MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

COURSE SUMMARY

Department of Mechanical Engineering

Name of the Subject	COMPUTER AIDED DESIGN AND MANUFACTURING	**Name of the handling Faculty**	Ms.Yamini
Subject Code	ME8691	**Year / Sem**	III / VI
Academic Year	2021-2022	**Batch**	2020-2024

Course Objective

O1	To provide an overview of how computers are being used in mechanical component design
O2	To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

Course Outcomes

Upon the completion of this course the students will be able to

CO1	Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics
CO2	Explain the fundamentals of parametric curves, surfaces and Solids
CO3	Summarize the different types of Standard systems used in CAD
CO4	Apply NC & CNC programming concepts to develop part programme for Lathe & Milling Machines
CO5	Summarize the different types of techniques used in Cellular Manufacturing and FMS

Lesson Plan

Sl. No.	Topic(s)	T / R* Book	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Cognitive Levels (L1-L6)	COs	POs
-	Overview of the course details	-	1	Oral Talk	L1	-	-
UNIT I - INTRODUCTION							
1	Product cycle- Design process	T1,T2, R1	1	BB	L2	CO1	PO1, PO2, PO3, PO5
2	Sequential and concurrent engineering	T1,T2, R1	1	BB	L2	CO1	PO1, PO2, PO3, PO5
3	Computer aided design – CAD system architecture	T1,T2, R1	1	BB	L3	CO1	PO1, PO2, PO3, PO5
4	Computer graphics – co-ordinate systems	T1,T2, R1	1	BB	L2	CO1	PO1, PO2, PO3, PO5
5	2D and 3D transformations- homogeneous coordinates	T1,T2, R1	1	BB	L4	CO1	PO1, PO2, PO3, PO5
6	Brief introduction to CAD and CAM	T1,T2, R1	1	BB	L3	CO1	PO1, PO2, PO3, PO5
7	Manufacturing Planning, Manufacturing control	T1,T2, R1	1	BB	L3	CO1	PO1, PO2, PO3, PO5
8	Introduction to CAD/CAM- CAD/CAM concepts	T1,T2, R1	1	BB	L2	CO1	PO1, PO2, PO3, PO5
9	Types of production- Manufacturing models and Metrics	T1,T2, R1	1	BB	L3	CO1	PO1, PO2, PO3, PO5

10	Mathematical models of Production Performance	T1,T2, R1	1	BB	L4	CO1	PO3, PO12
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any- NIL							
Evaluation method : Internal Assessment Test, Multiple Choice Questions (MCQs)							
UNIT II - GEOMETRIC MODELING							
11	Representation of curves	T1,T2, R1	1	BB	L2	CO2	PO1, PO2, PO3, PO5
12	Hermite curve	T1,T2, R1	1	BB	L3	CO2	PO1, PO2, PO3, PO5
13	Bezier curve	T1,T2, R1	1	BB	L3	CO2	PO1, PO2, PO3, PO5
14	B-spline curves-rational curves	T1,T2, R1	1	BB	L3	CO2	PO1, PO2, PO3, PO5
15	Techniques for surface modeling	T1,T2, R1	1	BB	L2	CO2	PO1, PO2, PO3, PO5
16	surface patch	T1,T2, R1	1	BB	L2	CO2	PO1, PO2, PO3, PO5
17	Coons and bicubic patches	T1,T2, R1	1	BB	L3	CO2	PO1, PO2, PO3, PO5
18	Bezier and B-spline surfaces	T1,T2, R1	1	BB	L3	CO2	PO1, PO2, PO3, PO5
19	Solid modeling techniques	T1,T2, R1	1	BB	L2	CO2	PO1, PO2, PO3, PO5
20	CSG and B-rep	T1,T2, R1	1	BB	L4	CO2	PO1, PO2, PO3, PO5
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any- NIL							
Evaluation method : Internal Assessment Test, Multiple Choice Questions (MCQs)							
UNIT III - CAD STANDARDS							
21	Standards for computer graphics	T1,T2, R1	1	BB	L2	CO3	PO1, PO2, PO3, PO5
22	Graphical Kernel System (GKS)	T1,T2, R1	1	BB	L3	CO3	PO1, PO2, PO3, PO5
23	standards for exchange images	T1,T2, R1	1	BB	L2	CO3	PO1, PO2, PO3, PO5
24	Open Graphics Library (OpenGL)	T1,T2, R1	1	BB	L2	CO3	PO1, PO2, PO3, PO5
25	Data exchange standards	T1,T2, R1	1	BB	L2	CO3	PO1, PO2, PO3, PO5
26	IGES, STEP, CALS etc.	T1,T2, R1	1	BB	L2	CO3	PO1, PO2, PO3, PO5
27	communication standards	T1,T2, R1	1	BB	L2	CO3	PO1, PO2, PO3, PO5
28	Case Studies	T1,T2, R1	1	BB	L4	CO3	PO1, PO2, PO3, PO5
29	Appllication Oriented 3D Model using CAD	T1,T2, R1	1	BB	L5	CO3	PO1, PO2, PO3, PO5
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any- NIL							
Evaluation method : Internal Assessment Test, Multiple Choice Questions (MCQs)							
UNIT IV - FUNDAMENTAL OF CNC AND PART PROGRAMING							
30	Introduction to NC systems and CNC	T1,T3, R1	1	BB	L2	CO4	PO1, PO2, PO3, PO5
31	Machine axis and Co-ordinate system	T1,T3, R1	1	BB	L3	CO4	PO1, PO2, PO3, PO5

32	CNC machine tools- Principle of operation CNC	T1,T3, R1	1	BB	L2	CO4	PO1, PO2, PO3, PO5
33	Construction features including structure	T1,T3, R1	1	BB	L3	CO4	PO1, PO2, PO3, PO5
34	Drives and CNC controllers	T1,T3, R1	1	BB	L2	CO4	PO1, PO2, PO3, PO5
35	2D and 3D machining on CNC	T1,T3, R1	1	BB	L3	CO4	PO1, PO2, PO3, PO5
36	Introduction of Part Programming, types	T1,T3, R1	1	BB	L2	CO4	PO1, PO2, PO3, PO5
37	Detailed Manual part programming on Lathe & Milling machines using G	T1,T3, R1	1	BB	L4	CO4	PO1, PO2, PO3, PO5
38	Cutting Cycles, Loops, Sub program and Macros	T1,T3, R1	1	BB	L3	CO4	PO1, PO2, PO3, PO5
39	Introduction of CAM package.	T1,T3, R1	1	BB	L2	CO4	PO1, PO2, PO3, PO5
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any- NIL							
Evaluation method : Internal Assessment Test, Multiple Choice Questions (MCQs)							
UNIT V- CELLULAR MANUFACTURING AND FLEXIBLE MANUFACTURING SYSTEM (FMS)							
40	Group Technology(GT)	T1,T3, R1	1	BB	L2	CO5	PO1, PO2, PO3, PO5
41	Production flow Analysis	T1,T3, R1	1	BB	L3	CO5	PO1, PO2, PO3, PO5
42	Part Families–Parts Classification and coding	T1,T3, R1	1	BB	L3	CO5	PO1, PO2, PO3, PO5
43	Simple Problems in Opitz Part Coding system	T1,T3, R1	1	BB	L3	CO5	PO1, PO2, PO3, PO5
44	Cellular Manufacturing	T1,T3, R1	1	BB	L2	CO5	PO1, PO2, PO3, PO5
45	Composite part concept-Types of Flexibility	T1,T3, R1	1	BB	L2	CO5	PO1, PO2, PO3, PO5
46	FMS – FMS Components	T1,T3, R1	1	BB	L2	CO5	PO1, PO2, PO3, PO5
47	FMS Application & Benefits	T1,T3, R1	1	BB	L3	CO5	PO1, PO2, PO3, PO5
48	FMS Planning and Control	T1,T3, R1	1	BB	L3	CO5	PO1, PO2, PO3, PO5
49	Quantitative analysis in FMS	T1,T3, R1	1	BB	L3	CO5	PO1, PO2, PO3, PO5
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any- NIL							
Evaluation method : Internal Assessment Test, Multiple Choice Questions (MCQs)							
Content Beyond the Syllabus Planned							
B1	Computer Aided Manufacturing and welding Process						
B2	Additive Manufacturing and Prototyping						
Text Books							
T1	Ibrahim Zeid “Mastering CAD CAM” Tata McGraw-Hill PublishingCo.2007						
T2	Mikell.P.Groover “Automation, Production Systems and Computer Integrated Manufacturing”, Prentice Hall of India, 2008.						
T3	Radhakrishnan P, SubramanyanS.andRaju V., “CAD/CAM/CIM”, 2nd Edition, New Age International (P) Ltd, New Delhi, 2000.						
Reference Books							
R1	Chris McMahon and Jimmie Browne “CAD/CAM Principles", "Practice and Manufacturing management “ Second Edition, Pears						
R2	Donald Hearn and M. Pauline Baker “Computer Graphics”’. Prentice Hall, Inc,1992.						

R3	Foley, Wan Dam, Feiner and Hughes - "Computer graphics principles & practice" Pearson Education -2003
R4	William M Neumann and Robert F.Sproul "Principles of Computer Graphics", McGraw Hill Book Co. Singapore, 1989.
Website / URL References	
U1	https://nptel.ac.in/courses/112/102/112102101/
U2	https://onlinecourses.swayam2.ac.in/nou20_cs15/preview
U3	https://youtu.be/5HqIMUzewGo

Cognitive Levels

Level 1 (L1) : Remembering	Lower Order Thinking	Fixed Hour Exams	**Level 4 (L4) : Analysing**		Higher Order Thinking	Projects / Mini Projects
Level 2 (L2) : Understanding			**Level 5 (L5) : Evaluating**			
Level 3 (L3) : Applying			**Level 6 (L6) : Creating**			

Mapping syllabus with Bloom's Taxonomy LOT and HOT

Unit No	Unit Name	L1	L2	L3	L4	L5	L6	LOT	HOT	Total
Unit I	Metal Casting Processes	0	4	4	2	0	0	8	2	10
Unit II	Joining Processes	0	4	5	1	0	0	9	1	10
Unit III	Metal Forming Processes	0	6	1	1	1	0	7	2	9
Unit IV	Sheet Metal Processes	0	5	4	0	1	0	9	1	10
Unit V	Manufacture of Plastic Components	0	4	6	0	0	0	10	0	10
Total		0	23	20	4	2	0	43	6	49
Total Percentage		**0**	**46.94**	**40.816327**	**8.1632653**	**4.0816327**	**0**	**87.76**	**12.245**	**100**

COs Mapping with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1		2								1	
CO2	2	1	2		2								2	
CO3	2	0	2		1								2	
CO4	2	2	3		3								2	1
CO5	1	2	3		3								3	2
Avg	**2**	**1**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**

Justification for CO-PO mapping

CO1	**PO1 (3) -** Graduate attains highly ***basic knowledge*** about CAD/CAM and its applications, **PO2 (2) -** Graduate will be ***analyze the problem*** concepts in CAD/CAM for manufacturing, **PO5 (2) -** Graduate will be upgrade the knowledge for CAM using ***Modern Tool Usage,*** **PSO1 (1) -** Graduate will be learn the basic concept of manufacturing using Modern Tool Usage
CO2	**PO1 (2) -** Graduate will be understand ***basic knowledge*** about create and develop the geometric modelling**, PO2 (1) -** Graduate will be ***analyze the problem*** in geometrical modelling and structure, **PO5 (2) -** Graduate will be upgrade the knowledge for modelling and analysis using ***Modern Tool Usage*** **, PSO1 (2) -** Graduate will be learn the concept of modelling using Modern Tool Usage
CO3	**PO1 (2) -** Graduatewill be understand ***basic knowledge*** about Engineering standards for CAD**, PO5 (1) -** Graduate will be convert the model of file exchange in ***Modern Tool*** using CAD Softwares, **PSO1 (2) -** Graduate will be learn file standards and exchange using Modern Tool Usage

CO4	**PO1 (2) -** Graduate will be understand the ***basic knowledge*** of CNC and Part Programming, **PO2 (2) -** Graduate will be ***problem analyze*** in Part Programming for manufacturing**, PO5 (2) -** Graduate will be develop the programme for CNC using ***Modern Tool Usage*** , **PSO1 (1) -** Graduate will be learn to develop the Part Programme using Modern Tool Usage
CO5	**PO1 (2) -** Graduate attains highly ***basic knowledge*** about Cellular Manufacturing and its applications, **PO2 (1) -** Graduate will be ***analyze the problem*** concepts in Cellular Manufacturing and FMS, **PO5 (2) -** Graduate will be upgrade the knowledge for FMS using ***Modern Tool Usage*** **, PSO1 (1) -** Graduate will be learn the basic concept of manufacturing using Modern Tool Usage

3	**High level**	**2**	**Moderate level**	**1**	Low level

Name & Sign of Faculty Incharge : Ms.S.Yamini,

Name & Sign of Subject Expert : Mr.K.K.Vinothkumar,

Head of the Department : Dr.S.Prasath

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