

Program Name	: Civil Engineering Program Group
Program Code	: CE/CR/CS
Semester	: Third
Course Title	: Computer Aided Drawing
Course Code	: 22022

1. RATIONALE

An essential skill of a civil engineering diploma holder is to use Computer aided drawing as a drafting tool to draw, read and interpret the civil engineering drawings. This will facilitate the more speed, accuracy and repetitive use of drawings as and when needed. Through this technique student will be able to edit the existing drawing and create new 2 and 3-dimensional drawings and isometrics as per requirements.

2. COMPETENCY

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

- Draw civil engineering drawings using Computer aided drawing software.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- a. Interpret the given 2-dimensional drawing.
- b. Use CAD software for drafting and editing 2-dimensional drawings.
- c. Locate the dimensions of the drafted drawing.
- d. Draw the isometric and 3- dimensional drawings.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+ P)	Examination Scheme													
				Theory						Practical							
L	T	P		Paper	ESE		PA		Total		ESE		PA		Total		
				Hrs.	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
-	-	4	4	--	--	--	--	--	--	--	50@	20	50~	20	100	40	

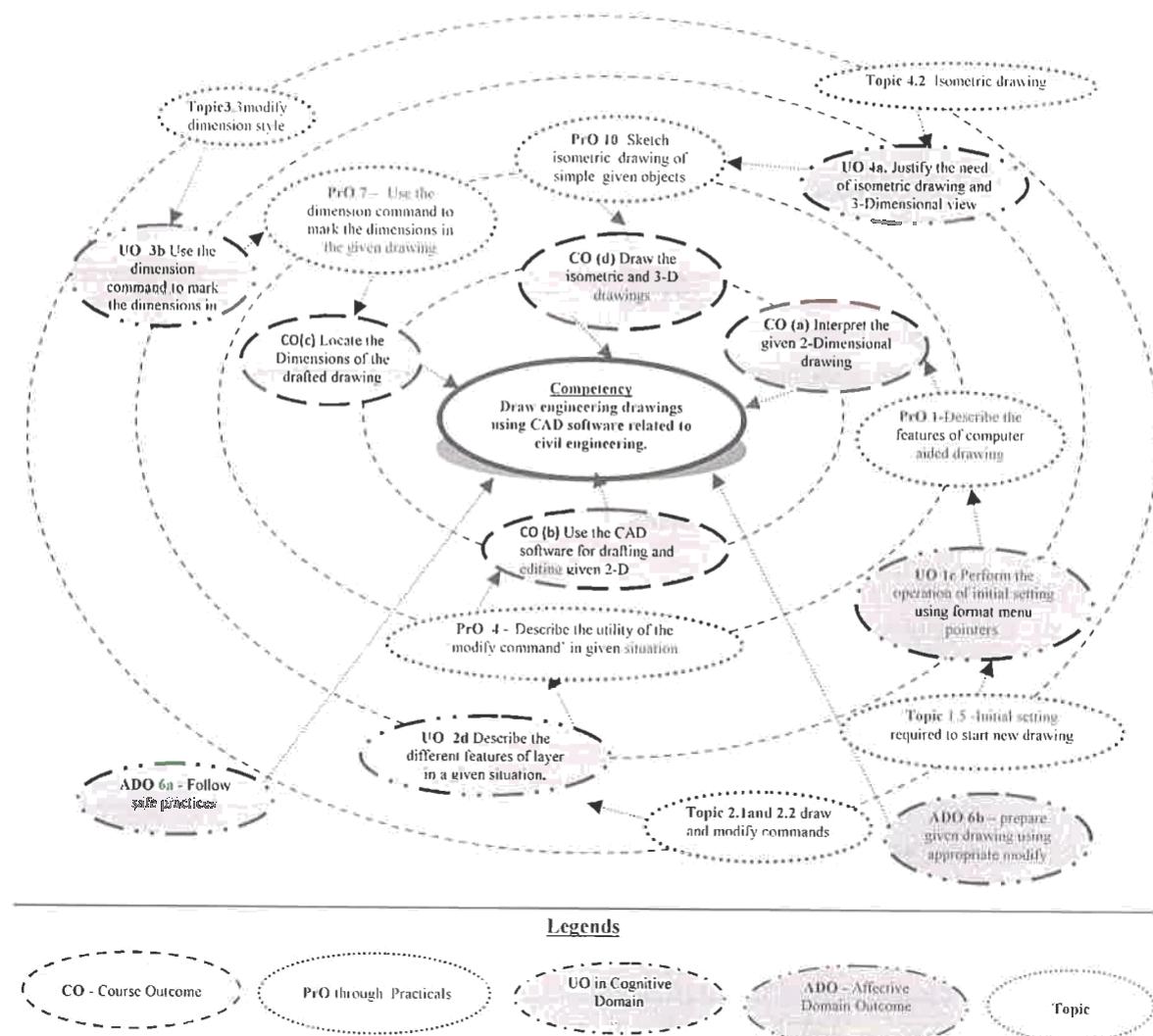
(~²): For the **practical only courses**, the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e. 30 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e. 20 marks). This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

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

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course. Use all domains of learning in terms of the outcome based employer identified competency depicted at the centre of this map.

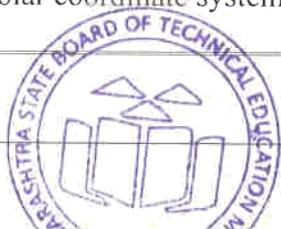


**Figure 1 - Course Map**

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Identify the components of CAD screen and apply the processes of Initial setting using format menu. Part I	I	02*
2	Identify the components of CAD screen and apply the processes of Initial setting using format menu. Part II	I	02*
3	Calculate -Cartesian coordinates (relative and absolute) Polar coordinates of given shapes.(any Two)	I	02*
4	Calculate -Cartesian coordinates (relative and absolute) Polar coordinates of given shapes.(any Two)	I	02*
5	Draw the given figures according to Cartesian coordinate system. (any Two)	I	02*
6	Draw the given figures according to Polar coordinate system. (any Two)	I	02*



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
7	Use “Draw and modify command” to draw the given shapes - (minimum 2 shapes)	II	02*
8	Use “Draw and modify command” to draw the given shapes - (minimum 2 shapes)	II	02*
9	Use “Draw and modify command” to draw the given shapes - (minimum 2 shapes)	II	02*
10	Use “Draw and modify command” to draw the given shapes - (minimum 2 shapes)	II	02
11	Use “Draw and modify command” to draw given shapes - (minimum 2 shapes)	II	02
12	Use “Draw and modify command” to draw given shapes - (minimum 2 shapes)	II	02
13	Use “Draw and modify command” to draw given shapes - (minimum 2 shapes)	II	02
14	Use “Draw and modify command” to draw given shapes - (minimum 2 shapes)	II	02
15	Use “Draw and modify command” to draw given shapes - (minimum 2 shapes)	II	02
16	Use “Draw and modify command” to draw cross section of walls showing different building components symbols.	II	02
17	Use “Draw and modify command” to draw cross section of walls showing different building material symbols.	II	02*
18	Draw plan of any one stair case from the given drawing. (Dog legged stair case / spiral stair case)	II	02*
19	Draw sectional elevation of stair case drawn in exercise no 18.	II	02*
20	Mark the dimensions in the figures drawn in exercise number 5 to 15. and 18, 19.	III	02 *
21	Use area command to compute the area of the given, figure, line plan (of residential and public building).	III	02*
22	Use “Draw and modify command” to prepare line plan of given residential building.	III	02*
22	Use “Draw and modify command” to prepare line plan of given public building.	II	02*
23	Use “Draw and modify command” to prepare typical floor developed plan of a given framed residential building in minimum four layers.	II	02*
24	Use “Draw and modify command” to prepare above typical floor developed plan of a given framed residential building in minimum four layers . Give labels , doors and window openings , schedule of openings . scale . north direction.	II	02*
25	Use “Draw and modify command” to prepare elevation of given framed residential building in exercise 22.	II	02*
26	Use “Draw and modify command” to prepare section of a given framed residential building in exercise 22.	II	02*
27	Use “Draw and modify command” to prepare section of a given framed residential building in exercise 22.	II	02*



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
28	Use “dimension command” to locate dimensions of typical floor plan, elevation and section dimensions of a given framed residential building in layer in exercise 22 to 26.	II	02*
29	Draw isometric drawing of simple objects.(minimum 02 objects)	IV	02*
30	Draw isometric drawing of simple objects.(minimum 02 objects)	IV	02
31	Draw 3-D view of simple object.(any one)	IV	02*
32	Draw 3-D view of simple object.(any one)	IV	02
Note: 1. The term work consists of a journal with the relevant write up and output of 2-11 experiment in the form of print out as an output and soft copy as well. 2. The figures used for practical numbers from 7 to 15 are different for each practical.			
	Total		64

Note

- i. A suggestive list of **PrOs** is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 24 or more practical LOs/tutorials need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- ii. Hence, the 'Process' and 'Product' related skills associated with each PrO of the laboratory/workshop/field work are to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1.	Prepare Initial setting necessary for given drawing.	10
2.	Prepare given drawing using draw commands.	30
3.	Follow Safety measures	05
4.	Prepare given drawing using appropriate modify commands.	20
5.	Answer the questions related to drafted drawing.	10
6.	Submit journal report on time	15
7.	follow Housekeeping	05
8.	Attendance and punctuality	05
TOTAL		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- a. Follow safety practices.
- b. Practice good housekeeping.
- c. Demonstrate working as a leader/a team member.
- d. Maintain tools and equipment.
- e. Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs

according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications	PrO. S.No.
1.	Computer with specification as 2GB RAM ,HDD 500GB,LCD Monitor with relevant CAD software.(with latest configuration)	1 to 32
2.	Printer preferably for the output of A-3 size ,paper	5 to 32
3.	LCD projector.	1 to 32

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit- I Fundamentals of computer aided drawing	1a. Explain the importance of computer aided drawing in civil engineering applications. 1b. Describe the features of computer aided drawing screen. 1c. Describe the operation of initial setting using Format menu. 1d. Calculate coordinates in given situation.	1.1 CAD software –meaning, various drafting software for civil engineering applications. 1.2 System requirement for drawing software 1.3 Advantages of computer aided drawing over traditional method of drawing. 1.4 Features of CAD screen. 1.5 Initial setting required to start new drawing from scratch 1.6 Coordinate systems used in CAD. 1.7 Save and plot/print command.
Unit-II CAD commands	2a. Draw the given figures using “draw commands” 2b. Describe the utility of the ‘modify command’ in given situation. 2c. Describe the utility of enquiry command to find the parameters like distance, area, perimeter of a given figure. 2d. Describe the different features of layer in a given situation.	2.1 Draw commands-line, poly line, construction line, rectangle, polygon, circle, ellipse, hatch, boundary, text, arc, point, make block 2.2 Modify commands- erase, copy, mirror, offset, trim, move, extend, rotate, array, lengthen, scale, chamfer, fillet, explode, stretch, join, break, divide. 2.3 Enquiry –list, area ,distance, mass property 2.4 Changing properties of entity-line type, color, scale, font- size, color,



		style. 2.5 Layer command.
Unit– III Introduction to Dimension command	3a. Explain the necessity of the dimensioning the given figure. 3b. Use the dimension command to mark the dimensions in the given drawing. 3c. Modify the existing dimension style.	3.1 Enter form of dimension style. 3.2 Type of dimensions-quick dimension, linear dimension, and continuous dimension; align dimension, angle dimension and radius, diameter. 3.3 Modify dimension style.
Unit– IV Introduction to 3-Dimension al view	4a. Justify the need of isometric drawing and 3-Dimensional view. 4b. Sketch isometric drawing of simple given objects. 4c. Sketch 3- dimensional drawing of simple given object.	4.1 Necessity of 3 dimensional view 4.2 Isometric drawing- meaning and necessity, use of isometric snap, isometric axes, isocircle, isotext 4.3 3-Dimensional drawing –use of extrude ,pressfull command.

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

- Not applicable -

10. SUGGESTED STUDENT ACTIVITIES

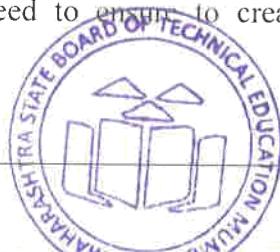
Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5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

- a. Collect the working drawings from builders, architect and engineers.
- b. Collect the 3-Dimensional drawings from various resources.
- c. Collect information of similar software other than Computer Aided drawing available in construction industry.
- d. Search for the websites related to course contents.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course. 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. '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- c. About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).
- d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.



- e. Guide student(s) in undertaking micro-projects
- f. Demonstrate students thoroughly before they start doing the practice.
- g. Encourage students to refer different websites to have deeper understanding of the subject.
- h. Observe continuously and monitor the performance of students in Lab.

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 are given here. Similar micro-projects could be added by the concerned faculty:

- a. Draw plan, elevation, and section of a given framed structure as it is from the available drawings using software available in laboratory.
- b. Prepare construction notes, site plan, and schedule of openings from the drawings of a framed structure made available from builder/engineer/civil engineering service provider.
- c. Draw plan, elevation, and section and site plan of a given load bearing structure as it is from the available drawings using software available in laboratory.
- d. Prepare construction notes, site plan, and schedule of openings from the drawings of a load bearing structure made available from builder/engineer/civil engineering service provider.
- e. Learn latest software's of Civil Engg Drawing

13. SUGGESTED LEARNING RESOURCES

S.N.	Title of Book	Author	Publication
1	AUTOCAD-2000	Frey, David	BPB Publication, New Delhi, ISBN13: 9788176560801
2	Introduction to Auto CAD 2012 for Civil Engineering Applications	Yasmin, Nighat	SDC Publication, 2011 ISBN 978-1-58503-642-4
3	AutoCAD 2016: A Problem-Solving Approach, Basic and Intermediate	Tickoo, Shyam	CADCIM Technologies, 22nd Edition , August 2015 ISBN 13: 9781942689003
4	Auto CAD 2010 Instructor	Leach, James	Tata Mc Graw Hill, New Delhi 2007; ISBN:9780073375410
5	Auto CAD and its Applications-Basics	Shumaker, Terence M.; Madsen, David	Good heart- Willcox Publishers, 2010; ISBN:13: 9781590707630



S.N.	Title of Book	Author	Publication
	2010	A.; Madsen, David P.;	
6	Engineering drawing	Bhatt, N.D.	Charotar Publications, Anand, 2016 ISBN:978-93-80358-96-
7	Working with Auto CAD 2000	Singh, Ajit	Mc Graw Hill Publishing New Delhi, 2002; ISBN: 9780070435964

14. SUGGESTED SOFTWARE/LEARNING WEBSITES

- a. <http://www.autodesk.com/education/freesoftware/autocad>
- b. <http://www.youtube.com/playlist?list=PLIpIybv1CupI-9xve13CxzzwK0PLL>
- c. www.zwsoft.com/cad accessed on 15th October 2016,
- d. <https://www.scribd.com/doc/260678036/> accessed on 12th October 2016,
- e. medobute.pixnet.net/blog/post/123908069 accessed on 10th October 2016
- f. www.ndl.iitkgp.ac.in

