

COURSE DESCRIPTION			
Program	Artificial Intelligence, Artificial Intelligence & Machine Learning, Biomedical Engineering, Cloud Computing and Big Data, Cyber Forensics and Information Security, Computer Science and Technology, Computer Science & Engineering, Computer Engineering, Computer Science and Engineering (Artificial Intelligence & Machine Learning), Electronics and Communication, Electronics Engineering, Electronics Engineering (Embedded Systems), Electronics and Computer Engineering, Integrated Circuit Design & Fabrication, Instrumentation Engineering, Information Technology, Micro Electronics, Automation and Robotics, Robotic Process Automation, Textile Technology		
Course Title	Engineering Drawing with CAD		
Course Code	1004	Semester	I
Type of Course	Lab	Contact Hours	45
Teaching Scheme (L: T:P:R)	0:0:3:0	Credits	1.5
CIE Marks	60	ESE Marks	40

Introduction

Engineering graphics is the fundamental language of engineers used to visually communicate ideas, designs, and technical information without any language barriers. Its objectives include developing the ability to interpret and create accurate drawings, Understanding the shape, size, and relationship of components, and Applying standards for clear communication. It also enhances spatial visualization and supports the effective planning and manufacture of engineering products.

Introduction of CAD software and practicing the development of drawings along with Engineering graphics give an insight to students regarding development of drawings with accuracy and efficiency without paper usage in engineering design.

Course Objectives

1	To familiarize the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs.
2	Provide skills to translate ideas into sketches and to draw and read various engineering curves, conic sections and the generation of 3D solid surfaces into plane areas.
3	To apply basic skill to develop projection of points, lines, orthographic views and sectional views of objects.
4	To familiarize the use of CAD software
5	To acquire skill in developing orthographic and sectional views using CAD.

Course Pre-requisite

Topic	Course code	Course Title	Semester
Basic Geometry			Secondary Education

Course Outcome

CO	Course Outcome	Blooms Taxonomy Level
CO1	Construct geometrical figures and illustrate development of surfaces.	Apply
CO2	Interpret projections of points and lines ,orthographic projections and sectional views .	Apply
CO3	Familiarization in using CAD software.	Apply
CO4	Develop orthographic projections and sectional views in CAD	Apply

CO-PO mapping

COURSE ARTICULATION MATRIX											
Course Outcomes	PROGRAM OUTCOMES										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-
CO3	2	-	2	3	-	-	-	-	-	-	-
CO4	3	2	3	3	-	-	-	-	-	-	-
Total	11	7	10	6	-	-	-	-	-	-	2
Correlation Level	2.75	2.33	2.5	3	-	-	-	-	-	-	1
Legends: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"											

Teaching and Assessment Scheme

Teaching Scheme/Week				Self-learning (SS)/Week	Total Hours/Semester	Credits C	Examination Scheme						
							Theory			Practical			Total
L	T	P	S				CIE	ESE	Total	CIE	ESE	Total	
0	0	3	0	1.5	45	1.5				60	40	100	100

L: Lecture (One unit is of one-hour duration with one credit), T: Tutorial (One unit is of one-hour duration with one credit), P: Practical (One unit is of one-hour duration with 0.5 credit), S: Project (One unit is of one-hour duration with 0.5 credit) SS: Self-Learning, CIE: Continuous Internal Evaluation, ESE: End Semester Examination

Detailed Syllabus

Expt No.	Experiment name	Practical Outcome	Mapped CO	Taxonomy Level	Instructional Hours
Module I					
Drawing	Regular Polygons	Illustrate knowledge of polygons.Construction of Regular Polygons- A) Pentagon, B) Hexagon (Any suitable method for each type when side length is given)	CO1	Apply	3
Drawing	Conic Sections	Develop the idea of conic sections. Construct Ellipse by A)Rectangular Method & B) Concentric Circle Method .	CO1	Apply	3
Drawing	Development of Surfaces	Extend knowledge about 'Development' of surfaces. Draw Development of following items A)Rectangular Prism B)Cylinder	CO1	Apply	3
Module II					
Drawing	Basic Projections	Outline the theory of projection (First angle and Third angle projections)	CO2	Understand	3
Drawing	Projections of points & lines	Demonstrate and develop the projections of points in all 4 quadrants. Demonstrate and develop the projections of lines in First quadrant only	CO2	Apply	6
Drawing	Orthographic projections& Sectional views of objects	Demonstrate and develop orthographic projections & sectional views of various simple engineering objects from Isometric figures. [Orthographic -Minimum 3 exercises Sectional-Minimum 2 exercises]	CO2	Apply	6
Module III					
Lab	Familiarize the use of CAD software and various basic commands used in CAD.	Introduction, application,open and save new drawing,draft settings,draw commands,modify commands, property change,dimensioning and text. simple exercises-	CO3	Apply	9
Module IV					
Lab	Develop orthographic views & Sectional views of various objects in CAD	Develop orthographic projections(minimum 3nos) & sectional views (minimum 2nos)of simple engineering objects. (Draw same exercises practiced in module-III)	CO4	Apply	9

Open-ended experiment

Objective:

To encourage creativity, innovation, and application of knowledge by allowing students to design and perform an experiment beyond the prescribed list, using the concepts learned during the course.

Description:

At the end of the laboratory course, each student (or group of students) shall undertake one open-ended experiment. In this activity, students are expected to conceive, design, and implement an experiment of their own choice related to the course outcomes. The aim is to apply theoretical knowledge and laboratory skills to a new or practical problem not explicitly covered in the regular experiments. Any 3 to 5 open ended problems may be chosen and divided among student groups.

Students may choose to:

The drawing sheets completed by the students in Modules 1 and 2 may be considered open-ended experiments, and marks can be awarded accordingly.

Student Activities for Self-Learning

Week	Self-Learning description	Hours
Module I		

1	Regular Polygon definition and terminology. Construction of a Regular Polygon (Pentagon, Hexagon, Heptagon, Octagon) with given side length	1.5
2	Conic Sections - Methodology and terminology. Construction of Ellipse, Parabola & Hyperbola	1.5
3	Development of Surfaces – Procedure familiarisation for engineering applications	1.5
Module II		
4	Outline the theory of projection, First angle and Third angle projections. Projection of Points & Lines.	1.5
5	Orthographic, Isometric projection. Practice more exercises	3
6	Familiarisation of Sectional Views Draw the sectional views of various simple engineering objects. Practice more exercises	3
7	Series Exam Preparation	1.5
Module III		
8	Introduction to Computer Aided Drafting: Application - Advantages over manual drafting – Hardware requirements – Software requirements -- Different software CAD basics – new drawing, open, save, save as, exit, drawing editor, entering commands using mouse, pull down menu, getting help, data entry, entity selection	1.5
9	Limits of drawing, units, grid, snap, osnap, co-ordinates, ortho mode. Draw commands - line, circle, arc, ellipse, rectangle, polygon, spline, polyline, hatch etc. Modify commands - erase, copy, array, rotate, mirror, offset, scale move, trim, fillet, chamfer, extend, stretch, p-line edit, explode etc.	1.5
10	Working with CAD: Properties of lines – colour, line weight, line type, dimensions and text on drawings	1.5
Module IV		
11	Developing orthographic views of simple components with dimensions and text. More practice exercises.	1.5
12	Sectional views: Draw sectional views of simple engineering objects. More practice exercises.	1.5
13	Series Exam Preparation	1.5
Total Self-Learning hours		22.5

Learning Resources

TEXT BOOK			
Sl. No.	Title	Author	Publication
1	Engineering Graphics with AUTOCAD	P I Varghese	VIP Publishers
2	Engineering Graphics	K. C John	PHI Learning Private Limited
3	Engineering Graphics unique methods easy solutions	K N Anilkumar	Adhyuth Narayan Publishers
4	Engineering Drawing with CAD Applications	N. D. Bhatt & V. M. Panchal	Charotar Publishing House

REFERENCE			
Sl. No.	Title	Author	Publication
1	Engineering Drawing	N. D. Bhatt	Charotar Publishing House, Anand, Gujarat
2	Engineering Graphics with AutoCAD	D.M. Kulkarni, A.P. Rastogi, A.K. Sarkar	PHI Learning Private Limited
3	Engineering Drawing	M. B. Shah and B.C. Rana	Pearson Publications

WEB RESOURCES		
Sl. No.	URL	Modules Covered
1	https://youtube.com/playlist?list=PL0GNZSidsWdVsGAfX3xHlvkbSvIm_6JSM&si=_ZGC3FA6jUx4OOU0	All
2	https://drive.google.com/drive/folders/1-p6TelKAPovRg3dqiK98YLaWB8vCYUOE	All
3	https://drive.google.com/drive/folders/1ECRoqHYUeOs66ksK8vZlo36RlBywl3yW	All
4	https://drive.google.com/drive/folders/1guvFtoaBoHvDVaaf_RJz5zeziH7BJQ91	All

5	https://t.me/+WlapqvUQXwoyOGM1	All
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Major Equipment/Instruments/Components required for a batch of 30 students

Sl. No.	Particulars	Specifications	Quantity
1	Desktop Computers	Intel i3/i5, 8GB RAM, 500GB HDD/SSD, Ubuntu 22.04 / Windows 10	30

Major Software required for a batch of 30 students

Sl. No.	Particulars	Specifications	Quantity
1	Suitable version of CAD software(open access/licensed)	Institution choice	30

Assessment Methodology - Lab

Mode	Attendance	CE	CA1	CA2	OEE	ESE
		Continuous evaluation	Practical test (first half of experiments)	Practical test (second half of experiments)	Open-ended experiment	Practical
Duration			3 hours	3 hours		3 hours
Exam mark		50	40	40	50	40
Converted to			15	15	10	
Marks	5	30	15		10	40
Total marks	60					40
Tentative schedule	End of semester	Every lab slot	7th week	14th week	15th week	

Scheme of Evaluation - Practical (Continuous Internal Evaluation)

Sl. No.	Criteria	Description	Marks
1	Preparation and Punctuality	Attendance, timely submission of record, pre-lab preparation, understanding of experiment objectives and theory.	10
2	Experimental Setup & Procedure	Ability to identify components/equipment, correct circuit connections/setup, systematic and safe execution of the procedure.	10
3	Observation & Data Recording	Accuracy and neatness of readings, correct use of units, tabulation, and systematic recording of results.	5
4	Analysis & Result Interpretation	Proper calculations, graphical representation, result verification, discussion, and logical conclusion.	10
5	Viva Voce / Concept Understanding	Clarity of theoretical concepts, explanation of procedure, ability to answer questions related to the experiment.	10
6	Workmanship, Discipline & Teamwork	Laboratory discipline, care of instruments, teamwork, attitude, and safety practices.	5
Total			50

Scheme of Evaluation - Practical Test & End Semester Evaluation

Category	Things to evaluate	Marks
Write-up / Procedure (before experiment)	Aim, circuit diagram/flowchart, stepwise procedure.	10
Experiment Setup & Execution	Correct circuit connections / coding / setup. Handling of instruments/software. Accuracy of execution.	10
Observation & Result / Output	Proper tabulation of readings. Calculations/graphs/program output. Correctness of result / expected outcome.	8
Viva Voce	Conceptual understanding of experiment. Related theoretical knowledge.	8
Record	Completion & neatness of practical record. Proper certification by faculty.	4
Total		40

Scheme of Evaluation - Open-ended experiment

Category	Things to evaluate	Marks
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Originality and Relevance of the Idea	Assesses how creative, innovative, and relevant the chosen experiment is to the course objectives.	10
Clarity of Objectives and Experimental Plan	Evaluates how clearly the student defines the aim, scope, and systematic plan of the experiment.	10
Correctness of Execution and Data Recording	Checks the accuracy, safety, and neatness in performing the experiment and recording observations.	10
Analysis, Interpretation, and Presentation of Results	Measures the student's ability to analyze data, interpret outcomes, and present results logically.	10
Teamwork and Innovation Demonstrated	Judges the level of collaboration, initiative, and creativity shown during the experiment.	10
Total		50

Note:

1. Students need to draw above exercises from module-I&II in A2/A4 size sheet
 2. If preferring A4 drawing then students should be familiar with sheet size, margin, title block and angle of projection additionally.
 3. Consider the above sheets from module-I&II as open-ended project.
 4. End semester examination in CAD practicals only.
 5. Students are required to prepare and submit a certified fair record for ESE attached with all figures with construction procedure from module-I & II in part-A and study of CAD and Printed/plotted CAD drawings for exercises from module III & IV with drawing procedure in part-B.
- Series test -I (module I&II) - 1.5hrs.
[Series test-1 should be in descriptive mode - 4 questions of 10 marks each / divide suitably]
Series test -II (module III&IV) - 1.5hrs [In CAD]

Computer Aided Engineering Graphics ESE split up:

1. Ten questions from CO1 & CO2 -multiple choice/fill in the blanks/one or two sentence type- 1Mark each (10 Marks)
2. CO3 & CO4- CAD drawing (18 Marks)
3. Viva voce (8 Marks)
4. Record (4 Marks)

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