MME 305: CAD/CAM

Programme: B.Tech. (ME) Year: 3rd Semester: Odd
Course : Core Credits :3 Hours :40

Course Context and Overview (100 words):

This is a compulsory course offered to the third year students of MME department. The objective of the course is to provide the students with basic knowledge of the CAD/CAM systems such as computer graphics, NC/CNC machines and rapid prototyping etc. Basic principles, operation features and characteristics of various CAD/CAM systems are covered.

Prerequisites Courses:

(Course name and course code) NIL

Course outcomes (COs):

On completion of this course, the students will have the ability to:	
CO1: Demonstrate the applications and benefits of computer aided design.	Unit 1
C02: Demonstrate various concepts of geometric modeling.	Unit 2
C03: Demonstrate the knowledge of computer aided manufacturing.	Unit 3
C04: The student would have gained basic knowledge in CIM and rapid prototyping.	Unit 4

Course Topics:

Topics	**Lecture Hours**		**Student development**
UNIT - I **1. Topic: Introduction to CAD/CAM**		11	Employability and Skill Development
1.1 Introduction to CAD/CAM, Historical Developments and Future trends, Necessity of CAD, Product life cycle.	1		
1.2 CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, storage devices.	1		
1.3 Introduction to Graphic standards, Output primitives- Line drawing algorithm and Circle generating algorithm,	1		
1.4 World/device Coordinate Representation, Windowing and clipping.	2		

1.5 Geometric Transformations: 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation,	1		
1.6 Composite transformation, 3 D transformations, multiple transformation.	3		
1.7 Introduction to Engineering drawings of mechanical components such as threaded fasteners, keys, cotters, shaft couplings etc.	2		
UNIT - II **2. Topic: Geometric modeling**		8	Employability and Skill Development
2.1 Curves representation, Interpolation vs approximation, parametric representation of analytic curves such as Spline curve, Bezier curve, Continuity conditions.	2		
2.2 Polygon surfaces, Quadric and Super quadric surfaces, blobby objects and Fractals	2		
2.3 Fundamentals of Solid modeling-Set theory, Boundary representation, Constructive solid geometry, Sweep representation, Color models, Application commands for AutoCAD & Solid works software.	3		
2.4 Introduction to finite element method	1		
UNIT - III **3. Topic: Introduction to CAM**		13	Employability and Skill Development
3.1 Automated Manufacturing systems, Need of automation, Basic elements of automation, Levels of automation, Automation Strategies	1		
3.2 Historical development and future trends. Fundamental of Numerical Control, elements of NC machine tools,	2		
3.3 Classification of NC machine tools, Advantages, suitability and limitations of NC machine tools,	1		
3.4 DNC, CNC, Robots, Adaptive control.	2		
3.5 CNC machines and tooling: Vertical machining center, horizontal machining center, universal machining center, Controls and interpolators, Sensors.	1		
3.6 CNC Part Programming: Manual part programming (in word address format) with examples of Drilling, Turning and Milling,	3		
3.7 Computer aided part programming using APT language, Geometry, Motion and Additional statements.	3		
UNIT - IV **4. Computer integrated manufacturing systems**		8	Employability
4.1 Computer aided process planning, Group Technology	2		

4.2 Cellular manufacturing, Flexible Manufacturing System, CIM,	2		
4.3 Computer aided Inspection, Material handling and storage system, transfer lines	2		
4.4 Rapid prototyping.	2		

Textbook references (IEEE format):

1. Hearn & Baker, *Computer Graphics*, Prentice Hall of India, 2009.
2. MP Groover & EW Zimmers, Jr. *CAD/CAM*, Prentice Hall India Ltd, 1984.
3. MP Groover, *Automation, production systems and computer-integrated manufacturing,* Prentice Hall India Ltd, 1998.
4. Tirupathi R. Chandrupatla, *Introduction to finite elements in engineering*, Prentice Hall, 2015
5. Yoram Koren , *Computer control of manufacturing systems*, Tata McGraw-Hill, 2009.

Reference books

1. DF Rogers & JA Adams, *Mathematical Elements for Computer Graphics*, Tata McGraw-Hill, 1999
2. Ibrahim Zeid & R Sivasubramaniam, *CAD/CAM Theory and Practice*, McGraw Hill, 2013.
3. J.N. Reddy, *An Introduction to finite element method*, McGraw Hill, 2001.
4. Farid Amirouche, *Principles of Computer Aided Design and Manufacturing*, Pearson Education, 1996
5. J Srinivas, *CAD/CAM: Principles and Applications*, Oxford University Press, 2017

Evaluation Methods:

Item	Weightage
Midterm exam	30
Teacher's assessment (Assignment, Presentation, Project, Quiz, Attendance etc)	20
End term	50

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