GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester - III

Course Title: Surveying & Levelling
(Course Code: 1036304)

Diploma programme in which this course is offered	Semester in which offered
Architectural Assistantship	Third

1. RATIONALE

It is essential for learners to have information of the field and its topography to prepare maps or drawings; for any civil or architectural work. This course will help the learners to get familiar with the various surveying instruments and will help improving the understanding of topography of building site. This course will provide an opportunity to develop skills of surveying at primary level.

2. COMPETENCY

The course contented should be taught and implemented with the aim to develop different types of skills so that learners are able to acquire following competencies:

- **Carry out different types of field survey and prepare required set of drawings and maps.**
- **Interpret all types of surveyed drawings and contoured maps.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the learner for the achievement of the following COs:

a) Explain the basics of Surveying.
b) Take linear and angular measurements using surveying instruments.
c) Use levels for contour drawings.
d) Relate advanced surveying techniques in different surveys.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
2	0	2	3	**30**	70	**25**	**25**	150

Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *- Practical;* ***C*** *– Credit,* ***CA*** *- Continuous Assessment;* ***ESE*** *- End Semester Examination.*

1. SUGGESTED LIST OF PRACTICAL / EXERCISES

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 learners are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

2.

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 forthis programme. Faculty should refer to that common list and should ensure that learners also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. require
1	Demonstrate the uses of Survey tools and equipment.	I	06
2	Carry out the surveying project on given site to locate surrounding features using Chain and Compass.	II & III	08
3	Carry out levelling project on an undulating ground and prepare the drawing sheet showing ground profile and contours of site.	IV	14
		Total	28

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practical in all institutions across the state.

Sr. No.	Equipment Name with Broad Specifications
1	Metric Chain, Tapes, Open Cross staff, Optical Square, Prismatic Compass, Surveyor's Compass, Dumpy Level, Levelling Staff and other equipment.

7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs. More could be added to fulfil the development of this course competency.

a) Work as a leader/a team member.
b) Follow ethical practices.
c) Practice of friendly methods and processes for sustainable environment.

The ADOs are best developed through the field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should

gradually increase as explained below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit – I Introduction	1a. Explain the basics of surveying. 1b. Use scales as per requirements	1.1. Objective and uses of surveying 1.2. Classification of Survey 1.3. Principles of Survey 1.4. Types of Scale and selection of scale 1.5. Construction of diagonal scale.
Unit – II Chain and tape Survey	2a. Perform linear measurements using simple tools and equipments. 2b. Prepare drawing as per recorded measurements.	2.1. Instruments used in chain and tape survey Metric Chain, Tapes, Arrow, Tapes, ranging rod, Offset rod, Open cross staff, optical square 2.2. Technical terms related with chain survey. Survey Station, Base line, Check line, Tie line, Offset, Tie station 2.3. Methods of chaining 2.4. Errors in chain survey 2.5. Obstacles in chaining 2.6. Ranging 2.7. Recording measurements in a field book
Unit – III Compass Survey	3a. Perform angular measurements using appropriate compass. 3b. Prepare drawing as per recorded measurements.	3.1. Introduction 3.2. Survey & Traversing 3.3. Components and functions of Prismatic Compass 3.4. Technical Terms - True Meridian & Bearing, - Magnetic Meridian & Bearing, - Arbitrary Meridian & Bearing, - Dip of Magnetic needle - Declination - Fore Bearing & Back Bearing, WCB, RB 3.5. Method of finding included angles from bearings-examples 3.6 Local attraction and Closing error with relevant examples. 3.7. Errors and its elimination.

Unit – IV Levelling	4a. Use levels for surveying application. 4b. Prepare contour maps by calculating Reduce level.	4.1. Introduction 4.2. Basic terminology related with levelling like Level surfaces, horizontal & vertical surfaces, Datum, Bench Marks, Reduced Level, Rise, Fall, Line of collimation, Axis of Telescope, Axis of bubble tube, Station, Back sight, Fore sight, intermediate sight, change point, Heightof instruments, Focusing a parallax, etc. 4.3. Dumpy Level & Automatic Level - Components and their functions - Temporary adjustment of Level 4.4. Levelling Staff 4.5. Folding and Telescopic staff 4.6 Examples & methods of finding out the R. L. in Level Book by H.I. Methods & Rise & FallMethods 4.7. Contour and uses of contours • Characteristics of contours • Methods of Contouring Interpolation of contours
Unit – V Introduction to advanced surveying Techniques	5a. Use of advanced survey instruments for site works. 5b. Demonstration of working on different advanced survey instruments.	5.1 Enlist different type of advanced Surveying instrument. 5.2 Uses of advanced surveying Instrument. 5.3 Demonstration of total station.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	**Introduction**	04	02	02	03	07
2	**Chain Survey**	04	02	06	06	14
3	**Compass Survey**	08	04	08	09	21
4	**Levelling**	10	04	05	12	21
5	**Introduction to advanced surveying Techniques**	02	02	05	00	07
Total		**28**	**14**	**26**	**30**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

Note*: This specification table provides general guidelines to assist learners for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.*

10. SUGGESTED LEARNER ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested learner- related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Learners should perform following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (learner's) portfolio which may be useful for their placement interviews:

a) Field book of your survey practice.
b) Explain different types of survey required for given situation.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide learner(s) in under taking micro-projects.
c) ***'L' in section No. 4*** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the learners for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide learners on how to use different surveying instruments for specific purpose.
g) Guide learners for using relevant ordering principle.
h) Arrange visit to nearby site for understanding surveying practices for measurement.
i) Use video/animation films to explain various concepts/processes related to Site measurements with various instruments.
j) Use different instructional strategies in classroom teaching.
k) Display various technical brochures of recent Architectural Design processes

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a learner that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of learners in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each learner will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the micro project should be about **14-16 (fourteen to sixteen) learner engagement hours** during the course. The learners ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This must match with the competency and the COs. Similar micro-projects could be added by the concerned course teacher:
Some examples of micro-projects.

a) Measurement of given object with the proper selection of survey instruments.
b) Prepare a page of field book with considering different offset.
c) Find the height of each step of your college stair using levelling techniques.

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Surveying and levelling Vol-I	T. P. Kanetkar & S. V. Kulkarni	Vidyarthi Griha Prakashan , ISBN: 978-8185825113
2	Surveying and Levelling Vol-I	Dr. B. C. Punmia	Laxmi Publications Pvt. Ltd. ISBN: 978-8170088530
3	Surveying and levelling	N.N.Basak	Mc.Graw. Hill Education India ISBN: 9332901537
4	Surveying and levelling	R.Agor	Khanna Publications. ISBN: 9788132110255
5	Surveying	S.K.Duggal	Mc.Graw. Hill Education India ISBN : 788174092359
6	Surveying and Levelling Vol-II	Dr. B. C. Punmia	Laxmi Publications Pvt. Ltd. ISBN: 978-8170088837

14. SOFTWARE/LEARNING WEBSITE

- https://archive.nptel.ac.in/courses/105107157/
- https://archive.nptel.ac.in/courses/105107158/
- https://archive.nptel.ac.in/courses/105103176/

15. PO-COMPETENCY-CO-MAPPING

Semester III	SURVEYING & LEVELLING (Course Code: 4335004)								
	POs and PSOs								
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ development of solutions	PO 4 Engineering Tools, Experimentation &Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning	PSO 1 *	PSO 2 #
Competency	• Carry out different types of field survey and prepare required set of drawings and maps. • Interpret all types of surveyed drawings and contoured maps.								
Course Outcomes CO a) Explain the basics of Surveying	3	1	0	0	1	2	0	2	1

CO b) Take linear and angular measurements using surveying instruments.	3	3	3	3	1	2	2	2	3
CO c) Learner will be able to use levels for contour drawings.	3	3	3	3	1	2	2	2	3
CO d) Learner will be able to relate advanced surveying techniques in different survey.	3	-	-	3	-	-	2	1	1

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO/PSO.*

***PSO1: Planning & Design:** Prepare architectural designs and all types of drawings with appropriate material specifications and application techniques as per specific project requirements.

#PSO2: Execution: Work competently as assistants in architectural firms so as to contribute and coordinate both office work and execution on site.

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

Sr. No.	Name and Designation	Institute	Contact No.	Email
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