



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



Mechanical Engineering
B. Tech. Semester IV

Course Name: Solid Modeling

Course Code: BTME13407

Type of course: Professional Core Courses (PCC)

Prerequisite: Engineering Graphics & Design

Rational of course: This course will enable the students acquire the knowledge needed to complete the process of designing models from conceptual sketching, through to solid modeling, assembly design and drawing preparation.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	50
0	0	2	1	--	--	--	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction to 3D Modeling software: Demonstration of drafting tools in 3D modeling software, coordinate systems, user interface of the software.	1	5%
2.	Sketch Tools: Create: Point, line, spline, rectangle, circle, arc, polygon, ellipse, slot, conic curve, text, mirror, pattern, sketch dimension. Modify: Fillet, chamfer, trim, extend, break, sketch scale, offset, move, copy. Constraints: Horizontal, vertical, coincident, tangent, equal, parallel, perpendicular, fix, unfix, midpoint, concentric, collinear, symmetry, curvature. Construct: Offset plane, Mid plane, tangent plane, plane at angle etc. Inspect: measure, interference, center of mass.	8	25%
3.	Solid Modeling Tools: Solid Create: Extrude, revolve, sweep, loft, rib, web, emboss, hole, thread, box, cylinder, sphere, torus, coil, pipe, pattern, mirror, thicken, boundary fill. Solid Modify: Press pull, fillet, chamfer, shell, draft, scale, combine, offset face, replace face, split face, split body, silhouette	8	25%



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Sr. No.	Topics	Teaching Hrs.	Module Weightage
	split, move, copy, align, delete, physical material, appearance, manage materials. Sheet Metal: Create sketch, flange, bend, extrude, hole, tread, pattern, modify.		
4.	Assembly Tools: Creating components, reusing components, positioning components, importing components from the browser, move, copy process, assembly constraints, introducing joints - using the rigid joint type, working with the different types of joints, creating rigid groups, understanding contact set, enabling motion linking, standard parts insert: McMaster-Carr component.	4	15%
5.	Drawing Tools: Drawing settings and preferences, interpret different drawing annotations, additional drawing views: base view, projected view, section view, detail's view, break view and exploded views, dimensioning method, linear, part list of tables (BOM).	6	20%
6.	Rendering , Animation and Manufacture Tools: Rendering: Physical material and appearance, scene setting, IN CANVAS RENDER. Animation: Story board, transform, annotation, view and publish. Manufacture: Product data exchange, file types (IEGS, STEP, ACIS, DXF, PARASOLID, STL, etc.).	3	10%

Percentage Distribution of Marks as per Bloom's Taxonomy (Theory/Practical):

Percentage Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	35	35	0	0	25

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

Learning Resources:

Sr. No.	Title of book /article	Author(s)	Publisher	Publication Year	Publication Edition
1.	Autodesk Fusion 360 For Beginners: Part Modeling, Assemblies, and Drawings	Tutorial Books	Kishore	2019	Illustrated edition
2.	Autodesk Fusion 360 Basics Tutorial	Tutorial Books	CreateSpace Independent Publishing Platform	2018	2 nd



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Sr. No.	Title of book /article	Author(s)	Publisher	Publication Year	Publication Edition
3.	Autodesk Fusion 360: A Power Guide for Beginners and Intermediate Users	John Willis, Sandeep Dogra,	Cadartifex	2020	4 th
4.	Mastering SolidWorks	Matt Lombard	Sybex	2018	1 st
5.	Autodesk Inventor Exercises	Bob McFarlane	Routledge	2017	1 st

Course Outcomes (CO):

Sr. No.	CO Statements	Marks % weightage
	After learning this subject, students will be able to	
CO-1	Describe the importance and application of 3D modeling software.	5
CO-2	Illustrate 2D and 3D drawing using 3D modelling software.	35
CO-3	Prepare an assembly drawing and details views of drawing.	35
CO-4	Develop animation and render of an object.	25

Mapping of (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	1	2	2	3	1	1	0	2	2	1	1	2	2	1
CO-2	3	3	3	2	3	1	0	1	2	2	1	0	1	3	1
CO-3	3	3	3	2	3	2	1	1	3	2	1	1	2	3	2
CO-4	1	1	0	0	2	0	1	1	3	3	1	0	1	1	1
Rationale*	10	8	8	6	11	4	3	3	10	9	4	2	6	9	5

*** Rationale - Mapping of CO's with PO's and CO's with PSO's:** According to the above CO-PO-PSO mapping, this course will focus on the basic concept and application of 3D modeling software. It also helps to design/development of components with the help of parametric 3D modeling software. It focuses on individual and team work for better communication.

List of Practical:

- To create point, line, spline, rectangle, circle, arc, polygon, ellipse, slot, conic curve, text, mirror, circular pattern, rectangular pattern, fillet, chamfer, trim, extend, break, sketch scale, offset, move, copy, sketch dimension using sketch tools.
- To create horizontal, vertical, coincident, tangent, equal, parallel, perpendicular, fix/unfix, midpoint, concentric, collinear, symmetry, curvature, measure, interference, center of mass using sketch constraints and inspect tools.
- To create extrude, revolve, sweep, loft, rib, web, emboss, hole, thread, box, cylinder, sphere, torus, coil, pipe, pattern, mirror, thicken, boundary fill using solid modeling tools.



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4. To create press pull, fillet, chamfer, shell, draft, scale, combine, offset face, replace face, split face, split body, silhouette split, move/copy, align, delete, physical material, appearance, manage materials using solid modify tools.
5. To create flange, bend, extrude, hole, tread, pattern, modify using sheet metal tools.
6. To construct the 2D sketch & 3D part model and create the rendering of object.
7. To prepare the assembly and create the animation of object.
8. To develop the orthographic views and exploded views of object.

Student Activities:

Student should conduct following activities in group and prepare power point presentation & report for each activity:

1. **2D Sketch:** Collect one or two 2D drawing. Measure the dimensions of 2D drawing and prepare sketches.
2. **Solid Modeling:** Collect the any 3D object. Measure the dimensions of object and prepare 3D part of object.
3. **Assembly:** Collect the small assembly (e.g., bench vice, couplings, joints, bearing, small gear box, air blower etc.). Prepare the 3D drawing of part and assembly of part.
4. **Drawing:** Prepare detail drawings of part model and assembly.
5. **Rendering & Animation:** Prepare animation and rendering of part model and assembly.

Equipment's available:

1. Computational facilities

List of Open Source/learning website:

1. [youtube.com/c/AutodeskFusion360/featured](https://www.youtube.com/c/AutodeskFusion360/featured)
2. <https://help.autodesk.com/view/fusion360/ENU/courses/>

List of Software:

1. 3D Modeling Software