DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF COURSE WORK

Course Title:	**SURVEYING AND GEOMATICS**		
Course Code:	**20CE1101**	**L T P C:**	**3 0 0 3**
Program:	**B. Tech.**		
Branch:	**Civil Engineering**		
Semester:	**I**		
Prerequisites:	**Basics of Mathematics**		
Courses to which it is a prerequisite:	**Advanced surveying, Transportation Engineering, Remote Sensing &GIS**		

Course Outcomes (COs):

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

CO1: Calculate horizontal and angular measurements, Measure levels and draw contours.

CO2: Assess areas of irregular boundaries, volumes of borrow pits, embankments and capacity of reservoirs.

CO3: Prepare theodolite traversing and different types of horizontal curves.

CO4: Study applications and importance of Total station, GPS and EDM.

CO5: Study Photogrammetric surveying.

Program Outcomes (POs):

1. Graduates will be able to apply the knowledge of mathematics, science, engineering fundamentals to solve complex civil engineering problems.
2. Graduates will attain the capability to identify, formulate and analyse problems related to civil engineering and substantiate the conclusions
3. Graduates will be in a position to design solutions for civil engineering problems and design system components and processes that meet the specified needs with appropriate consideration to public health and safety.
4. Graduates will be able to perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.
5. Graduates will be able to select and apply appropriate techniques from the available resources and modern civil engineering and software tools, and will be able to predict and model complex engineering activities with an understanding of the practical limitations.
6. Graduates will be able to carry out their professional practice in civil engineering by appropriately considering and weighing the issues related to society and culture and the consequent responsibilities.
7. Graduates will be able to understand the impact of the professional engineering solutions on environmental safety and legal issues.

8. Graduates will transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
9. Graduates will be able to function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
10. Graduates will be able to communicate fluently on complex engineering activities with the engineering community and society, and will be able to prepare reports and make presentations effectively.
11. Graduates will be able to demonstrate knowledge and understanding of the engineering and management principles and apply the same while managing projects in multidisciplinary environments.
12. Graduates will engage themselves in independent and life-long learning in the broadest context of technological change while continuing professional practice in their specialized areas of civil engineering.

Course Outcome Vs Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2		2	2	3	1	3	2	2	2	2
CO-2	3	3		2	1	2	2	2		3	2	
CO-3	2	3	2	2	3	2	2	2	2	3	2	2
CO-4	2	1		2	3	2		1	2	3	2	2
CO-5	2	2		2	3	1	1		2	3	2	2

S - Strongly correlated, M - Moderately correlated, *Blank - No correlation*

Course Out come Vs Programme Specific Outcomes:

CO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	1	3	3
CO3	2	2	3
CO4	3	2	2
CO5	3		

Mapping Levels:
1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), put -: No Correlation

Learning outcomes:

UNIT	LEARNING OUTCOMES
UNIT –I **INTRODUCTION TO SURVEYING:** Principles, Linear, angular, Survey stations, Survey lines- ranging, Bearing of survey lines. **LEVELING:** Principles of leveling - booking and reducing levels; differential, reciprocal leveling, profile leveling and cross sectioning. Digital and Auto Level, Errors in leveling; **CONTOURING:** Characteristics, methods, uses.	1. Understand basic procedures in surveying (L1) 2. Estimate errors in leveling (L2) 3. Understand Contour maps (L3)

UNIT –II **AREAS AND VOLUMES:** Area from field notes, Computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without	1. Compute areas using different methods (L1) 2. Compute volume of borrow pits (L2) 3. Determination of the capacity of the reservoir (L3)
transverse slopes. Determination of the capacity of reservoir. Volume of borrow pits.	
UNIT –III **TRIGONOMETRIC LEVELING AND CURVES:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods -triangulation - Inter-visibility of height and distances; Trigonometric leveling - Axis single corrections. Traversing – Types, balancing the traverse. Curves– Elements of simple and compound curves – Methods of setting out.	1. Measure angles using Theodolite.(L1) 2. Carryout trigonometric leveling. (L2) 3. Set simple and compound curve. (L3)
UNIT –IV **MODERN FIELD SURVEY SYSTEMS:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, 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.	1. Illustrate distance measurements using modern field survey systems.(L1) 2. Carryout surveying using Total Station (L2) 3. Determine Coordinates using GPS (L3)
UNIT –V **PHOTOGRAMMETRY SURVEYING:** Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial Photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, photographic mapping.	1.Understand Photogrammetry adopting various techniques (L1) 2. Distinguish different types of plotting instruments (L2) 3. Determination of photographic mapping (L3)

Assessment Methods:	Assignment / Seminar / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	**Topics**	**CO**	**Sample questions**	**Teaching-learning strategy**	**Assessment Method & Schedule**
1	Definition of surveying, overview of planes surveying (chain and compass).	1	1. Define surveying. Explain about the primary division of surveying. 2. Discuss about any six types of surveying.	Chalk & Board, Lecture	

2	Objectives principles and classifications. Distance and direction-	1	1. Explain about the classification of surveying based on instruments.	Chalk & Board, Lecture, Problem solving	
	distance measurements conventions and methods.		2. Describe the methods of chaining on an uneven ground.		
3	Use of chain and tape, Electronic distance measurements, Meridians, Azimuths and bearings, declination, computation of angles.	1	1. What is meridian? Explain about the types of meridian. 2. Explain about the reciprocal ranging?	Chalk & Board, Lecture, Problem solving	
4	Levelling and contouring-Introduction and terminology, temporary adjustments, Methods of levelling, plotting of L.S&C.S.	1	1. Explain about the profile levelling? 2. What are the temporary adjustments to be done in leveling?	Chalk & Board, Lecture, Problem solving	
5	Contouring: Uses of contours, Methods of conducting contour surveying and their plotting contour gradient-uses of contour maps.	1	1. Explain the characteristics and uses of contours. 2. Explain about the direct and indirect methods of contouring.	Chalk & Board	
6	Area from field notes, computation of areas Along irregular boundaries and area	2	Explain about the computation of volume from borrow pits	Chalk & Board, Lecture, Problem solving	
7	Consisting of regular boundaries. Embankments and cutting for level sections with and without transverse slopes.	2	State and derive the expression for Simpson's rule of areas?	Chalk & Board, Lecture, Problem solving	Assignment, Quiz
8	**MID TEST – I**				
9	Determination of the capacity of reservoir.	2	Determine the capacity of reservoir using contours.	Lecture, Problem solving	
10	Theodolite- Types of theodolites – temporary adjustments of theodolite-Measurements of horizontal angles- methods of repetition and reiteration. Measurements of verticalangle-uses of theodolite-errors of a theodolite.	3	1. Discuss about the measurement of horizontal angle by reiteration method. 2. Explain the sources of errors in theodolite surveying.	Chalk & Board, Lecture, Problem solving	
11	Triangulation - Inter-visibility of height and distances.	3	Determine the height of a building when its base is not visible.	Chalk & Board, Lecture, Problem solving	
12	Trigonometric leveling - Axis single corrections. Traversing – Types, balancing the traverse.	3	1. Explain the procedure for open and closed traverse of a theodolite. 2. Explain the methods of balancing the traverse.	Chalk & Board, Lecture, Problem solving	

13	Curves– Elements of simple and compound curves – Methods of setting out.	3	1. List and discuss the components of a compound curves. 2. Explain the methods of setting a simple curve.	Chalk & Board, Lecture, Problem solving	
14	Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey	4	1. What is total station? Explain its components with neat sketch. 2. Write the applications of total stations in civil Engineering.	Chalk & Board, Lecture	
15	Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.	4	1. Briefly discuss about the co-ordinate transformation. 2. Explain the errors and biases that take place in GPS measurements.	Chalk & Board, Lecture	
16	PHOTOGRAMMETRY SURVEYING: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning	5	Discuss about terrestrial Photogrammetry with the help of a neat figure.	Chalk & Board, Lecture	
17	Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, photographic mapping.	5	Differentiate aerial triangulation and radial triangulation.	Chalk & Board, Lecture	Assignment, Quiz
18	**MID TEST – II**				