



Gyanmanjari
Innovative University

Syllabus
Gyanmanjari Institute of Technology
Semester- 1 (B.Tech.)

Subject: Computer-Aided Engineering Design-BET1ME10301

Type of course: Engineering Science Course

Prerequisite: Basic Knowledge of Engineering Graphics

Rationale:

The main objective of this course is to develop the skills regarding various modeling and digital production drawings as required by the industry using appropriate CAD software. This program provides students with a strong foundation in design principles, 2D/3D modeling, drafting, and simulation. It enables them to bridge the gap between conceptual product design and practical manufacturing execution. The curriculum integrates theoretical knowledge with practical skills using industry-standard software such as AutoCAD and Mastercam.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P		SEE	CCE	
2	0	4	4	100	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; CCE-Continuous and Comprehensive Evaluation.

Course Content:

Sr. No	Course content	Hrs.	% Weigh tage
1	<p>Introduction to Drawing What is a drawing, Uses, Elements of Graphics, Methods of Expression, Methods of Size Description, Methods of Preparing Drawings, Types of Mechanical Drawings, Drawing Standards.</p> <p>Practical:</p> <ol style="list-style-type: none"> 1) Identify and label elements of a standard mechanical drawing. 2) Practice on size description using dimensioning methods (linear, angular, aligned, etc.) 3) Identify and understand symbols and conventions used in technical drawings. 4) Create a title block and understand standard sheet layouts. 	T: 04 P: 06	20%

	<p>5) Analyze real-world machine drawings and list their components.</p> <p>Evaluation Method:</p> <table border="1" data-bbox="295 310 1218 646"> <thead> <tr> <th>Sr. No.</th> <th>Evaluation Methods</th> <th>SEE</th> <th>CCE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Drawing Standards and Layout Assessment</td> <td>10</td> <td></td> </tr> <tr> <td>2</td> <td>Application of Drawing Standards, Dimensioning, and Title Block in CAD</td> <td>10</td> <td></td> </tr> <tr> <td>3</td> <td>Drawing Identification and Classification Exercise</td> <td></td> <td>10</td> </tr> <tr> <td></td> <td>Total</td> <td>20</td> <td>10</td> </tr> </tbody> </table> <p>Examination Style: Students will be given a CAD template. It is required to identify and apply standard symbols and conventions as per BIS/ISO guidelines. demonstrate proper dimensioning techniques (linear, aligned, angular) on a given sketch or component and design and complete a standard title block with accurate sheet layout, borders, and required details (title, scale, date, drawn by, etc.).</p> <p>Assessment Criteria</p> <table border="1" data-bbox="295 1075 1224 1264"> <thead> <tr> <th>Description</th> <th>Marks</th> </tr> </thead> <tbody> <tr> <td>Identification and Correct use of dimensioning methods with proper layout and information</td> <td>10</td> </tr> <tr> <td>Application of standard symbols & conventions</td> <td>05</td> </tr> <tr> <td>Title block creation</td> <td>05</td> </tr> </tbody> </table> <p>Continuous Assessment Examination Drawing Identification and Classification Exercise (10 marks) Students required to label key elements of a given sample drawing, including the title block, views, scale, borderlines, and commonly used symbols. They need to identify the applicable drawing standard (such as BIS or ISO) and classify the type of drawing.</p>	Sr. No.	Evaluation Methods	SEE	CCE	1	Drawing Standards and Layout Assessment	10		2	Application of Drawing Standards, Dimensioning, and Title Block in CAD	10		3	Drawing Identification and Classification Exercise		10		Total	20	10	Description	Marks	Identification and Correct use of dimensioning methods with proper layout and information	10	Application of standard symbols & conventions	05	Title block creation	05		
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2	<p>Computer Aided Drafting Basic information of AutoCAD software, computer configuration, working of various function keys, coordinate system, AutoCAD programme window, basic AutoCAD Commands- Units, Line, Circle, Arc, Rectangle, Polyline, Polygon, Array, etc. 2D Modify/Edit commands- Erase, Copy, Move, Offset, Mirror, Trim, Rotate, Extend, Chamfer, Fillet, Scale, etc. Drafting setting commands- Grid, Snap, Polar tracking, OSnap, Ortho, Dynamic input, Units, etc. 3D</p>	T: 04 P: 10	20%																												

primitives- Box/Cube, Cylinder, Cone, Pyramid, Wedge, Torus, etc. 3D commands- Revolve, Sweep, Loft, Press pull, Extrude, etc. 3D Modify- 3D Array, 3D Mirror, 3D Rotate, Union, Subtract, Intersect, etc.

Practical:

- 1) Basic Drawing with Line and Circle Commands.
- 2) Generate objects with mixed geometries using polyline, polygon, and arc commands.
- 3) Create circular and rectangular arrays for repetitive elements like bolt holes.
- 4) Learn to manipulate object using move, copy, and erase commands.
- 5) Apply mirror and trim to create balanced and clean 2D drawings.
- 6) Apply chamfer and fillet on intersecting line to round and bevel edges.
- 7) Modify object orientation with Using rotate, scale, and extend commands.
- 8) Explore how to improve drawing speed and accuracy using polar tracking, ortho & osnap.

Evaluation Method:

Sr. No.	Evaluation Methods	SEE	CCE
1	2D Component Layout Drawing	20	
2	AutoCAD Command Identification		05
3	Viva		05
	Total	20	10

Examination Style:

2D Component Layout Drawing (20 Marks)

Students will be given a 2D machine part drawing. They are required to recreate the given machine part drawing using AutoCAD (or similar software) by applying appropriate 2D drafting tools and modification commands.

Assessment Criteria

<i>Description</i>	<i>Marks</i>
Use of line, circle, arc, polyline, polygon	03
Use of array command (circular or rectangular)	03
Mirror and trim commands for symmetry/cleanup	03
Chamfer and fillet for edge detailing	03
Rotate, scale, extend for orientation adjustment	03
Use of ortho, osnap, polar tracking for precision	03
Application of move, copy, erase	02

	<p>Continuous Assessment Examination Identify AutoCAD Commands from a given Machine Drawing (05 marks) Identify and List AutoCAD Commands Used for a Given Machine Drawing Component.</p> <p>Viva of Unit 1 (05 marks) Five viva questions should be asked from this unit to assess students' recall and understanding of the concepts.</p>																		
3	<p>2D Drafting and dimensioning using Auto CAD: 2D views: Front, Top, Side views, Types of dimensions: Linear, Aligned, Angular, Radius, Diameter, Baseline, Continue, Dimensioning rules, placement, and tolerances, Dimension styles and Dimension layer, Leader lines, and Engineering notes, Plotting, Printing & Exporting.</p> <p>Practical:</p> <ol style="list-style-type: none"> 1) Drafting Front, Top, and Side views of a given mechanical component. 2) Apply linear and aligned dimensions to a 2D drawing. 3) Dimensioning circular features using Radius and Diameter tools. 4) Add angular dimensions to arcs and angled features. 5) Use of Baseline and Continue dimensioning techniques. 6) Create and apply custom dimension styles. 7) Manage dimensions using layers. 8) Add Leader Lines and Engineering Notes to drawings. 9) Plot and Print drawing with proper layout and scale. 10) Export a final drawing to pdf and other formats. <p>Evaluation Method:</p> <table border="1" data-bbox="295 1352 1218 1577"> <thead> <tr> <th>Sr. No.</th> <th>Evaluation Methods</th> <th>SEE</th> <th>CCE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Drafting and Dimensioning using AutoCAD</td> <td>20</td> <td></td> </tr> <tr> <td>2</td> <td>2D Drawing Analysis for Dimensioning and Standards</td> <td></td> <td>10</td> </tr> <tr> <td></td> <td>Total</td> <td>20</td> <td>10</td> </tr> </tbody> </table> <p>Examination Style: 2D Drafting and Dimensioning of a Machine Component using AutoCAD (20 Marks) Students will be provided with a 2D drawing (either printed or digital) of a mechanical component. They are required to recreate the Front, Top, and Side views of the component using AutoCAD, and apply</p>	Sr. No.	Evaluation Methods	SEE	CCE	1	Drafting and Dimensioning using AutoCAD	20		2	2D Drawing Analysis for Dimensioning and Standards		10		Total	20	10	T: 06 P: 16	20%
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	<p>appropriate dimensions, leader lines, and annotations as per standard drafting practices.</p> <p>Assessment Criteria</p> <table border="1"> <thead> <tr> <th><i>Description</i></th> <th><i>Marks</i></th> </tr> </thead> <tbody> <tr> <td>Accurate creation of 2D views</td> <td>03</td> </tr> <tr> <td>Proper application of dimensions</td> <td>03</td> </tr> <tr> <td>Use of dimension styles and layers</td> <td>03</td> </tr> <tr> <td>Use of leader lines and engineering notes</td> <td>03</td> </tr> <tr> <td>Drawing layout, plotting, and presentation</td> <td>03</td> </tr> <tr> <td>Export drawing to PDF or any other format</td> <td>02</td> </tr> </tbody> </table> <p>Active Learning Activity of Unit 3 2D Drawing Analysis for Dimensioning and Standards (10 marks) Analysis of a 2D Mechanical Drawing for Dimensioning and Drafting Standards.</p>	<i>Description</i>	<i>Marks</i>	Accurate creation of 2D views	03	Proper application of dimensions	03	Use of dimension styles and layers	03	Use of leader lines and engineering notes	03	Drawing layout, plotting, and presentation	03	Export drawing to PDF or any other format	02		
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4	<p>3D Modeling – 1: Auto CAD 3D modeling from 2D drafting, 3D modeling using commands: Extrude, Presspull, Revolve, Thicken, Region, Solid editing operations: Union, Subtract, Intersect, Fillet Edge, Chamfer Edge, Shell, 3D Primitives: Box, Cylinder, Cone, Sphere, Torus, Wedge, Navigation and Visual Styles: Orbit, Pan, Zoom, ViewCube, Conceptual & Realistic styles, View generation: Flatshot, Section plane.</p> <p>Practical:</p> <ol style="list-style-type: none"> 1) Create a 3D Model from 2D Drafting using EXTRUDE. 2) Create Revolved 3D Objects using REVOLVE Command. 3) Forming 3D Shapes using the PRESSPULL and THICKEN Commands. 4) Create Complex 3D Models using REGION and EXTRUDE. 5) Construct 3D Models with Primitives: Box, Cylinder, Cone, Sphere, Torus, Wedge. 6) Modify 3D Solids using UNION, SUBTRACT, and INTERSECT. 7) Apply FILLETEDGE, CHAMFEREDGE, and SHELL to 3D Models. 8) Navigate 3D Models using ORBIT, PAN, ZOOM, and ViewCube. 9) Change Visual Styles: Wireframe, Conceptual, and Realistic. 10) Generate 2D Views from 3D Models using FLATSHOT and SECTIONPLANE. 11) Plot and Export 3D Models to PDF or other formats. 	T: 06 P: 16	20%														

Evaluation Method:			
Sr. No.	Evaluation Methods	SEE	CCE
1	3D Solid Modeling: AutoCAD	20	
2	3D Feature Identification from 2D Multiview Drawing		10
	Total	20	10
Examination Style:			
3D Solid Modeling a given Mechanical Component using AutoCAD (20 Marks)			
Students will be given a 2D multiview drawing or part description and are required to create a 3D model using appropriate AutoCAD commands and primitives. They must apply solid editing operations like Union, Subtract, Fillet Edge, and Chamfer Edge as needed. Students needs to generate 2D views using Flatshot or Sectionplane and plot or export the final model in the required format.			
Assessment Criteria			
<i>Description</i>		<i>Marks</i>	
Creation of 3D model using primitives/commands		06	
Application of solid editing operations		04	
Use of navigation tools and visual styles		04	
Generation of 2D views from 3D model		04	
Plot and Export drawing with proper layout		02	
Active Learning Activity of Unit 4			
3D Feature Identification from 2D Multiview Drawing (10 marks)			
Students will be given a 2D multiview mechanical drawing (front, top, and side views) and are required to analyze it to identify the 3D primitives and features needed to create the model. They must list the appropriate 3D modeling commands and solid editing operations they would use to create the model.			
5	3D Modeling – 2: CAD Software (SolidWorks) 2D profiles, Creation of 3D features: Extrude, Revolve, Sweep, and Loft, Parametric constraints and dimensioning, Feature-based modeling: Hole, Fillet, Chamfer, Shell, Rib, and Pattern features, Use of part modeling, assembly creation, and constraints, Generation of 2D drawing from 3D model with dimensions and annotations, Rendering and Exploded views, Plot and Export 3D parts and assembly.	T: 06 P: 16	20%

	<p>Practical:</p> <ol style="list-style-type: none"> 1) Create basic 2D sketches with geometric and dimensional constraints. 2) Create 3D solid models using Extrude and Revolve features. 3) Create complex models using Sweep and Loft features. 4) Apply Fillet, Chamfer, Shell, and Rib features. 5) Create Holes using standard hole tools. 6) Use Pattern features: Linear, Circular, and Mirror patterns. 7) Create an Assembly of multiple parts using assembly constraints. 8) Create Exploded views and apply basic rendering for presentation. 9) Exporting models to standard formats (PDF, STL, STEP). <p>Evaluation Method:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Sr. No.</th> <th style="width: 45%;">Evaluation Methods</th> <th style="width: 15%;">SEE</th> <th style="width: 30%;">CCE</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>3D Solid Modeling: Parametric CAD Software</td> <td style="text-align: center;">20</td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td>Analyze 2D Views for 3D Modeling</td> <td></td> <td style="text-align: center;">10</td> </tr> <tr> <td></td> <td>Total</td> <td style="text-align: center;">20</td> <td style="text-align: center;">10</td> </tr> </tbody> </table> <p>Examination Style: 3D Part Modeling using Parametric CAD Software (20 Marks) Students will be provided with a basic part sketch or drawing. Using parametric CAD software such as NX, SolidWorks, or Creo, they are required to create a 3D part model by applying proper sketch constraints and feature-based operations like Extrude, Revolve, Sweep, and Loft. They must also incorporate advanced modeling features such as Fillet, Chamfer, Hole, and Pattern.</p> <p>Assessment Criteria</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"><i>Description</i></th> <th style="width: 30%;"><i>Marks</i></th> </tr> </thead> <tbody> <tr> <td>Create sketch with correct constraints and dimensions using parametric CAD software such as NX, SolidWorks, or Creo</td> <td style="text-align: center;">06</td> </tr> <tr> <td>Use of 3D features (Extrude, Revolve, etc.)</td> <td style="text-align: center;">04</td> </tr> <tr> <td>Application of features (Fillet, Chamfer, Hole, Shell, etc.)</td> <td style="text-align: center;">04</td> </tr> <tr> <td>Generation of 2D drawing with dimensions and annotations</td> <td style="text-align: center;">04</td> </tr> <tr> <td>Plot and Export drawing with proper layout</td> <td style="text-align: center;">02</td> </tr> </tbody> </table> <p>Active Learning Activity of Unit 5 Analyze 2D Views for 3D Modeling (10 marks)</p>	Sr. No.	Evaluation Methods	SEE	CCE	1	3D Solid Modeling: Parametric CAD Software	20		2	Analyze 2D Views for 3D Modeling		10		Total	20	10	<i>Description</i>	<i>Marks</i>	Create sketch with correct constraints and dimensions using parametric CAD software such as NX, SolidWorks, or Creo	06	Use of 3D features (Extrude, Revolve, etc.)	04	Application of features (Fillet, Chamfer, Hole, Shell, etc.)	04	Generation of 2D drawing with dimensions and annotations	04	Plot and Export drawing with proper layout	02		
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Suggested Specification table with Marks:

Distribution of Theory Marks (Revised Bloom’s Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	10%	10%	30%	15%	10%	25%

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand basic concepts, types, and standards of mechanical drawings.
CO2	Implement basic 2D and 3D AutoCAD commands for drafting and modeling.
CO3	Create 2D views with proper dimensioning, annotations, and plotting using Auto CAD.
CO4	Develop 3D models from 2D drawings using Auto CAD, solid editing commands, and visual styles.
CO5	Modify 3D parametric models and generate detailed drawings with annotations and assemblies using any other parametric modeling software.

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

- [1] Machine drawing including AutoCAD, Ajeet Singh, McGraw-Hill
- [2] Textbook of Machine Drawing, R. K. Dhawan, S. Chand Publication
- [3] Engineering Graphics with AutoCAD, James D. Bethune, Pearson
- [4] Fundamentals of Machine Drawing, Sadhu Singh, Khanna Publishers
- [5] Technical Drawing with Engineering Graphics, Frederick E. Giesecke et al., Pearson Education