

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM Course Title: Advanced Surveying (Code: 3340602)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering/Transportation Engineering	4th Sem.

1. RATIONALE

Field survey is the basic requirement for preparing any engineering maps or drawings. Field survey can be professionally carried out only when various steps involved in the survey work are known with skills of operating modern survey equipments.

In the third semester, under the course of “surveying”, students have already learnt basic principles and techniques of surveying by using chain surveying, compass surveying, levelling, plane table surveying and GPS. It is expected that they have developed some of skills and technique of carrying out field surveying. In this course of Advanced Surveying students will be learn the advance surveying methods and techniques using modern equipments.

To achieve this knowhow of operation and handling of various advanced survey instruments like Theodolite, Digital Theodolite, Techeometer, Total Station, EDM Instruments, etc. should be known. In this course these kinds of performance oriented abilities will be developed which are expected from a civil engineering technician.

2. COMPETENCIES (Programme outcomes according to NBA Terminology)

The course content should be taught and implemented with the aim to develop required knowledge base, skills and competence in order to perform and acquire following abilities:

1. To use advance surveying equipments for carrying out different kinds of field surveys and prepare required drawings & maps (drawing sheets and in soft form) and find out various physical quantities.
2. To interpret the survey output i.e. maps & drawings, and find out different physical quantities like length, area, volume, elevations, angles, latitude, departure, etc.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	200
3	0	6	9	70	30	40	60	

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

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Theodolite	1a. Explain the basic function of different parts theodolite. 1b. Able to operate theodolite and read horizontal and vertical angle. 1c. Compute the altitude and departure of given points on ground.	1.1 Introduction Classification of theodolite 1.2 Uses of theodolite 1.3 Sketch and parts of Transit Vernier theodolite 1.4 Reading of main and vernier scale on horizontal and vertical plate 1.5 Temporary adjustment of a theodolite 1.6 Permanent Adjustment of theodolite (Fundamental axis of theodolite and their relationship) 1.7 Definitions and technical terms 1.8 Methods of measuring horizontal angles And vertical angles 1.9 Use theodolite for measuring a magnetic bearing, prolong a line, ranging a line 1.10 Measuring direct and deflection angles 1.11 Errors in theodolite work 1.12 Theodolite Traversing 1.13 Traverse computations 1.14 Closing errors, Balancing the traverse 1.15 Gale's Traverse Table 1.16 Related examples
Unit – II Trigonometrical Levelling	2a. Determine relative elevations and angular measurements for given different conditions of instruments. 2b. Calculate the height of objects through a trigonometrical levelling.	1.1 Introduction 1.2 Methods of observations (Direct and Reciprocal) 1.3 Methods of determining the elevation of a particular point - when base of the object is accessible - when base of the object is inaccessible 1.4 Related examples using all methods
Unit – III Tacheometry	3a. Explain the principles and various methodologies involved in techeometry. 3b. Calculate R.L. and horizontal distance between object and instruments.	3.1 Introduction 3.2 Purpose and Principles of tacheometric surveying 3.3 Instruments used in Tacheometry 3.4 Theory of Stadia Tacheometry 3.5 Anallatic Lens, advantages & disadvantages. 3.6 Methods of determining constants of a Tacheometer 3.7 Related examples on tacheometer constants 3.8 Methods of Tacheometry (Stadia & Tangential) 3.9 Method of Fixed Hair : - When line of sight is horizontal and staff held vertically - When line of sight is inclined and staff held vertically (Angle of Elevation & Depression)

Unit	Major Learning Outcomes	Topics and Sub-topics
		3.10 Advantages and disadvantages of Tangential method 3.11 Related examples of Tacheometer using all methods.
Unit – IV Curves	4a. Describe different elements of curves. 4b. Calculate necessary data required to setting out curve on field.	4.1 Introduction 4.2 Types of circular curves 4.3 Definitions and notations 4.4 Designation of curve 4.5 Relation between Radius and degree of curve 4.6 Elements of simple circular curve 4.7 Setting out simple circular curve 4.8 Methods of setting out simple circular curves 4.9 Transition curves - Requirements and purpose of it. 4.10 Vertical curves 4.11 Related examples of curves.
Unit – V Advanced Survey Equipments	5a. Explain the principles of total station and to develop skill how to use the total station. 5b. Recording the data on total station as well as on computer. 5c. Retrieving the data and generate the drawings using application software.	5.1 Introduction 5.2 Basics of Digital Theodolite 5.3 Introduction and Principles of E.D.M. 5.4 Introduction and Basics of Total station - Parts of Total station - Advantages, disadvantages and uses of Total Station - Types of Total Station - Advancement in Total Station Technology - Automatic Target Recognition ATR 5.5 Surveying using Total Station - Flow chart of data collection - Fundamental Parameters of Total Station 5.6 Precautions to be taken while using Total Station 5.7 Field equipments 5.8 Set up of Total Station - Centering, Levelling , back-sight, Azimuth Marks 5.9 Measurement with Total Station 5.10 Total Station Initial Setting 5.11 Field Book recording 5.12 Radial Shooting 5.13 Total Station Traversing 5.14 Survey Station description 5.15 Occupied Point Entries 5.16 Data Retrieval 5.17 Field Generated Graphics 5.18 Construction layout using Total Station 5.19 Overview of Computerized Survey Data System 5.20 Equipment Maintenance 5.21 Maintaining Battery Power 5.22 Total Station Job Planning and

Unit	Major Learning Outcomes	Topics and Sub-topics
		5.23 Estimating Total Survey system errors Sources and how to avoid them
		5.24 Controlling errors

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Theodolite	12	05	05	11	21
2	Trigonometrical Levelling	06	02	02	03	07
3	Tacheometry	08	04	06	08	18
4	Curves	08	03	04	07	14
5	Advanced Survey Equipments	08	03	03	04	10
Total		42	17	20	33	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

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

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme outcomes). Following is the list of practical exercises for guidance.

Note: Here only course outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those programme outcomes/course outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise/Project	Apprx. Hrs. Required for Practical	Apprx. Hrs. Required for Project
1	I	Theodolite: (1) Understand with parts of the theodolite (2) To measure the hori. angle by Repetition, Reiteration (3) To measure the vertical angle (4) To measure the deflection angle	04 08 02 02	

S. No.	Unit No.	Practical/Exercise/Project	Apprx. Hrs. Required for Practical	Apprx. Hrs. Required for Project
		(5) To calculate the data for Gale's table Theodolite Traversing: - To Carry out the project for a closed traverse 4 to 5 stations and prepare the drawing sheet using Gale's Table	02	06
2	III	Tacheometry: (1) To find out the tacheometric constant (2) To find out the distance and R.L. of a point when line of sight of hori. (3) To find out the distance and R.L. of a point when line of sight is inclined for an angle of elevation (4) To find out the distance and R.L. of a point when line of sight is inclined for an angle of depression Tacheometry Survey: - To Carry out the project for a 3 to 4 stations for closed traverse on undulating/hills regions and prepare the drawing sheet	02 04 04 04	12
3	IV	Curve : (1) To calculate the elements of simple circular curve (2) To calculate the data for setting out curve from offset of long Chord (3) To calculate the data for setting out curve By Rankine (one theodolite) method Curve Setting: - To carry out the project by Rankine's methods	02 02 02	04
4	IV	Total Station: (1) To familiarise with parts of the Total Station (2) To set out the total station on a station (3) To set out station by setting up a back sight (4) To set out station by setting up a Azimuth Mark (5) To measure the hori. Angle (6) To measure the vertical angle (7) To measure the deflection angle Total Station survey: - To carry out the project for small traverse on a ground and prepare the drawing sheet	02 02 02 02 02 04 04	06
Total			56	28

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like: Course/topic based seminars, internet based assignments, teacher guided self learning activities,

course/library/internet/lab based mini-projects etc. These could be individual or group-based.

S. No.	Unit No.	Student Activities
1	I	Comparison between different angular measurement equipments
2	IV	Visit the area having horizontal and vertical curves
3	V	Collecting, transferring and processing field data and preparing drawings through computer software.

7. SPECIAL INSTRUCTIONAL STRETEGIES (If any)

- Lecture cum demonstration of equipments of advanced surveying
- Field demostration
- Software based preparing of maps.

8. SUGGESTED LEARNING RESOURCES

(A)

List of Books:

S. No.	Title of Books	Author	Publication
1	Surveying and levelling Vol-I & II	T. P. Kanetkar & S. V. Kulkarni	Pune Vidyarthi Griha Prakashan
2	Surveying and Levelling Vol-I & II	Dr. B. C. Punmia	Laxmi Publications Pvt. Ltd.
3	Surveying and Levelling Vol-I & II	S.K.Hussain, M.S. Nagaraj	S. Chand and co.
4	Surveying and Levelling Vol-I & II	S. K. Duggal	Tata Mc Graw Hill
5	Surveying and Levelling	N. N. Basak	Tata Mc Graw Hill
6	Fundamentals of Surveying	S. K. Roy	PHI Learning Pvt. Ltd
7	CD Programme on EDM and Total Station	Learning Materials Development Project	Taramani, Chennai NITTTR, Bhopal

(B) List of Major Equipment/Materials:

Transit Theodolite, Digital Theodolite, Levelling Staff, Techeometer, Total Station and its accessories, other misc. equipments, etc.

(C) List of Software/Learning Websites

- www.Autodesk.com
- www.drawingnow.com
- www.learn-to-draw.com
- www.sitetopo.com
- www.surfer.com

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- (1) Prof. B. V. Modi ,Principal – BVPIT(DS) Umarakh Ta-Bardoli
- (2) Prof. P. D. Gohil, Sr. L.C.E. - Sir B. P. T. I., Bhavanagar
- (3) Prof. H. K. Rana ,L.C.E. - Government Polytechnic, Valsad

Coordinator and Faculty Members from NITTTR Bhopal