Lesson Plan- 8th, ME, Computer Aided Design and Manufacturing (Theory)

Course In charge: Dr.Vikas Gupta, Assistant Professor

Course Name & Code: Computer Aided Design and Manufacturing (Theory), PEC-ME403-T

Course Category: Professional Core Course **Semester:** 8th, ME

Course Credits: 3.0 **Contact Hours:** 3 hours/week (L: 3; T: 0)

Mode: Lectures **Examination Duration:** 3 hours

Course Assessment Methods (internal: 30; external: 70): Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks.

Course Objectives: Student will be able to define the scope and applications of CAD/CAM, geometric modelling, geometric transformations, curves, surfaces, solids and will use computer assisted part programming for CNC machines.

Sr. No.	Topic	No. of days	Book
1.	CNC Technology: Introduction,	1	T2
2.	Types or NC systems, NC machine tools,	1	T2
3.	Principle of operation of CNC,	1	T2
4.	Advantages and limitations of CNC systems,	1	T2
5.	Direct numerical control (DNC) and its application, MCU and other components.	1	T2
6.	Part Programming: Integrating CAD, NC and CAM	1	T2
7.	Preparing CAD data for NC system, NC part programming, coordinate systems	1	T2
8.	NC programming languages, G & M codes, Part program for simple parts	4	T2
9.	Complex CNC part programming, axes of CNC machines	4	T2
10.	Computer aided part programming using APT, Automatic NC program generation from CAD models.	3	T2
11.	Introduction to CAD/CAM: Historical developments, product life cycle	1	T2
12.	CAD/CAM systems, scope of CAD/CAM, .CAD CAM applications, 3D modeling approaches,	1	T2
13.	Types of geometric modeling, coordinate systems,	1	T2
14.	Sketching and sketch planes, basic features of a CAD/CAM system (extrusion, revolution, hole, cut, sweep, loft, fillet, chamfer, rib, shell, draft. Patterns spiral & helix)	2	T2
15.	Feature based modeling, parametric modeling, datum features, geometric constraints, modeling operations	2	T2
16.	Heterogeneous modeling, strategies, master model, system modes, model viewing	2	T2
17.	Transformations: Introduction, transformation of points and line,	2	T3
18.	2-D translation, rotation, reflection, scaling,	2	T3
19.	Homogeneous representation, concatenated transformation	2	T3
20.	Mapping of geometric models, 3-D scaling, shearing, rotation, reflection and translation, combined transformations	2	T3
21.	Orthographic, Isometric and perspective projections.	2	T3
22.	Curves: Algebraic and geometric forms	1	T1
23.	Tangents and normal, blending functions re-parameterization, straight lines,	2	T1
24.	Conics	2	T1
25.	Cubic Splines	2	T1
26.	Bezier curves	2	T1
27.	B-Spline curves.	2	T1
28.	Surfaces: Algebraic and geometric forms,	1	T1
29.	Tangents and normal, blending functions	1	T1
30.	Re-parameterization, sixteen point form	2	T1
31.	Four curve form, plane surface,	2	T1
32.	Ruled surface, surface of revolution, tabulated cylinder,	2	T1
33.	Bi-cubic surface	2	T1
34.	Bezier surface	2	T1
35.	B-Spline surface	2	T1
36.	Surface manipulations.	1	T1
37.	Solids: Geometry and topology,	1	T1
38.	Solid models and representation schemes,	1	T1
39.	Constructive solid geometry,	1	T1
40.	Boundary representation,	1	T1
41.	Sweep representation,	1	T1
42.	Cell decomposition	1	T1
43.	Spatial occupancy enumeration, solid manipulators.	1	T1

Text Books (T) & Reference Books (R)

T1: Zeid, I., "CAD/CAM", McGraw Hill, 2008.

T2: Groover and Zimmer, "CAD/ CAM", Prantice I Jail,

T3: Rogers, D. F. and Adams, J. A., "Mathematical Elements for Computer Graphics", McGraw Hill.