

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Semester-III

Course Title: Computer Aided Drafting

(Course Code: 4330605)

Diploma programme in which this course is offered	Semester in which offered
Civil Engineering, Environmental Engineering	Third

1. RATIONALE

Computer Aided Drafting is invariably used for Civil Engineering Drawing and visual representation before actual construction. With advancement in Building Technology, new features have been introduced in structures. Further structural design has also been modernized. This has further increased the importance of drawing and drafting softwares which help in visualizing the structures thus increasing the understanding. Besides technological development in drafting softwares have made them more user friendly thus making them virtually indispensable. Hence knowledge of Computer Aided Drafting has become even more important skill than before. Civil Engineering Drawing, the language of a Civil Engineer helps him in efficiently representing engineering details like plan, elevation, section, foundation, building elements, etc. for easy understanding of the clients, authorities, etc. Computer Aided Drafting (CA Drafting) helps in easily performing the above task and drastically reducing the time of preparation of the drawings.

Computer Aided Drafting tools like AUTOCAD, REVIT, SKETCHUP have made civil engineering drawing simple, easy to represent details and time saving. Knowledge of above softwares is necessary for increasing employable skills of diploma engineers. Hence, the recent curriculum is framed keeping in mind the above requirements.

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:

- **Prepare detailed 2D drawing of building components (beam, slab, column and footing), plan, elevation and section drawings required for civil engineering activities using advance tools AutoCAD and basic tools of REVIT software.**
- **Prepare basic 3D drawing of a small building.**

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:

CO1 Prepare 2D drawings of building components like beam, slab, column and footing residential & commercial building using CAD.

CO2 Prepare 2D drawings like Plan, Elevation and Sectional of residential & commercial building using CAD.

CO3 Preparesimple3D drawing of residential & commercial building using CAD.

CO4 Prepare simple building drawing using REVIT

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	CA*	ESE	CA	ESE	
-	-	4	2	-	-	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	Draw the sectional Elevation and Plan showing Reinforcement details of Beam	1, 2	4
2	Draw the sectional Elevation and Plan showing Reinforcement details of slab	1, 2	4
3	Draw the sectional Elevation and Plan showing Reinforcement details of Column footing.	1, 2	4
4	Drawing Furnished Plan, Elevation and Sectional View of Residential Building having Ground and preferably 1 st floor construction showing title block, legends, schedule of opening; and margins with A3 page settings. Print/ Plot the above drawings using Plot Settings	1, 2	14
5	Develop a 3D drawing for a 1BHK Building. Print/ Plot the above drawings using Plot Settings.	3, 4	10
6	Prepare simple building drawings using REVIT	5	20
Total			56

Note

- 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.
- 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 %
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For PrOs 2, 5-12, 14 & 15		
1	Use of proper commands	30
2	Uniformity in Drawing and detailing	20
3	Accuracy in dimensioning, scaling, placing of drawings and text.	30
4	Timely completion and submission	5
5	Answer the questions	10
6	Attendance & Punctuality	5
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"> • Computer system—minimum Intel Core i3 or equivalent processor, 4GB RAM, 500 GB Hard disk, graphics card.* • Printer and/or Plotter as per printing requirement • LCD Projector <p>*As CAD Softwares are regularly updated, higher configuration of computer system may be required in future.</p>	1 to 6

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) Work with care and safety.
- c) Work with discipline and responsibility.
- d) Follow ethical practices.

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 CAD	1a.Demonstrate the basics of CAD software and its important commands 1b.Prepare a simple building drawing file using basic draw and modify commands	1.1 File menu of CAD with New, Open, Save, Save as and Close 1.2 Basic 2D commands like Line, Circle, Ellipse, Multi Line ,Construction Line, Polyline, Point, Donut, Ellipse, Polygon, Rectangle, Arc, Erase, Snap, Redraw, Regenerate, Zoom, Pan
Unit – II Demonstration of 2D commands in CAD	2a.Explain the applications of Edit commands 2b.Modify existing CAD Drawing 2c.Apply advance command for edit /modification of drawing 2d. Prepare typical Drawings using Different Layers 2e. Develop final Drawings with Dimension and Text and Hatching	2.1 Modify Properties of Drawing Entity 2.2 Copy, Move, Rotate, Mirror, Offset, 2.3 Array, Scale, Stretch, Lengthen, Trim 2.4 Extend, Break, Chamfer , Fillet 2.5 Block, Insert and Explode 2.6 Application of LAYER command in Civil Engineering 2.7 Layer command with its all sub commands, Line type, Color 2.8 Dimension command – linear , aligned, arc, length, radius, Diameter, Centre, Leader, Baseline and Continuous, Dimensioning, tolerance, override and Dimension updates Text and DTEXT commands with Text Style, Hatch command
Unit – III Demonstration of 3D commands in CAD	3a.Use 3D commands togenerate3dviewfrom2Ddrawing 3b. Prepare 3D Drawings using 3D Commands of CAD 3c.perform rendering/shading on 3D drawing	3.1 Units, Elevation, Thickness, UCS and UCS Icon 3.2 Viewports , Extrude , 3D Solids – Sphere, Box, Cylinder, Cone, Wedge, Interference 3.3 3D Surface – Revolved, Tabulated and Ruled Surfaces Hide, Render and Shade of3Ddrawings
Unit– IV Plot of 2D & 3DDrawings	4a.Setup printer, plotter for printing of drawings 4b.Plot 2D and 3D Civil Engineering Drawings as per requirement on different scale and sizes	4.1 PLAN, ELEVATION and 3D Views of Residential and Commercial Building. 4.2 PLOT and its Sub Command for Plotting Drawing on A1, A2 and A3 Size Paper using Printer and /or Plotter
Unit– V Introduction to REVIT/Similar software	5a. Explain basics of BIM 5b. Demonstrate components of REVIT UI 5c. Prepare simple building drawing using REVIT 5d. Demonstrate Rendering in REVIT 5e. Calculate data from REVIT	5.1 Introduction to BIM 5.2 Understanding of REVIT UI 5.3 Grid and Level 5.4 Model Line 5.5 Wall 5.6 Door & Window 5.7 Floor 5.8 Roof 5.9 Railing & Stair Case 5.10 Sheet Creation 5.11 Import & Export 5.12 Rendering in Revit 5.13 Calculate data from Revit Drawings

9. 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) 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.
- d) Expert Lecture/Seminar regarding latest softwares like Sketch Up, etc related to Computer Aided Drafting may be arranged.

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:

- Draw the Cross Section through Wall
- Draw different types of foundation (any five).
- Draw different types of brick masonry bonds (any five).
- Draw different types of stone masonry (any five).
- Draw different types of doors (elevation) (any five).
- Draw different types of windows (elevation) (any five).
- Draw different types of caissons.
- Draw profile leveling of longitudinal section of road. (Assume required data).
- Draw a contour map of 40 m by 40 m area showing minimum 5 contours. (Assume required data).
- Draw the detailed plan for a small school building.
- Draw the detailed plan for a small shopping complex.
- Draw a layout plan of a plot/scheme and its key plan.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	AutoCAD for dummies	Bill Fane	John Wiley & Sons, 2016
2	AutoCAD 2018 3D Drawing & Modeling- Student Guide	--	Ascent Centre for Technical Knowledge, 2017
3	Mastering AutoCAD 2019 and AutoCAD LT 2019	George Omura	Sybex, 2018
4	AutoCAD Workbook for Architects and Engineers	Shannon R.Kyles	Wiley-Blackwell, 2008
5	AutoCAD 2021 Beginning and Intermediate	Munir M.Hamad	Mercury Learning and Information, 2020
6	Mastering Autodesk Revit 2020	Robert Yori-Marcus Kim, Lance Kirby	Sybex, 2020

14. SOFTWARE/LEARNING WEBSITES

- AutoCAD, REVIT, SKETCH UP
- <https://www.autodesk.com/education/edu-software/overview?sorting=featured&filters=individual>
- <https://old.aicte-india.org/bfreedownloadsadestk.php>
- www.Autodesk.com
- <https://www.thesourcecad.com/autocad-tutorials/>

15. PO-COMPETENCY-CO MAPPING

Semester III	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	<ul style="list-style-type: none"> Prepare detailed 2D drawing of building components (beam, slab, column and footing), plan, elevation and section drawings required for civil engineering activities using advanced tools AutoCAD and basic tools of REVIT software. Prepare basic 3D drawing of a small building. 									
CO 1 Prepare 2D drawings of building components like beam, slab, column and footing residential & commercial building using CAD.	3	1	2	3	2	2	3	-	-	-
CO 2 Prepare 2D drawings like Plan, Elevation and Sectional of residential & commercial building using CAD.	3	2	2	3	3	2	3	-	-	-
CO 3 Prepare simple 3D drawing of residential & commercial building	2	1	2	2	2	1	2	-	-	-

using CAD.										
CO 4 Prepare simple building drawing using REVIT	1	1	2	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

S. No.	Name and Designation	Institute	ContactNo.	Email
1	Shri K.P. Jasodani	Govt.Polytechnic, Himatnagar	02772-229285	jasodani_kamalkumar1@gtu.edu.in
2	Shri M.L. Patel	R.C. Technical Institute, Ahmedabad	079-27664785	mlpatel504@gmail.com
3	Shri C.B. Patel	Govt.Polytechnic,Ahmedabad	079-26301285	patel.chig@gmail.com
4	Dr. A.K.Patel	Govt.Polytechnic,Ahmedabad	9825009719	Ashutech.asp@gmail.com