FR. Conceicao Rodrigues College Of Engineering
Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50
Department of Production Engineering

T.E. (Production) (semester V) (2019-2020)

Lecture Plan for CAM/CIM (Cad by Prof. Sudhakar)

Subject: CAD/CAM/CIM (PEC504) **Credits-04**

Syllabus.

Objectives:

1. To familiarize the concepts of computer aided engineering for design & manufacturing.
2. To impart the knowledge on computer graphics used in engineering.
3. To familiarize the students with the concepts of computer aided manufacturing and its significance.
4. To familiarize the students with interfacing of drive systems with the machines.

Outcomes: Learner will be able to...

1. Use computer graphics in design.
2. Identify proper modeling techniques for geometric modeling.
3. Develop expertise in computer-aided manufacturing.
4. Illustrate basic concepts of control systems.
5. Write the appropriate code for performing particular tasks in a CNC.
6. Solve real life engineering problems using FEA.

Module	Contents	Hrs.
01	**Computer Aided Design:** 1.1 I**ntroduction** : Need and Utility of CAD systems in industry, Product Cycle, Definition of CAD tools based on their Constituents and Implementation in a design environment. 1.2 **CAD Hardware *:*** Types of systems, system considerations, I/O devices, Hardware Integration & Networking.	**04**
02	**Computer Graphics** : Pixel plotting, Scan conversions of lines & circuits, 2D & 3D transformation, 2D Viewing and clipping. Parallel Projection. Elementary treatment of Hidden lines and surfaces. Cubic spines Bezier curves & B- spines, Animation and Color models.	**10**
03	**Solid Modeling :** Types of representation of solid models, interactive tools available with solid modeling software's. Introduction to surface modeling. **CAD DATA Exchange** : File Structure and format of IGES,STEP and DXF	**05**
04	**Introduction :** Elements of CAM system, Computer Numerical control of Machine Tools, Fundamental elements of CNC, Benefits of CNC, Computer control concepts, Data processing units & Binary calculation. **Basics of control systems:** Motion controller, Interpolation-Linear & Circular, Positioning & contouring control loops, Incremental & Absolute system, DNC & CNC systems and Adaptive control system. **CNC Hardware Basics:** CNC drives, Spindle design, Actuation and Feedback devices	**10**

05	**CNC Programming :** Introduction to CNC Lathe & Milling, Touch probe system, Tool length, nose radius & Diameter compensation, Turning & Machining centre programming, CNC part programming using ISO controllers, Canned cycles, Looping Jumping Subroutines Macros, Parametric programming, Computer aided part programming using APT and Post processing.	**11**
06	**CIM :** Computer applications in manufacturing, Automation and Integrated Production management systems. Automated Material handling systems, Conveyors, AVG, AS/RS, GT, FMS, Automated inspection procedure, Distributed Numerical control & Benefits of CIM and implementation & computer aided shop floor control system. Concept of "Ghost" factory. **FEA:** Introduction, Stress and Equilibrium, Boundary Condition, Strain – Displacement Relations, Stress Strain Relation, Potential Energy. One Dimensional Problem: Finite Element Modelling, Coordinate Potential Energy Approach, Galerkin Approach, Assembly of Global Stiffness Matrix, Properties of Stiffness Matrix, Finite Element Equations. Trusses: Introduction, 2D Trusses, Assembly of Global Stiffness Matrix.	**10**

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions**, **each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only **Four questions need to be solved**

Reference Books:

1. *CAD/CAM* by Groover and Zimmers
2. *CAD Principles and Applications* by Barr, Krimger and Lazaer
3. William M Neumann and Robert F.Sproul "*Principles of Computer Graphics*", Mc Graw Hill Book Co. Singapore, 1989.
4. Donald Hearn and M. Pauline Baker "*Computer Graphics*", Prentice Hall, Inc., 1992.
5. Foley, Wan Dam, Feiner and Hughes – *Computer graphics principles & practices, Pearson Education – 2003.*
6. Reddy, J.N, "*An Introduction to the Finite element Method*", McGraw – Hill, 1985.
7. Rao, "*Finite Element Method in Engineering*", Pergammon Press, 1989.
8. CAD / CAM by P.N. Rao (Tata-Mcgraw- Hill) 2

9. *Mathematical and Procedural Elements for computer graphics* by Roger and Adams
10. *Computer Graphics* by Hearn and Baker (PHI)
11. *A first course in FEM* by daryl L.Logon(Cengage) 3
12. *Concepts and applications of FEA* by Cook, Malkus (Jhon-wiley)
13. *Mastering CAD – CAM* by Ibarahim Zeid (Tata-Mcgraw-Hill) 4

1. CO Statements.

PEC504.1: Student will develop expertise in computer aided manufacturing.

PEC504.2: Student can demonstrate basic concepts of control system.

PEC504.3: Student can formulate code for performing particular task in CNC.

2. CO-PO-PSO Mapping.

CO# / PO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC504.1	2	0	0	-	-	-	-	-	-	-	-	0
PEC504.2	2	0	0	-	-	-	-	-	-	-	-	0
PEC504.3	2	2	2	-	3	-	-	-	-	-	-	2

CO# / PSO#	PSO1	PSO2
PEC504.1	2	-
PEC504.2	2	-
PEC504.3	2	-

3. Curriculum Gap/Content beyond syllabus (if any).

4. CO Assessment tools.

FINAL CO	**=**	**(0.8* Direct) + (0.2* Indirect)**

Direct	**CO1**	(0.6*UTest) +(0.4*Univ Exam)
	CO2	(0.6*UTest) +(0.4*Univ Exam)
	CO3	(0.6*UTest) +(0.4*Univ Exam)

Indirect	**CO1**	(1*Exit Survey)
	CO2	(1*Exit Survey)
	CO3	(1*Exit Survey)

LECTURE PLAN

Week No.	Topics	Module	Hours
Week 1 (01/7/18 – 07/07/18)	Course objectives, Course outcomes, Study material, Scheme etc. Elements of CAM system, Computer Numerical control of Machine Tools.	**1**	**2**
Week 2 (08/7/18 – 14/07/18)	Fundamental elements of CNC, Benefits of CNC, Computer control concepts, Data processing units & Binary calculation.	**4**	**2**
Week 3 (15/7/18 – 21/07/18)	Motion controller, Interpolation-Linear & Circular, Positioning & Contouring control loops,	**4**	**2**
Week 4 (22/7/18 – 28/07/18)	Incremental & Absolute system, DNC & CNC systems and Adaptive control system.	**4**	**2**
Week 5 (29/7/18 – 04/08/18)	CNC drives, Spindle design, Actuation and Feedback devices.	**4**	**2**
Week 6 (05/08/18 – 11/08/18)	Introduction to CNC Lathe & Milling, Touch probe system.	**5**	**2**
Week 7 (12/8/18 – 18/08/18)	**Unit Test 1 (Aug 13,14,16)**		
Week 8 (19/08/19 – 25/08/19)	Tool length nose radius & Diameter compensation, Turning & Machining centre programming,	**5**	**2**
Week 9 (26/8/19 – 01/09/19)	CNC part programming using ISO controllers, Canned cycles, Looping Jumping Subroutines Macros,	**5**	**2**
Week 10 (2/09/19 – 08/09/19)	Mid term break		
Week 11 (09/09/19 – 15/09/19)	CNC part programming using ISO controllers, Canned cycles, Looping Jumping Subroutines Macros,	**5**	**2**
Week 12 (16/9/19 – 22/09/19)	CNC part programming using ISO controllers, Canned cycles, Looping Jumping Subroutines Macros,	**5**	**2**

Week 13 (23/09/19 – 29/09/19)	Computer aided part programming using APT and Post processing. Computer applications in manufacturing.	**5**	**2**
Week 14 (30/09/19 – 06/10/19)	Computer applications in manufacturing, Automation and Integrated Production management systems. Automated Material handling systems,	**5**	**2**
Week 15 (07/10/19 – 13/10/19)	Conveyors, AVG, AS/RS, GT, FMS, Automated inspection procedure, Distributed numerical control & benefits of CIM and implementation & computer aided shop floor system.	**5**	**2**
Week 16 (14/10/19 – 20/10/19)	**Unit Test 1 (Oct 14,15,16) Term ends on 18 Oct.**		**2**