

15MH321E	Geometric Modelling			L	T	P	C
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<i>Co-requisite:</i>	Nil						
<i>Prerequisite:</i>	Nil						
<i>Data Book / Codes/Standards</i>	Nil						
Course Category	P	Professional Elective	Mechanical Engineering				
<i>Course designed by</i>	Department of Mechatronics Engineering						
<i>Approval</i>	32 nd Academic Council Meeting held on 23.07.2016.						

Purpose	To impart the fundamentals of geometric modelling and its application in machine design.						
Instructional Objectives				Student Outcomes			
At the end of the course, student will be able to							
1.	Explain the concept of transformation.	a					
2.	Describe about various procedures followed in modelling.	a					
3.	Classify the various algorithm used in geometric modelling.	a					
4.	Model assembly machine elements.	a	e				
5.	Distinguish data exchange standards and common file types in CAD.	a					

Session	Description of Topics	Contact hours	C-D-I-O	IOs	Reference
	Unit I : Fundamentals of Computer Graphics	9			
1.	Design as a process, sequential and concurrent engineering, Computer Aided Design (CAD) and its architecture.	1	C	1	1,2
2.	Computer graphics, co-ordinate system.	1	C	1	1,2
3.	Transformation in 2D and 3D: Translational, scaling.	1	C,D	1	1,2
4.	Transformation in 2D and 3D: Rotation, reflection.	1	C,D	1	1,2
5.	Transformation types: Two and three dimensional.	1	C,D	1	1,2
6.	Two dimensional transformations: Problems on rotation, scaling, translation, reflection.	1	C,D	1	1,2
7.	Three dimensional transformations: Problems on rotation, scaling, translation, reflection.	1	C,D	1	1,2
8.	Homogeneous co-ordinates.	1	C	1	1,2
9.	Algorithms: Line, clipping and viewing.	1	C,D	1	1,2
	Unit II : Geometric Modelling	9			
10.	Wire frame modelling: Introduction, model, entities.	1	C	2	1,2
11.	Representation of synthetic curves: Hermite curve, Bezier curve.	1	C	2	1,2
12.	B-spline curves, rational curves.	1	C	2	1,2
13.	Surface modelling: Introduction, model.	1	C	2	1,2
14.	Parametric representation of analytic surface: Plane surface and ruled surface.	1	C	2	1,2
15.	Parametric representation of synthetic surface: Coons and bicubic.	1	C	2	1,2
16.	Bezier and B-spline surfaces.	1	C	2	1,2
17.	Solid modelling: Introduction, models, entities.	1	C	2	1,2
18.	Solid modelling representation: Boundary representation, constructive solid geometry.	1	C	2	1,2
	Unit III: Visual Realism	7			
19.	Hidden line removal: Visibility of object views, techniques, sorting and coherence.	1	C	3	1,2

Session	Description of Topics	Contact hours	C-D-I-O	IOs	Reference
20.	Hidden surface removal: Z-buffer, Warnock's algorithm.	2	C	3	1,2
21.	Hidden solid removal: Ray-tracking algorithm.	1	C	3	1,2
22.	Shading: Model, surface, enhancement, solid.	1	C	3	1
23.	Coloring: Models.	1	C	3	1
24.	Computer animation: Entertainment and engineering.	1	C	3	1
Unit IV: Assembly of Machine Elements		8			
25.	Assembly modelling: Introduction, part modelling, representation and hierarchical relationship.	1	C	4	1,2
26.	Interferences of positions.	1	C,D	4	1,2
27.	Tolerance: Concept, geometric tolerance, modelling and representation.	1	C,D	4	1,2
28.	Tolerance analysis: Worst- case arithmetic method, worst- case statistical method and Monte Carlo simulation method.	2	C,D	4	1,2
29.	Mass property calculations: Introduction, geometrical property, formulation and evaluation.	2	C,D	4	1,2
30.	Properties of composites, mass property calculation by using CAD systems.	1	C,D	4	1,2
Unit V : CAD Protocols		8			
31.	Computer graphics: Introduction, software function and standards.	2	C	5	4
32.	Graphical Kernel System (GKS), polyline representation, poly marker.	1	C	5	3
33.	Area fill attribute: Fill style and pattern, text attribute.	1	C	5	4
34.	Standards for exchange of images.	1	C	5	4
35.	Open Graphics Library (OpenGL).	1	C	5	3
36.	Data exchange standards: IGES, STEP, CALS.	1	C	5	4
37.	Communication standards for CAD systems.	1	C	5	4
Assessment		4			
38.	Cycle test -I	1			
39.	Cycle test -II	2			
40.	Surprise test/Assignment and Quiz	1			
Total contact hours		45			

Learning Resources	
Sl.No.	Text Books
1.	Ibrahim Zeid, " <i>Mastering CAD CAM</i> ", Tata McGraw-Hill Publishing Co, 2007.
Reference Books/Other Reading Materials	
2.	Chris McMahon and Jimmie Browne, " <i>CAD/CAM Principles</i> ", Practice and Manufacturing Management 2 nd edition, Pearson Education, 1999.
3.	William M Neumann and Robert F.Sproul, " <i>Principles of Computer Graphics</i> ", McGraw-Hill Book Co. Singapore, 1989.
4.	Donald Hearn and M. Pauline Baker, " <i>Computer Graphics</i> ", Prentice Hall, Inc, 1992.
5.	Foley, Wan Dam, Feiner and Hughes, " <i>Computer Graphics Principles and Practice</i> ", Pearson Education, 2003.

Course nature				Theory			
Assessment Method (Weightage 100%)							
In-semester	Assessment tool	Cycle test I	Cycle test II	Cycle Test III	Surprise Test	Quiz	Total
		Weightage	10%	15%	15%	5%	5%
End semester examination Weightage:							50%