INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

COURSE DESCRIPTOR

Course Title	**ENGINEERING GRAPHICS AND DESIGN LABORATORY**					
Course Code	AMEB02					
Program me	B.Tech					
Semester	I	ECE | EEE | CE				
	II	AE | CSE | IT | ME				
Course Type	Core					
Regulation	IARE - R18					
Course Structure	**Theory**			**Practical**		
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**	
	1	-	-	4	3	
Chief Coordinator	Mr. B.V. Satyanarayana Rao, Associate Professor					
Course Faculty	Dr. B.D.Y. Sunil, Associate Professor. Mr. C. Labesh Kumar, Assistant Professor Mr. M. Sunil Kumar, Assistant Professor Mr. A.Venuprasad, Assistant Professor					

I. COURSEOVERVIEW:

One of the best ways to communicate one's ideas is through some form of picture or drawing. This is especially true for the engineer. An engineering drawing course focuses on learning lettering, construction of geometric shapes, etc. Students study dimensioning, shapes and angles or views of such drawings. Dimensions feature prominently, with focus on interpretation, importance and accurate reflection of dimensions in an engineering drawing. Other areas of study in this course may include projected views, pictorial projections and development of surfaces. This course also gives basic concepts for studying machine drawing, building drawing, circuit drawings etc.

II. COURSEPRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
-	-	-	-	-

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Engineering Graphics and Design Laboratory	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONALMETHODOLOGIES:

✘	Chalk & Talk	✘	Quiz	✘	Assignments	✘	MOOCs
✔	LCD / PPT	✘	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATIONMETHODOLOGY:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

Semester End Examination (SEE): The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concerned experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	**Laboratory**		**Total Marks**
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

Continuous Internal Examination (CIE):
One CIE exam shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	**Performance**	**Calculations and Graph**	**Results and Error Analysis**	**Viva**	**Total**
2	2	2	2	2	10

VI. HOW PROGRAM OUTCOMES AREASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.	3	Lab exercises
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	-
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.	1	-

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES AREASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** To produce engineering professional capable of synthesizing and analyzing mechanical systems including allied engineering streams.	1	Lab exercises
PSO 2	**Modelling and Simulation Practices:** An ability to adopt and integrate current technologies in the design and manufacturing domain to enhance the employability.	-	---
PSO 3	**Successful Career and Entrepreneurship:** To build the nation, by imparting technological inputs and managerial skills to become Technocrats.	-	---

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES(COs):

The course should enable the students to:	
I	Understand the basic principles of engineering drawing in the construction of scales and curves used in engineering field using Auto cad.
II	Apply the knowledge of interpretation of projection of points and lines using Auto cad in different quadrants.
III	Understand the projections of planes and solids, when it is inclined to both planes.
IV	Create intricate details of components through sections and develop its surfaces.
V	Convert the pictorial views into orthographic view and vice versa.

IX. COURSE OUTCOMES

COs	Course Outcomes	CLOs	Course Learning Outcomes
CO1	Learn the important auto cad commands for engineering drawing. This will give student basic knowledge of technical drawings and means of communication with others.	CLO 1	Understand the BIS conventions of engineering drawing with basic concepts, ideas and methodology.
		CLO 2	Principles of dimension and their execution using Auto CAD.
CO2	Understand the main idea of using dimension for engineering drawing in the construction of scales and curves.	CLO 1	Understand the BIS conventions of engineering drawing with basic concepts, ideas and methodology.
		CLO 6	Discuss the various types of scales for engineering application like maps, buildings, bridges.
		CLO 4	Visualize parabolic, Hyperbola and elliptical profiles in buildings and bridges.
		CLO 5	Visualize cycloidal and involutes profiles in developing new products like gears and other engineering applications.
CO3	Familiarize with technical standards and procedures for construction of geometric shapes, points, lines, planes and solids.	CLO 7	Solve specific geometrical problems in plane geometry involving points and lines.
		CLO 8	Understand the theory of projection in planes located in various quadrants and apply in manufacturing processes.
		CLO 9	Understand the concept of projection of solids inclined to both the planes
		CLO 10	Understand the concept of projection of section of solids inclined to both the planes
CO4	Understand the development of surfaces and sectioning of cubes, pyramids, prisms, cylinders and cones.	CLO 11	Apply the terminology of development of surfaces in the area of chimneys and chutes.
		CLO 12	Understand the orthographic projection concepts in solid modeling and apply the concepts in the areas of design.
CO5	Understand the orthographic views and isometric drawing.	CLO 13	Visualize the components by isometric projection by representing three dimensional objects in two dimensions in technical and engineering drawings.

X. COURSE LEARNING OUTCOMES(CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AMEB02.01	CLO 1	Understand the BIS conventions of engineering drawing with basic concepts, ideas and methodology	PO 1	3
AMEB02.02	CLO 2	Principles of dimensions and their execution using AutoCAD.	PO 1	3
AMEB02.03	CLO 3	Apply the commands used in AutoCAD for different basic geometric shapes.	PO 1	3
AMEB02.04	CLO 4	Visualize parabolic, Hyperbola and elliptical profiles in buildings and bridges	PO 1, PO 2, PO 4	2
AMEB02.05	CLO 5	Visualize cycloidal and involutes profiles in developing new products like gears and other engineering applications.	PO 1	2
AMEB02.06	CLO 6	Discuss the various types of scales for engineering application like maps, buildings, bridges.	PO 1, PO 2, PO 4	2
AMEB02.07	CLO 7	Solve specific geometrical problems in plane geometry involving points and lines.	PO 1, PO 2	2
AMEB02.08	CLO 8	Understand the theory of projection in planes located in various quadrants and apply in manufacturing processes.	PO 1, PO 2	2
AMEB02.09	CLO 9	Understand the concept of projection of solids inclined to both the planes	PO 1, PO 2	2
AMEB02.10	CLO 10	Understand the concept of projection of section of solids inclined to both the planes	PO 1	2
AMEB02.11	CLO 11	Apply the terminology of development of surfaces in the area of chimneys and chutes.	PO 1	3
AMEB02.12	CLO 12	Understand the orthographic projection concepts in solid modeling and apply the concepts in the areas of design.	PO 1, PO 2	3
AMEB02.13	CLO 13	Visualize the components by isometric projection by representing three dimensional objects in two dimensions in technical and engineering drawings.	PO 1	3

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XI. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFICOUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												1		
CLO 2	3												1		
CLO 3	3												1		
CLO 4	3	2		1									1		
CLO 5	2														
CLO 6	2	2		1											
CLO 7	2	2											1		
CLO 8	2	2											1		
CLO 9	2	2													
CLO 10	2														
CLO 11	3														
CLO 12	3	3													
CLO 13	3														

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XII. ASSESSMENT METHODOLOGIES –DIRECT

CIE Exams	PO 1, PO 2, PO 4, PSO 1	SEE Exams	PO 1, PO 2, PO 4, PSO 1	Assignments	-	Seminars	PO 2, PSO 1
Laboratory Practices	PO 1, PO 2, PO 4, PSO 1	Student Viva	PO 1, PO 2, PO 4, PSO 1	Mini Project	-	Certification	-

XIII. ASSESSMENT METHODOLOGIES –INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIV. SYLLABUS

LIST OF EXPERIMENTS	
Week-1	**CONSTRUCTION OF PARABOLA BY ALL METHODS**
Draw the parabola by General Method, rectangle method, tangent method and parallelogram methods.	
Week-2	**CONSTRUCTION OF ELLIPSE BY ALL METHODS**
Draw the Ellipse by General method, concentric circle method, oblong method, arcs of circles method and parallelogram methods.	
Week-3	**CONSTRUCTION OF HYPERBOLA BY ALL METHODS**
Draw the Hyperbola by General Method and Rectangle method.	
Week-4	**CONSTRUCTION OF CYCLOIDS AND INVOLUTES**
Draw the Cycloid, Epi-Cycloid, Hypo-Cycloid, Involute for a thread wound around a circle and polygons.	
Week-5	**CONSTRUCTION OF SCALES**
Construct the Plain scale, Diagonal Scale, and Vernier scales.	
Week-6	**PROJECTION OF POINTS AND LINES**
Locate the projection of points in different quadrants. Draw the projection of the lines parallel, perpendicular and inclined to planes.	
Week-7	**PROJECTION OF PLANES**
Draw the projection of the Planes, parallel, perpendicular and inclined to planes.	
Week-8-9	**PROJECTION OF SOLIDS**
Draw the projection of the Solids whose axis is parallel, perpendicular and inclined to planes.	
Week-10	**SECTION OF SOLIDS**
Draw the projection of Solids cut by plane when the axis is parallel, perpendicular and inclined to planes.	
Week-11-12	**DEVELOPMENT OF SURFACES**
Draw the development of lateral surface of cube, cylinder, Prism, Pyramid and cone.	
WeeK-13-14	**TRANSFORMATIONS**
Conversion of Isometric Projections to Orthographic Projection and vice-versa	
Week-15	**ISOMETRIC VIEWS**
Draw the Isometric views of solids and castings.	

XV. COURSEPLAN:

The course plan is meant as a guideline. Probably there may be changes.

Week No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Principles of engineering drawing – Geometrical construction.	CLO 1	T1:1.4 R1:1.2
2	Principles of dimensions and their execution. Introduction to auto-cad.	CLO 2	T1:1.5 R1:2.4
3	Familiarization of auto-cad commands. Draw and modify commands, dimensions, line properties, status bar, etc..,	CLO 3	T1:2.5 R1:2.5
4	Construction of parabola curves. – General method, rectangle method, and parallelogram methods.	CLO 4	T2:2.5 R1:2.6
5	Construction of elliptical curves- General method, rectangle method, concentric circle method, and parallelogram methods.	CLO 4	T1:22.7
6	Construction of hyperbola curves- eccentricity method, rectangle method.	CLO 4	T1:6.3 R2:5.3
7	Construction of various curves cycloid, epicycloids, hypocycloid and involutes	CLO 5	T1:7.5 R1:6.3
8	Construction of various scales for engineering use- plain, diagonal, and vernier.	CLO 6	T1:8.5 R1:6.8
9	Projection of points and lines inclined to single plane and both the planes.	CLO 7	T1:12.2 R3:13.1
10	Projection of planes- inclined to single plane and both the planes.	CLO 8	T1:12.3 R1:13.2
11	Projection of solids inclined to single plane and both the planes.	CLO 9	T1:12.10 R2:13.7
12	Projection of section of solids whose axis is, parallel and perpendicular to planes, and inclined to planes.	CLO 10	T1:11.2 R1:10.2
13	Draw the development of lateral surfaces of cube, prism, pyramid, cylinder and cone.	CLO 11	T2:2.5 R1:2.5
14	Draw the basic isometric views.	CLO 12 CLO13	T2:22.7
15	.Convert the pictorial views to orthographic views and vice versa.	CLO 14 CLO15	T1:12.10 R2:13.7

XVI. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSIONREQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Learn to take data and transform it into graphic drawings	NPTEL	PO 4, PO 2	PSO 1
2	Students will become familiar with office practices and standards.	NPTEL	PO 2	PSO 1

Prepared by:

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