –SURVEYING**

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| **Course Category**  | Professional Core | **Credits** | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical** | 2-1-0 |
| **Prerequisite**  | Mathematics | **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 use of measurement techniques and basic equipment used in land surveying.
2. To perform the operation of automatic level and recording observations, reduce levels, interpolation and plotting of contours.
3. To outline various methods of angular measurements and perform traverse computations.
4. To analyze the basics of curve setting and various methods of computing areas and volumes.
5. To apply the principles, 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 | Outline chain and plane table surveying principles to record observations and make necessary calculations. |
| CO2 | Be able to determine the elevations using various methods of levelling and prepare contour maps using levelling data. |
| 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 the data required to set out 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 work 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, 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, equipment and types of level instruments, 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 bridge-locating centre’s 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, 2nd edition, 2014.
2. Dr. K.R. Arora “*Surveying Vol-I, II and III”*, Standard Book House, 17th edition, 2019.
3. B. C. Punmia, Ashok K Jain and Arun K Jain, “*Surveying Vol.I”,* Laxmi Publications, 17th edition, 2018.

**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 Vidyarthi Griha Prakashan 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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|   | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | - | 1 | - | - | - | - | - | - | - | - | 1 | - |
| **CO2** | 3 | 2 | - | 1 | 1 | 1 | - | - | - | - | 1 | 2 |
| **CO3** | 3 | 2 | - | 1 | - | - | - | - | - | - | - | 1 |
| **CO4** | 3 | 2 | - | 1 | - | - | - | - | - | - | - | 1 |
| **CO5** | 2 | 1 | - | 2 | 3 | 2 | 1 | - | - | - | 3 | 2 |
| **CO6** | 1 |  1 | - | 2 | 2 | 1 | 1 | - | - | - | 2 | 2 |