Faculty of Engineering & Technology, SRM University, Kattankulathur – 603203
School of Mechanical Engineering

Department of Mechanical Engineering
Course plan

Course code : **ME 0210** Date : 01 July 2013
Course title : Computer Aided Design And Analysis
Semester : 3
Academic year / semester : 2013-'14 / Odd (July – November 2013)

Section details:

Section	Room No.	Details of Faculty member				
		Name	Room No.	Intercom No.	e-mail id	Student contact time
A	H301 B	Mr.M.Balaji	MEB104/G	-	-	1.00-1.30
B	H302F	Mr. S.Balamurugan	MEB404	1806	balamurugan.sr@ktr.srmuniv.ac.in	
C	H302 B	Mr.V.Raghavendra Rao	MED101B	-	raghavendra.v@ktr.srmuniv.ac.in	
D	H303F	Mr.Vamsi Krishna Dommeti	MEH101/C	-	vamsikrishna.d@ ktr.srmuniv.ac.in	
E	H303 B	Mr.P.Susai Manickam	MEH101/C	-	susaimanickam.p@ktr.srmuniv.ac.in	
F	H306	Mr.D.Raja	MEB205	1802	raja.d@ ktr.srmuniv.ac.in	
G	H307	Mr.M.Sermaraj	MEB305	1805	sermaraj.m@ ktr.srmuniv.ac.in	
H	H308	Mr.N.Arun	MEH109	-	arun.n @ ktr.srmuniv.ac.in	
I	H309	Mr.S.Kolli Balasivarama Reddy	MEH109	-	balasivarama.s@ ktr.srmuniv.ac.in	
J	H310	Mr.D.Amrish Raj	MEB104/F	-	amrish.d@ktr.srmuniv.ac.in	

Direct assessment details:

Name of assessment	Marks	Topics	Tentative date	Duration
Cycle test - I	10	Upto - Inverse transformation	29.07.2013	100 minutes
Surprise test	05	Animation	05.08.2013	10 – 15 min
Cycle test - II	10	Hidden line removal to Stiffness matrix	26.08.2013	100 minutes
Model examination	20	Full Syllabus	23.10.2013	3 hours
End semester examination	50	Full Syllabus	11.11.2013	3 hours
Attendance	05	-	-	-

Syllabus of the course:

		L	T	P	C
ME0210	Computer Aided Design And Analysis	3	0	0	3
	Prerequisite				
	Nil				

(Use of approved Steam tables are permitted in the University Examinations)

PURPOSE

To study how computer can be applied in mechanical engineering design.

INSTRUCTIONAL OBJECTIVES

To familiarize with

- Concepts of modeling in 2D and 3D
- Concepts of computer graphics
- CAD Packages and its features
- Theory of analysis and its implementation in CAD

INTRODUCTION 9

Introduction to Design process - CAD. **Geometric Modeling**: Types - Wireframe, surface and solid modeling. **Solid modeling techniques**: CSG and B-rep - Operations: Boolean - Extrude - Sweep - Revolve. Entities - Line - Circle - Ellipse - Parabola - Cubic Spline, Bezier and B-spline (Basic treatment only).

GRAPHICS CONCEPTS (2D and 3D) 9

Coordinate systems - Transformations: translation, scaling, reflection, rotation - Concatenated transformation - Inverse transformation. Hidden line removal - Shading - Colouring - Rendering - Animation (Basic treatment only).

SOFTWARE PACKAGES AND RECENT TECHNOLOGY 6

Commercial solid modeling packages: Salient features - Technical comparison - Modules and tools - Brief outline of data exchange standards. Brief outline of feature technology: Classification of features - Design by features - Applications of features - Advantages and limitations.

FEM FUNDAMENTALS 12

Introduction - Steps involved in FEA: Nodes - Elements and their types, shape function, constraints, forces and nodal displacements - Stiffness matrix - Solution techniques. Analysis of spring element. Simple problems involving stepped bar subject to axial loading and simple structural members with triangular element.

ANALYSIS 9

FEA in CAD Environment: Stages of FEA in CAD environment - Preprocessor - Solver and postprocessor. Demonstration of the above using any one commercial packages. Brief outline of kinematic analysis - Manufacturability analysis and simulation (Basic treatment only).

TOTAL 45

TEXT BOOKS

- Ibrahim Zeid, *CAD / CAM - Theory and Practice*, Tata Mcgraw-Hill, New Delhi, 2001
- Radhakrishnan. P., *CAD / CAM / CIM* - New age international, 2000
- Chairs Mcmahon and Jimmie Browne, *CAD/CAM*, Addision Wesly, New York, 2000

REFERENCE BOOKS

- Chandupatla and Belagundu, *Introduction to Finite Element Methods in Engineering*, Prentice Hall of India Private Limited, New Delhi, 1997
- Newman and Sproull R. F., *Principles of interactive computer graphics*, Tata Mcgraw-Hill, New Delhi, 1997
- Mikell P. Groover, *CAD/CAM*, Prentice Hall of India Private Limited, New Delhi, 1997

		L	T	P	C
ME0210	COMPUTER AIDED DESIGN AND ANALYSIS	3	0	0	3
	Prerequisite				
	Nil				

Student outcomes	Program Educational Objectives			
	1. Apply / improve their knowledge in basic sciences for excelling in various disciplines of Mechanical Engineering with the emphasis on Design, Thermal and Manufacturing.	2. Enhance professional practice to meet the global standards with ethical and social responsibility.	3. Solve industrial, social, and environmental problems with modern engineering tools.	4. Develop skills to work in teams, think intellectually and pursue life-long learning.
(a) an ability to apply knowledge of mathematics, science, and engineering	X			
(b) an ability to design and conduct experiments, as well as to analyze and interpret data		X		
(e) an ability to identify, formulate, and solve engineering problems	X		X	
(j) a knowledge of contemporary issues			X	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.			X	

Course designed by		Department of Mechanical Engineering										
1	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		×	×			×					×	×

2	Category	GENERAL (G)	BASIC SCIENCES (B)	ENGINEERING SCIENCES AND TECHNICAL ART (E)	PROFESSIONAL SUBJECTS (P)
					X
3	Broad area (for professional courses only, i.e 'under P' category)	Manufacturing	Design	Thermal	Genaral
			X		
4	Course Coordinator	S.Balamurugan			

SESSION PLAN

Session No.	TITLE/DETAILS OF CHAPTER	REFERENCES
	INDRODUCTION	
1	Introduction to Design process – CAD definition, design process (Shigley, Pahl and beitz and Oshuga)	R3,T3
2	Wire frame modeling - introduction, advantages, disadvatages, application and wire frame entites (analytic & synthetic)	T1
3	Surface modeling - introduction, advantages, disadvatages, application and surface entites	T1
4	Solid modeling - techniques, CSG and B-REP, solid entities	T1
5	Operation performed: Boolean, Extrude - sweep(linear & non linear) - Revolve	AR1
6	Mathematical representation of lines & circle (Basic treatment only)	T1
7	Mathematical representation of ellipse & parabola (Basic treatment only)	T1
8	Mathematical representation of and cubic spline (Basic treatment only)	T1
9	Mathematical representation of bezier and B-spline (Basic treatment only)	T1
	GRAPHICS CONCEPTS (2D and 3D)	
10	Co-ordinate systems-working,model and screen	T1
11	Basic transformations - traslation, scaling and reflection of points	T1
12	Basic transformations -rotation of points, concatenated transformation and inverse transformation	T1
13	Hidden line removal - visibility Techniques, priority and area oriented Algorithm	T1
14	Z- buffer algorithms	T1
15	Shading - shading models, shading surfaces and shading enhancements	T1
16	Colour - colour model(RGB, CMY, YIQ, HSV and HLS), Rendering	T1
17	Animation - conventional, computer and engineering animation	AR1
18	Animation -types and techniques	AR1
	SOFTWARE PACKAGES AND RECENT TECHNOLOGY	
19	NX & SOLIDWORKS - salient feature, technical comparison, modules and tools available	Lab manual

20	ProE & CATIA - salient feature, technical comparison, modules and tools available	Lab manual
21	Data exchange standards - IGES, STEP, CALS and DXF	T3
22	Features - Definition, classification of features(funtional, design and manufacturing)	T3
23	Design by features - synthesis by features,destructive solid modelling with features	T3
24	Feature - applications, advantages and limitations	T3
	FEM FUNDAMENTALS	
25	Introduction to FEA- basic concept, engineering application and types of boundary value problems	R1
26	Steps involved in FEA, nodes, elements and their types - one , two and three dimensional elements	R1
27	Shape function - 1 D element linear (2 nodes)	R1
28	Shape function - 1 D element quatratic (3 noded)	R1
29	Constraints, forces and nodal displacements	R1
30	Derivation of element stiffness matrics	R1
31	Assembly of element stiffness matrics and load vectors	R1
32	Solution techniques, analysis of springs	R1
33	Tutorial - simple problems in stepped bar subjected to axial loads	R1
34	Tutorial - simple problems in stepped bar subjected to axial loads	R1
35	Two dimenstional analysis - triangular element	R1
36	Problems in simple structural members for triangular element	R1
	ANALYSIS	
37	Stages of FEA in CAD Environment Preprocessor - element types, real constant, material properties and modeling	Lab manual
38	Preprocessor - meshing, Loads	Lab manual
39	Solution - Analysis types	Lab manual
40	Post processor - types of I/O available, interpretation of results	Lab manual
41	Post processor - time history	Lab manual
42	Demonstration of the above using any one popular commercial package - simple cantilever beam problem	Demo using commercial package
43	Other types of analysis - manufacturability analysis (automated & web - based)	AR3, AR4,AR5
44	Kinematic analysis - case study	AR2
45	Simulation - types of simulation	AR3, AR4,AR5

TEXT BOOKS

- Ibrahim Zeid, *CAD / CAM - Theory and Practice*, Tata Mcgraw-Hill, New Delhi, 2001
- Radhakrishnan. P., *CAD / CAM / CIM* - New age international, 2000
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- Mikell P. Groover, *CAD/CAM*, Prentice Hall of India Private Limited, New Delhi, 1997

ADDITIONAL REFERENCE BOOKS

- Ibrahim Zeid, Mastering *CAD / CAM* Tata Mcgraw-Hill, New Delhi
- http://www.scribd.com
- http://www.springerlink.com
- http://www.doc.ic.ac.uk
- http://terpconnect.umd.edu

Name of the Faculty:	Signature:
1. Mr.M.Balaji	
2. Mr. S.Balamurugan	4/7/13.
3. Mr.V.Raghavendra Rao	4/7/13.
4. Mr.Vamsi Krishna Dommeti	
5. Mr.P.Susai Manickam	5/7/13.
6. Mr.D.Raja	5/7/13
7. Mr.M.Sermaraj	
8. Mr.N.Arun	
9. Mr.S.Kolli Balasivarama Reddy	5/7/13
10. Mr.D.Amrish Raj	5/7/13.

05/07/2013

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