

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Semester-II

Course Title: Civil Engineering Drawing

(Course Code: 4320601)

Diploma programme in which this course is offered	Semester in which offered
Civil	Second

1. RATIONALE

Engineering drawing is considered as a language of engineering communication. Basic and primary features of engineering drawing are being taught in course “Basic Engineering Drawing and Graphics (code 4300013)”. For a Diploma holder of civil engineering, it became essential to interpret the civil engineering drawing and also to prepare the working drawing and/ or submission drawing as and when required. Therefore, this course has been designed in such a way that a diploma holder can easily produce detailed civil engineering drawing related to construction of single storeyed, double storeyed residential/ public/ any other simple civil engineering structures giving due respect to building regulation and bye-laws as per local authorities. So, that plan gets approval by local civic authorities.

2. COMPETENCY

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

- **Read and interpret the building construction drawings.**
- **Produce working and /or submission drawings for simple civil engineering structures with building services as per regulations and bye-laws considering green building aspects.**

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) Interpret given civil engineering drawing- symbols, conventions, abbreviations and scale.
- b) Plan buildings as per principles of planning, building byelaws and regulation considering green building aspects.
- c) Develop working drawings for simple civil engineering (single and double storied) structures and conceptual plan for multi-storeyed building.
- d) Draw perspective view of given element/ building plan.
- e) Propose appropriate building component and services as per its scope.

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	-	4	4	30	70	25	25	150

(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

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	Interpretation of building drawings approved by local authority.	I		02*
2	Draw various types of graphical symbols for materials, Doors and Windows, symbols for sanitary, water supply and electrical installations and write Abbreviations in sketch book.	I		02*
3	Study of building bye-laws act and national building code (NBC)	II		02*
4	Study of GRIHA and IGBC manual for green building.	II		02*
5	Draw the detailed plan, elevation, section, site plan and schedule of openings for an existing residential building by taking actual measurement.(Drawing Sheet-01)	III		08*
6	Draw details of foundation plan of at least two rooms building in sketch book.	III		04*
7	Draw working drawings for single storeyed residential building (bungalow) on 250sq.m plot with scale and show following detail: GF & FF plan with elevation, section and opening schedule. (Drawing Sheet-02)	III		16*
8	Prepare concept plan of any one other type of building considering local bye laws: high school building, Shopping centre, Hospital and Industrial building in sketch book.	III		08*
9	Develop perspective view of a complicated object/element using one point method. (Drawing Sheet-03)	IV	9-10 or 11	2
10	Develop perspective view of small objects such as-steps, pedestals using two point method. (Drawing Sheet-03)	IV		2
11	Develop perspective view of single room residential building with verandah & steps by any methods. (Drawing Sheet-03)	IV		04
12	Visit a residential building and observe the existing building service and Draw line plan for above services in sketch book.	V		04*
13	Design and draw the Plan, Elevation & section of a stair case from given data in sketch book.	V	Any One	04

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
14	Draw parts of buildings such as stair cases, Weather sheds, Projections, columns, pier, slabs, footings etc. in sketch book.	V	04
Total			56

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 2, 5-12, 14 & 15		
1	Neatness, Cleanness on drawing sheet	10
2	Uniformity in Drawing and line work	10
3	Creating given drawing	40
4	Dimensioning the given drawing and writing text	20
5	Answer the question	10
6	Submission of drawing in time	10
Total		100

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

This 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	<ul style="list-style-type: none"> • Tape (10m, 20m, 30m Vinyl) • Drawing board • Mini drafter/T- square/Parallel 	12 5-12,14 &15 5-12,14 &15

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 fulfill the development of this competency.

- a) Work as a team member/ individual.
- b) Follow ethical practices.
- c) Follow safe practice on site.
- d) 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

Only the major Underpinning Theory is formulated as higher level UOs of *Revised Bloom's taxonomy* in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – I Introduction to Civil Engineering Drawing	1a. Appreciate types of Drawings and its importance. 1b. Draw various types of Projections 1c. Use building drawing Symbols, Conventions and Abbreviations 1d. Apply various types of scales as per needs.	1.1 Types of drawing with appropriate scale & uses (index map, key plan, village map, site plan, layout plan.) 1.2. Types of Projection adopted in Building Drawing. 1.3 Scales for various types of Drawings. 1.4 Working drawing, large scale drawing, enlarge scale drawing. 1.5 Symbols, Conventions and Abbreviations for Electrical fittings, water supply, sanitary fittings, material for construction etc.
Unit – II Principles of Planning, Building byelaws and Regulation	2a. Apply the Principles of Planning & Bye-laws for residential and other public buildings. 2b. Apply green building aspects.	2.1 Principles of planning for residential building in detail such as- Room dimension, area, height, privacy, roominess factor, orientation, grouping, drainage, aspect, prospect, economy. 2.2 Building bye laws of local body for residential building (show local authority publication) plot area, built up area, carpet area, FSI, size of rooms, margins, height, passages, ventilation, circulation and others 2.3 Color code for alteration and addition in existing building. 2.4 Approval procedure with respect to bye-laws. 2.5 Concept and components of green building. 2.6 Evaluation system of various authorities (GRIHA, IGBC)
Unit– III Planning of	3a. Develop concept plan of buildings.	3.1 Concept plan and drawing of residential single and two storeyed

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Buildings.	3b. Prepare detail drawings for single and two storeyed residential building and public building.	buildings. 3.2 Concept plan of public buildings such as hospital, school, shopping center, office building and industrial unit. 3.3 Given situation & Plot area: preparation of detailed drawing of a single storeyed and double storeyed residential building with detail of Line plan, Detailed Plan, Ground floor Plan, First floor plan, Elevation and Sections.
Unit– IV Perspective Drawings and modelling.	4a. Generate perspective view of simple building by different methods. 4b. Develop building models.	4.1 Introduction of perspective view and other related terms. 4.2 Perspective view of single room residential building and simple public buildings. 4.3 Elements of perspective drawing. 4.4 Model preparation of simple buildings.
Unit– V Constructional details drawing of buildings	5a. Draw details of components of buildings. 5b. Provide scope and provisions for building components and services.	5.1 Drawings of Parts of buildings such as staircases, chajjas, projections, columns, pier, slabs, footings etc. 5.2 provisions in drawings for building services such as air conditioning, plumbing, water supply and firefighting, elevators, lifts and escalators etc. 5.3 Show building service like water supply, sanitary, electrification on line plan.

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	Introduction to Civil Engineering Drawing	3	04	02	00	06
II	Principles of Planning, Building byelaws and Regulation	7	02	05	05	12
III	Planning of Buildings	10	04	08	14	26
IV	Perspective Drawings and modelling	6	04	04	08	16
V	Constructional details drawing of Buildings	2	02	04	04	10
Total		28	16	23	31	70

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

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions 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 vary slightly from above table.

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) Visit a construction site and collect working drawings to study the project.
- b) Draw proportionate line sketch (front elevation of any two storeyed residential building without using any drawing instruments.
- c) Visit an urban development authority office and obtain a Development control regulations (bye-laws) of local Body.
- d) Visit a public building like school, hospital, shopping centre etc, to have knowhow about essential requirements.
- e) Undertake micro-project.
- f) Give seminar on any relevant topic.

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 environment 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. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, 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 total duration of the micro-project should not be less than **16 (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) **Housing Colony:** Prepare a scaled layout plan of a housing colony within a plot of 3000 sq. mt to 8000 sq mt having the variety of bungalows and/or tenements and/or row houses considering bye-laws.
- b) **Primary health center:** Prepare a scaled detailed plan for Primary health center (minimum 01 doctor room, 01 dressing room, 01 vaccination room, office room, waiting area, wash rooms)
- c) **Hostel Building:** Prepare the detailed plan for a hostel building (minimum 200 person)
- d) **Secondary School:** Prepare the detailed plan for a secondary school building.
- e) **Shopping mall:** Prepare the detailed plan for a shopping mall
- f) **Library building:** Prepare the detailed plan for a library building
- g) **Apartments:** Prepare the detailed plan for apartments.
- h) **Model:** Prepare a scaled model of a simple building using card board.
- i) Prepare a suggestive report on upgrading existing building into green building as per IGBC/GRIHA standards.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Civil engineering Drawing	V. B. Sikka	B. D. Kataria Sons, Ludhiana
2	Civil Engineering Drawing	Gurcharan singh, Subash chander	Standard Publishers Distributors, Delhi
3	Civil Engineering Drawing	R. S. Malek G. S. Meo	New Asian Delhi
4	Civil Engineering Drawing	B. H. Shukla	Atul Prakashan Ahmedabad
5	Building Bye laws	Urban Development Authority	Local Authority e.g. AUDA, GUDA, RUDA etc.
6	Understanding Construction Drawings	Mark W. Huth Delmar,	Cengage Publishers
7	National Building Code of India	Bureau of Indian Standards	Bureau of Indian Standards, Govt. Of India
8	I.S 962: 1989-CODE OF PRACTICE FOR ARCHITECTURAL AND BUILDING DRAWINGS	Bureau of Indian Standards	Bureau of Indian Standards, Govt. Of India

S. No.	Title of Book	Author	Publication with place, year and ISBN
9	Green Rating for Integrated Habitat Assessment (GRIHA) Manual	Ministry of New and Renewable Energy, GOI & The Energy and Resources Institute New Delhi	Ministry of New and Renewable Energy, Government of India and The Energy and Resources Institute New Delhi
10	A text book on Green Building	Guttila Yugantha Jaysinghe Shehani Sharadha Maheepala	LAP Lamberd Academic Publishing ISBN13-9786138389187
11	Green building Guidance :The ultimate guide for IGBC	Karthik Karuppu	Notion Press.com ISBN-13 978-1684667291

14. SOFTWARE/LEARNING WEBSITES

- www.nptel.iitm.ac.in
- Auto CAD, Zwcad, civil Architect, draw plus X5
- www.Autodesk.com,
- www.drawingnow.com
- www.learn-to-draw.com
- www.igbc.in
- www.grihaindia.org

15. PO-COMPETENCY-CO MAPPING

Semester II	Civil Engineering Drawing (Course Code:4320601)									
	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	PSO 3 (if needed)
Competency	i. Read and interpret the building construction drawings. ii. Produce working and /or submission drawings for simple civil engineering structures with building services as per regulations and bye-laws considering green building aspects.									
Course Outcomes										
CO a) Interpret given civil engineering drawing-symbols, connotations, abbreviations and types of scale.	3	2	-	-	-	-	2	-	-	-
CO b) Plan buildings as per principles of planning, building byelaws and regulation considering green building aspects.	3	3	3	-	2	-	2	-	-	-
CO c) Develop working drawings for simple civil engineering (single and double storied) structures and conceptual	3	2	2	-	1	-	2	-	-	-

plan for multi-storeyed building.										
CO d) Draw perspective view of given element/ building plan.	3	1	1	-	-	-	-	-	-	-
CO e) Propose appropriate building component and services as per its scope.	3	2	1	-	-	-	1	-	-	-

Legend: '3' for high, '2' for medium, '1' for low or '-' for the relevant correlation of each competency, CO, with PO/ PSO

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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