NIRMA UNIVERSITY

Institute:	**Institute of Technology**
Name of Programme:	**B Tech in Civil Engineering**
Course Code:	2CL701
Course Title:	**Surveying**
Course Type:	(☑ Core/☐ Value Added Course/ ☐ Departmental Elective/ ☐ Institute Elective/ ☐ University Elective/ ☐ Open Elective ☐ Any other)
Year of Introduction:	2023-24

L	**T**	**Practical Component**				**C**
		LPW	**PW**	**W**	**S**	
2	**-**	**2**	**-**	**-**	**-**	**3**

Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to –

1. explain the concepts of surveying (BL2)
2. select appropriate survey methods for linear and angular measurements (BL3)
3. solve the practical problems related to vertical measurement (BL3)
4. make use of modern survey instruments and techniques. (BL3)

Syllabus: **Teaching hours:30**

Unit	**Syllabus**	**Teaching hours**
Unit-I	**Surveying Fundamentals** Principles, types, objectives, classification, scales and maps, errors and adjustment, map projections, coordinate systems, applications.	06
Unit-II	**Direction, Distance and Angle Measurements** Linear measurements; Compass: calculation of angles from bearings; Theodolite: measurements of horizontal and vertical angle, gales traverse table; Curves: types, geometry and setting out work	07
Unit-III	**Vertical Measurements** Levelling: Types of level, principle, types of levelling, errors; Contouring: Characteristics of Contours, methods, applications; Tacheometry: introduction, methods, Calculation of area and volume.	07
Unit-IV	**Advanced Surveying Instruments and Techniques** Electronics Distance Meter (EDM), Total Station, Global Navigation Satellite System (GNSS), Geographic Information System (GIS), Remote Sensing (RS), Photogrammetry, Light Detection and Ranging (LIDAR), Unmanned Aerial Vehicles (UAVs), Laser scanner.	10

Self-Study:	The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents.
Suggested Readings/ References:	● Punmia, B. C., *Surveying and Levelling*, Vol. I, II & III, Laxmi Publications. ● Subramanian, R., *Surveying and Leveling*, Oxford Higher Education. ● Duggal, K. S., *Surveying and Levelling*, Vol. I & II, Tata Mcgraw-Hill Publishing. ● Basak, N. N., *Surveying and Levelling*, Tata Mcgraw-Hill Publishing. ● Chandra, A. M., *Geoinformatics*, New Age International Publisher. ● Anderson, J. M. & Mikhali, E. M., *Surveying: Theory and Practice*, McGraw-Hill Publication. ● Gopi, S., Sathikumar R., & Madhu, N., *Advanced Surveying*, Pearson Education.
Suggested List of Experiments:	Laboratory work will be based on above syllabus with minimum 08 experiments/exercises to be incorporated.

Sr. No.	Name of Experiments/Exercises	Hours
1.	Angular measurement: Compass and Theodolite	04
2.	Setting out simple circular curve	02
3.	Vertical measurements using different types of level	06
4.	Measurements of coordinates using total station	06
5.	Staking out points using Differential Global Positioning System (DGPS)	04
6.	Land survey using Unmanned Aerial Vehicles (UAVs)	04
7.	Image Interpretation: Remote Sensing	02
8.	Demonstration of Geographic Information System	02