

GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL ENGINEERING (06)

ADVANCED SURVEYING

SUBJECT CODE: 2140601

B.E. 4th Semester

Type of course: Civil Engineering

Prerequisite: Elementary course on surveying

Rationale: A Civil Engineer has to be conversant with all the measurement techniques to know the ground topography and he should be able to use the modern survey equipments and be able to use different software applications in surveying.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
		PA	ALA		ESE	OEP				
3	0	2	5	70	20	10	20	10	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Tacheometric Surveying : Introduction, purpose, principle, instruments, stadia constants, methods of tacheometry, anallatic lens, subtense bar, field work in tacheometry, reduction of readings, errors and precisions.	7	15
2	Geodetic Surveying- Principle and Classification of triangulation system- Selection of base line and stations- Orders of triangulation- Triangulation figures- Station marks and signals- marking signals- Extension of base, Reduction of Centre, Selection and marking of stations	7	15
3	Theory of Errors : Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities.	7	15
4	Field Astronomy: Introduction, purposes, astronomical terms, determination of azimuth, latitude , longitude and time corrections to the observations.	6	10
5	Aerial photogrammetry : Introduction, Principle, Uses, Aerial camera, Aerial	6	10

	photographs, Definitions, Scale of vertical and tilted photograph,, Ground Co-ordinates, Displacements and errors, Ground control, Procedure of aerial survey, Photomaps and mosaics, Stereoscopes, Parallax bar.		
6	Modern Surveying Instruments: Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, Digital self-leveling levels , scanners for topographical survey.	2	10
7	Remote Sensing- Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global Positioning system	4	15
8	Geographical Information System- Definition of GIS, Key Components of GIS, Functions of GIS, Spatialdata,spatial information system Geospatial analysis, Integration of Remote sensing and GIS,and Applications in Civil Engineering.	3	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
10%	40%	40%	5%	5%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

Reference Books:

1. Surveying Vol. I, II and III by Dr. B.C. Punamia, Laxmi Publishers. New Delhi
2. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh
3. Surveying Vol. I, II and III by Dr. K.R. Arora, Standard Book House. New Delhi
4. Surveying Vol. I and II by S. K. Duggal, Tata Mcgraw Hill, New Delhi
5. Surveying and Levelling by N.N. Basak, Tata Mcgraw Hill, New Delhi
6. Surveying and Levelling by R. Agor, Khanna Publishers, New Delhi
7. Advanced Surveying by R. Agor, Khanna Publishers, New Delhi
8. Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi
9. Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi
10. Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
11. Remote sensing and Image interpretation by T.M Lillesand,. R.W Kiefer,. and J.W Chipman, 5th edition, John Wiley and Sons India
12. Surveying theory and practice 7th Edition by James M Anderson and Adward M Mikhail Tata McGraw Hill Publication.

Course Outcomes:

After studying this subject students will be able to:

1. Conduct tacheometry and geodetic survey.

2. Apply principles of theory of errors for correction of measurements.
3. Apply knowledge of astronomy for solving civil engineering problems.
4. Explain use of aerial camera, aerial photographs and procedure of aerial survey.
5. Utilize stereoscope and parallax bars.
6. Utilize total station and other modern survey instruments.
7. Apply GIS in solving engineering problems

Project Work:

Students shall perform the tachometry survey project at the hilly region.

Term Work:

- (1) Students will prepare contour map by manual calculation of horizontal distances and reduced levels from the field observations made at the project site, also the students shall desirably use the software for preparing three dimensional map of the ground and shall compare the contour map prepared by them with the ground view prepared by software.
- (2) Students shall complete all assignments given to them.

List of Practical:

1. Determination of multiplying and additive constants of a Tacheometer
2. Use of (i) Tacheometer, (ii) Total Station for determination of Reduced levels and Horizontal distances of various points in the field.
3. Examples on triangulations adjustments
4. Solution of examples on theory of errors
5. Interpretation of R S maps using image browser
6. Local survey using GPS
7. Use of different Softwares for surveying
8. Stereoscope and parallax bar and their applications
9. GIS Software and their application in surveying.

Design based/open ended problem

1. For depressed terrain:

Determine the water storage capacity in case of probable storage site assuming the height of barriers located at selected places

2. For Rough terrain:

Determine the optimal alignment for the site giving minimum cross drainage works and decide the proper gradient giving equal quantity of cutting and filling

- 3.** In surveyed terrain, planning of small colony and road networks, water supply & drainage system.

Major Equipments:

1. Tacheometer
2. Total Station
3. Digital self leveling level
4. Stereoscope

List of open Source Software/learning website:

1. ocw.mit.edu
2. nptel.ac.in

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.