SEMESTER: S7

COMPUTER AIDED DESIGN & MANUFACTURE

Course Code	PEPOT 742	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3-0-0-0	ESE Marks	60
Credits	3	Exam Hours	2Hrs. 30 Min.
Prerequisites (if any)	Nil	Course Type	Theory

Course Objectives:

1. Understand the Foundations of CAD Systems.
2. Develop Skills in Geometric Modeling and Transformations.
3. Master Computerized Manufacturing and CNC Programming.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	**Introduction to CAD (Computer aided design):** CAD system architecture- Packages for CAD/CAM/CAE/CAPP. Hardware in CAD components, user interaction devices, design database, graphic Standards, data Exchange Formats **Geometric transformations**: Transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling. Shearing, rotation, reflection and translation, combined transformations. Algebraic and geometric forms, tangents and normal, blending functions, re-parametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves.	9
2	**Geometric Modeling**: Plane surface, ruled surface, surface of revolution, tabulated cylinder, bi cubic surface, Bezier surface, B-spline surfaces and their modelling techniques.	9

	Solid models and representation scheme, boundary representation, constructive solid geometry. Sweep representation, cell decomposition, spatial occupancy enumeration, coordinate systems for solid modelling.	
3	**Computerized Manufacture Planning and Control System**: Computer Aided Process Planning, benefits of CAPP, Production Planning and Control Systems, typical activities of PPC System, computer integrated production management system, Material Requirement Planning, inputs to MRP system, working of MRP, outputs and benefits. **Flexible Manufacturing Systems**: Fundamentals of Group Technology and Flexible Manufacturing Systems, types of FMS, FMS components, Material handling and storage system, applications, benefits, computer control systems, Automated Storage and Retrieval Systems, AS/RS and Automatic parts identification systems and data capture.	**9**
4	**Computer Numerical Control:** Introduction, components of CNC, CNC programming, manual part programming, G Codes, M Codes, programming of simple components in turning, drilling and milling systems, programming with canned cycles. Cutter radius compensations. **Robot Technology**: Robot anatomy, joints and links, common robot configurations, robot control systems, accuracy and repeatability, end effectors, sensors in robotics. Robot programming methods: on-line and offline methods. Robot industrial applications: material handling, processing and assembly and inspection.	**9**

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Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

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Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the Architecture and Components of CAD Systems	**K2**
CO2	Apply Geometric Transformations in 2D and 3D Modeling	**K3**
CO3	Create Complex Geometric Models Using Advanced Modeling Techniques	**K6**
CO4	Analyze and Develop Computerized Manufacturing Plans	**K4**
CO5	Program and Operate CNC Machines and Robots for Manufacturing Tasks	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

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CO-PO Mapping Table:

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	CAD/CAM: Computer-Aided Design and Manufacturing	Mikell P. Groover and Emory W. Zimmers Jr.	Prentice Hall	1st Edition, 1983
2	Principles of Computer-Aided Design and Manufacturing	Farid Amirouche	Prentice Hall	1st Edition, 2004
3	Automation, Production Systems, and Computer-Integrated Manufacturing	Mikell P. Groover	Prentice Hall	4th Edition, 2014
4	Computer Graphics and Geometric Modeling for Engineers	Vera B. Anand	John Wiley & Sons	1st Edition, 1993

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Introduction to CAD/CAM	Ibrahim Zeid and R. Siva subramanian	McGraw-Hill	1st Edition, 1995
2	Computer-Aided Manufacturing	Tien-Chien Chang, Richard A. Wysk, and Hsu-Pin Wang	Pearson	3rd Edition, 2005
3	Computer-Aided Engineering Design	Anupam Saxena and Birendra Sahay	Springer	1st Edition, 2005
4	Numerical Control and Computer-Aided Manufacturing	T. Kundra, P. N. Rao, and N. K. Tewari	McGraw-Hill	1st Edition, 1993

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	Title: Introduction to CAD Professor: Dr. Praveen Kumar Institute: Indian Institute of Technology (IIT) Madras Link: https://nptel.ac.in/courses/112/106/112106256/ Title: Geometric Transformations Professor: Dr. Praveen Kumar Institute: Indian Institute of Technology (IIT) Madras Link: https://nptel.ac.in/courses/112/107/112107105/
2	Title: Computer Graphics and Geometric Modeling Professor: Dr. S. S. Murthy Institute: Indian Institute of Technology (IIT) Kharagpur Link: https://nptel.ac.in/courses/106/106/106106092/
3	Title: Introduction to Computer Integrated Manufacturing Professor: Dr. P. V. Rao Institute: Indian Institute of Technology (IIT) Kharagpur Link: https://nptel.ac.in/courses/112/106/112106060/
4	Title: CNC Machines and Programming Professor: Dr. M. P. Rao Institute: Indian Institute of Technology (IIT) Hyderabad Link: https://nptel.ac.in/courses/112/106/112106097/ Title: Robotics and Automation Professor: Dr. V. K. Jain Institute: Indian Institute of Technology (IIT) Delhi Link: https://nptel.ac.in/courses/112/105/112105292/

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