GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Course Title: **Basics of Civil Engineering**
(Course Code: 4310001)

Diploma programme in which this course is offered	Semester in which offered
Mechanical, Automobile, Marine, Fabrication	First
Electrical	Second

1. RATIONALE

Now a days Industrial activities/ task to be performed by allied programs such as Automobile, Marine, Fabrication are complex in nature and involves integration of activities of core programs which are Mechanical, Electrical and Civil. Thus, they are expected to look after many activities at work place, which may be interdisciplinary, for example he/ she has to interpret and execute the task as per the drawing, select suitable material, adopt/ suggest appropriate construction activity which requires the knowledge of civil engineering. Therefore he/she is supposed to be exposed to basics of civil engineering. This course mainly encompasses the major and general areas of civil engineering considering environmental aspects; knowledge of which is required by them.

2. COMPETENCY

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **To apply the basic principles of civil engineering to solve broadly defined engineering problems.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

a) Prepare drawing from field Survey data using Chain, Tape, Compass and /or Dumpy level.
b) Select suitable building material and construction technique.
c) Interpret various building drawing and Services.
d) Follow traffic control aids.
e) Use green and ecofriendly building technology.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
-	2	2	3	0	0	25*	25	50

(*):For this practical only course, 25 marks under the practical CA has two components i.e. the assessment of micro-project, which will be done out of 10 marks and the remaining 15

marks are for the assessment of practical. This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

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

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. *Some of the **PrOs** marked **'*'** are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'.*

S. No.	Practical Outcomes (PrOs)	Unit No.		Approx. Hrs. required
1	Record linear and angular measurements in horizontal plane using chain, tape and compass	1		02*
2	Prepare drawing using Chain, Tape and Compass Survey Data	1		04*
3	Record measurements in vertical plane using dumpy Level.	1		02*
4	Prepare contour map using leveling data.	1		02*
5	Prepare a report on market survey of construction materials	2		04*
6	Draw a sketch of wall section showing all building components.	2	Any three	02
7	Draw Sketches of different brick masonry bonds.	2		02
8	Prepare a chart of Standards of potable water.	2		02
9	Conduct field tests on Cement.	2		02
10	Conduct field tests on Bricks.	2		02
11	Prepare a cost estimate for the given drawing.	2		02
12	Draw Utility plans of a given building (Electricals, drainage)	3	Any three	02
13	Draw Sketches of different types of Foundations	3		02
14	Draw Sketches of plumbing fixtures.	3		02
15	Prepare list of abbreviation related to civil engineering drawing.	3		02
16	Prepare drawing of symbols related to Civil engineering drawing.	3		02
17	Draw Sketches of different Traffic Signs, Road Markings and Signals.	4		02
18	Prepare a report on ecofriendly materials.	5	Any one	02
19	Draw a typical sketch of rain water harvesting.	5		02
	Total			**28**

Note

*i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

*ii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency..*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	For PrOs 1 to 4	
1	Operation and handling of instruments	30
2	Observations and recording	20
3	Interpretation of result and plotting and submitting	10
4	Answer the questions	20
5	Follow safe practices measures	20
	Total	**100**

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
	For PrOs 5 to 19	
1	Initiative of work allotted	30
2	Neatness in work done and work place	20
3	Submission of report in time	10
4	Answer the question	20
5	Follow safe practices measures	20
	Total	**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

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

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	**Measuring Chain** (20m and 30m). The length of each linked is 200 mm. each meter is provided with circular brass ring & each five meter length is provided with brass tallies of requisite shapes each chain should be provided with 10 numbers of M.S. Arrows of 4 mm diameter bar and 40 cm. Height .As per IS 1492-1970	1,2
2	**Metallic Tape:** 30 Meter, consists of 12 to 15 mm wide Low High Accuracy 5mm + 10ppm 1mm + 1ppm Range 1 km 5 km Cost $10,000 $40,000 Data Storage none 7500 pts. Magnification 10X 30X Run-time 3 hrs. 6 hrs. . strip of either Yarn coating or linen or cloth / or plastic coating. having very fine brass or copper or bronze wires. Woven into it to prevent it from elongation and twisting Graduated in metric system. Each meter length is divided into decimeter and centimeters. It is available in various length. 30 meter length is in common use. The tape is available in a leather / suitable cover with a winding device. The Zero end of the tape is provided with a metal ring. 10 meters 15 meters 20 meters 30 meters 50 meters	1,2
3	**Ranging Rods:** Circular / Octagonal Ranging Rods preferably circular with 3 to 5 cm diameter made up of either seasoned solid bamboo stick or	1,2

S. No.	Equipment Name with Broad Specifications	PrO. No.
	metal conduit pipe of length 2 to 3 meters, with conical metallic shoe fitted at bottom & fully painted with 20 cm. long colour bands of either of the following combinations. Salient Features a) Black & White - size 2 meters b) Red & White - size 3 meters	
4	**Prismatic Compass:** consisting of brass or aluminum circular box with a diameter of 100/125 millimeter. Aluminum circle consists of a needle graduated to 30 min. (0. 50)	2
5	**Dumpy Level:** image erect, magnification 24x, length of telescope 300 mm, objective aperture 40 mm, stadia radio 02:40:00 am ,field of view 1° 30' ,resolution 0.01 cm at 100 mt plate, bubble size 12mm x 87.5 mm, sensitivity 45°/2 mm, circle diameter 75 mm(magnetic), circle graduation 1 div=1°	3,4
6	**Leveling Staff:** Made of Aluminium body Telescopic in 3 PCS, 4 meter in length packed in canvas cover, graduated in meters, dm, cm, and mm with background and black strips. 5 mm thick with suitable locking arrangement Made of Aluminium body / Metallic Body folding in 2 PCS, 4 meter in length graduated in meters, dm, cm and mm. with white background and black strips. 5mm thick with suitable folding & locking arrangement. Improved soap with pattern is made of best quality well seasoned teak wood, Telescopic in three pieces, brass fitting and glued, thus greatly increasing its strength, stability and durability, Accurately machine divided and engraved to read 5 mm. painted and polished. Size 4 meters. Long Size 5 meters. Long Size 6 meters Long.	3,4

7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above mentioned COs and PrOs. 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 environmental friendly methods and processes.

The ADOs are best developed through the laboratory/field based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned 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 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 Surveying and levelling	1a. Use surveying tools and instruments for field survey. 1b. Determine horizontal distances by chaining. 1c. Compute horizontal angles using prismatic compass. 1d. Calculate difference in levels using dumpy level. 1e. Prepare contour map of a given area.	1.1 Importance and types of Surveying & leveling 1.2 Principals of surveying. 1.3 Instrument/tools used for surveying and levelling. 1.4 Chaining and Ranging 1.5 Recording of measurements in field book. 1.6 Functions of different part of Prismatic compass 1.7 Setting and operations of compass 1.8 Methods of finding included angles from bearings 1.9 Basic terminology related to levelling 1.10 Functions of different part of Dumpy level 1.11 Different types of levelling staff 1.12 Setting of Dumpy Level 1.13 Methods of finding out the RL in level book by HI method and Rise & Fall Method with necessary check 1.14 Contour – use, characteristics 1.15 Preparations of contour sheets/ plan using survey data.
Unit – II Building Material and Construc-tion Technology	2a. Select different types of construction materials as per requirements. 2b. Test given construction materials on field for quality control. 2c. Classify various types of foundations. 2d. Explain various types of bonds in brick masonry. 2e. Estimate the cost of given simple construction works.	2.1. Common construction materials such as cement, brick, sand, aggregate, steel and water. 2.2. Properties of each materials & their acceptable standards. 2.3. Types of bricks, cement and aggregate 2.4. Field tests on bricks, cement 2.5. Functions of various components of buildings. 2.6. Classification and Types of foundations.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
		2.7. Bonds in brick masonry. 2.8. Estimations and costing for simple structure (only the material cost)
Unit– III **Building Drawing and Building Services.**	3a. Interpret various types of drawings used in civil engineering. 3b. Explain building bylaws and principles of planning. 3c. Describe basics of building services. 3d. Classify various types of building services. 3e. Apply various types of services as per need of building.	3.1 Types of building drawings 3.2 Abbreviation, conventions & symbols in civil drawing for • Electric fittings • Water supply and sanitary fittings. • Material for constructions • Surveying 3.3 Building byelaws and principles of planning of residential building. 3.4 Planning of a simple residential building. 3.5 Objective and uses of building services. 3.6 Applications of services for different types of building. 3.7 Classification of building services 3.8 Types of services 3.1 Electrical 3.2 Water Supply 3.3 Drainage 3.4 Circulation 3.5 Fire Safety
Unit– IV **Basics of Transpor-tation Engineering**	4a. Explain role of transportation. 4b. Explain various modes of transportation. 4c. Explain importance of traffic signs. 4d. Explain traffic control aids.	4.1 Role of transportation in national development. 4.2 Modes of Transportation. 4.3 Introduction to road traffic and traffic control aids.
Unit– V **Green and ecofriendly Technology**	5a. Use green and ecofriendly building technology. 5b. Explain rain water harvesting. 5c. Explain various types of green building materials. 5d. Explain components of green buildings.	5.1 Rain water harvesting for buildings. 5.2 Concept of GREEN buildings 5.3 Components of GREEN building.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A	Total Marks
I	Surveying and levelling	6	NOT APPLICABLE as no theory exam at the end of semester.			
II	Building Material and Construction Technology	8				
III	Building Drawing and Building Services.	8				
IV	Basics of Transportation Engineering	3				
V	Green and ecofriendly Technology	3				
Total		**28**				

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

10. SUGGESTED STUDENT ACTIVITIES

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

a) Prepare specification of surveying devices.
b) Prepare specification of various building materials by market survey.
c) Submit a report of construction work going on at site.
d) Prepare drawing of line plan of a house.
e) Prepare drawing of various services provided in a house.
f) Prepare power point on various construction stages.
g) Submit a report on traffic system in your city/town.
h) Submit a report on traffic control aids in your city/town.
i) Calculate traffic intensity in peak hours in a busy road in your city/town.
j) Give seminar on relevant topic.
k) Prepare a report of rainwater harvesting.
l) Prepare a report on green building construction.
m) Prepare showcase portfolios.

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 student(s) in undertaking 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 students 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 students on how to address issues on environ and sustainability

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students 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 student 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 microproject should be about **14-16** ***(fourteen to sixteen) student engagement hours*** during the course. The student 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 has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

a) Prepare a layout plan of an existing building of campus.
b) Comparison of test results obtain from different sources of drinking water with potable water standards (minimum 5 samples)
c) Prepare Report on Justifying traffic signs on particular section of roads.
d) Prepare a suggestive report on upgrading existing building into green building as per IGBC/GRIHA standards.
e) Rain water Harvesting System.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Surveying and Levelling	T.P.Kanetkar and S.V.Kulkarni	Pune Vidyarthi Griha Prakashan, ISBN13-9782508807185
2	Surveying Volume 1	B.C.Punamia, Ashokkumar Jain Arunkumar Jain,	Laxmi Publication ISBN-13: 978-8170088530
3	Engineering Material	S.C.Rangwala	Charotar Publishing House ISBN13 9788185594965
4	Building Construction	S.C.Rangwala	Charotar Publishing House ISBN13-9789385039041
5	Building Construction	Shushilkumar	Standard Publications-Delhi, 2008 ISBN 13: 9788186308868
6	Building Construction	Bindra and Arora	Dhanpat Rai & Co. ISBN-13-9788189928803
7	Traffic Engineering	L.R.Kadiyali	KHANNA PUBLISHERS ISBN-13-9788174092205
8	Water Supply and Sanitary Engineering	G. S. Birdi and J. S. Birdi	Dhanpat Rai Publishing Company (p) Ltd ISBN-13- 9788187433798
9	Building Drawing with an Integrated Approach to	CM Kale, MG Shah, SY Patki	McGraw Hill Education ISBN-13-9780071077873

S. No.	Title of Book	Author	Publication with place, year and ISBN
	Built Environment		
10	A text book on Green Building	Guttila Yugantha Jaysinghe Shehani Sharadha Maheepala	LAP Lamberd Academic Publishing ISBN13-9786138389187
11	Green building Guidence :The ultimate guide for IGBC	Karthik Karuppu	Notion Press.com ISBN-13 978-1684667291

14. SOFTWARE/LEARNING WEBSITES

a) www.nptel.iitm.ac.in

b) www.surveyofindia .gov.in

c) www.igbc.in

d) www.grihaindia.org

15. PO-COMPETENCY-CO MAPPING

	Basics of Civil Engineering (Course Code: 4310001)						
	POs						
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
Competency **To supervise the simple civil engineering tasks related to own branch's integrated tasks.**							
Course Outcomes CO a) Prepare drawing from field Survey data using Chain, Tape, Compass and /or Dumpy level.	3	2	-	3	-	2	1
CO b) Select suitable building material and construction technique.	3	-	-	2	1	-	1
CO c) Interpret various building drawing and Services.	2	-	-	-	-	-	-
CO d) Follow traffic control aids.	2	-	-	-	-	-	1
CO e) Use green and ecofriendly building technology	1	1	-	-	2	-	1

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

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

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