

16ME301 CAD / CAM



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	30	40	10	20	5	5

Course Description and Objective:

This course deals with applications of computers in various aspects of manufacturing such as design and drafting, process planning, scheduling, manufacturing, etc. The objective of this course is to provide knowledge on concepts of computer compatible mathematical representation of geometry, part programming, group technology and flexible manufacturing systems.

Course Outcomes:

The student will be able to:

- differentiate between product life cycle in conventional and computer based manufacturing systems
- analyze different modeling techniques of geometrical transformations during CAD geometry generation and display.
- develop various methodologies used for geometric construction.
- explore various modes of numerically controlled operations
- appreciate different preparatory and miscellaneous functions in CNC part programming.
- learn part coding and classification methods in manufacturing

SKILLS:

- ✓ Identify various facets of CAD / CAM.
- ✓ Acquire basic idea of structure of computing system hardware.
- ✓ Convert vector straight lines to raster images utilizing the pixel information.
- ✓ Develop various mathematical representations of the curves and surfaces used in geometric construction.
- ✓ Generate automated part programming for CNC systems.
- ✓ Perform production flow analysis used in group technology for various manufacturing applications.

ACTIVITIES:

- Fabrication of two cavity mould for injection moulding
- Measure and compare Metal Removal Rate (MRR), Surface Roughness (SR) and Tool Wear Rate (TWR) for different machining parameters
- CNC programming for different types of contour shapes.
- Create solid models using various modeling softwares.

UNIT - 1**L-9**

INTRODUCTION TO CAD/CAM: Definitions; Applications; product life cycle; Automation, Types of automation; Advantages of CAD/CAM; Basic structure; Input and output devices; CAD procedure; DDA algorithm.

UNIT - 2**L-9**

TRANSFORMATION OF GEOMETRY-2-D and 3-D transformation; Translation, Scaling, Reflection and Rotation and Homogenous Coordinate systems.

GEOMETRIC MODELING: Curve representation; Synthetic Curves: Cubic Splines, B-splines, Bezier-Curves; Wireframe model: Surface model and Solid model: Requirements, Primitives and Boolean operators, Boundary Representation (B-Rep), Constructive Solid geometry (CSG).

UNIT - 3**L-9**

NC/CNCMACHINES: Introduction to NC; NC components; NC procedure; NC coordinates systems and NC motion control Systems; Applications of NC; Computer controls in NC-Introduction to CNC; DNC

UNIT - 4**L-9**

NC PART PROGRAMMING: Part programming fundamentals; Manual part programming - Programming formats; Computer Assisted part programming-APT language, CNC programming (G-codes and M-codes);

COMPUTER AIDED PROCESS PLANNING: Retrieval type system and Generative type system.

UNIT - 5**L-9**

GROUP TECHNOLOGY AND FLEXIBLE MANUFACTURING SYSTEM: Introduction to GT; part families; parts classifications and Coding systems; design and manufacturing attributes; Production Flow Analysis (Rank order clustering technique); Benefits of GT; Basics of FMS.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours: 30

1. 2D drawings using creo sketcher
2. 3D solid models using creo modeling package
3. Assembly models:
 - Cotter joint
 - Knuckle Joint
 - Bush-pin coupling
 - Screw jack
 - Journal bearing
4. Manual part programming of:
 - Step turning
 - Drilling
 - Profile milling

TEXT BOOKS:

1. Ibrahim Zeid, "CAD/CAM Theory and Practice", 2nd edition, Tata McGraw Hill, 2009.
2. M.P Groover, "Automation, Production Systems and Computer Integrated Manufacturing", 3rd edition, Published by Pearson, Education, Inc, 2008.

REFERENCE BOOKS:

1. P.N.Rao, "CAD/CAM Principles and Applications" 3rd edition, Tata McGraw Hill, 2010.
2. David F.Rogers and J.Alan Adams, "Computer Graphics", 2nd edition, Tata McGraw Hill, 2002.
3. Kundra T.K, Rao P.N. and Tewari N.K, "Numerical Control and Computer Aided Manufacturing", 1st edition, Tata McGraw Hill, 2004.
4. Koren, "Computer Control of Manufacturing Systems", 1st edition, Tata McGraw Hill, 2005.

WEB LINK:

1. http://www.nptel.ac.in/courses/Webcourse-contents/IIT_Delhi/Computer%20Aided%20Design%20and%20ManufacturingI/index.htm