# CAD/CAM

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| **Course code** | 23ME3701 | **Year** | IV | **Semester** | I |
| **Course category** | Professional Core | **Branch** | ME | **Course Type** | Theory |
| **Credits** | 3 | **L-T-P** | 3-0-0 | **Prerequisites** | Manufacturing Processes, Machine tools |
| **Continuous Internal Evaluation:** | 30 | **SemesterEnd Evaluation:** | 70 | **Total Marks:** | 100 |

**Course Outcomes:** At the end of the course students will be able to

| CO's | Statement | Blooms Level |
|---|---|---|
| **CO1** | Explain the fundamentals of CAD, CAM, automation, product design process, and the role of computers in design and product development. | **L2** |
| **CO2** | Illustrate computer graphics concepts, geometric transformations, projections, and different modeling techniques such as wireframe, surface, and solid modeling. | **L3** |
| **CO3** | Apply curve representation methods and data exchange formats used in CAD systems for geometric modeling and product representation. | **L3** |
| **CO4** | Develop and interpret CNC part programs using manual part programming and APT language, and explain CNC machine tools, DNC, and adaptive control concepts. | **L3** |
| **CO5** | Analyze group technology and flexible manufacturing systems, including part classification, production flow analysis, FMS layout, equipment, tool management, and control systems. | **L3** |

**Contribution of Course outcomes towards the achievement of program outcomes & Strength of correlations (High :3, Medium:2, Low:1)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | - | 2 | - | - | - | - | - | 1 | 2 | 1 |
| **CO2** | 3 | 2 | 2 | 1 | 3 | - | - | - | - | - | 1 | 3 | 1 |
| **CO3** | 3 | 2 | 2 | 1 | 3 | - | - | - | - | - | 1 | 2 | 1 |
| **CO4** | 3 | 2 | 3 | 1 | 3 | - | - | - | 1 | 1 | 1 | 3 | 2 |
| **CO5** | 2 | 2 | 2 | 1 | 2 | 1 | - | 1 | 1 | 2 | 1 | 2 | 3 |

| Unit | Contents | CO |
|---|---|---|
| **I** | **INTRODUCTION:** Fundamentals of CAD, CAM, Automation, design process, Application of computers for design, Benefits of CAD, Product Design and CAD-Comparison, benefits of using CAD in product design and product development cycle. **COMPUTER GRAPHICS:** Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections. | **CO1** |
| **II** | **WIRE FRAME MODELING:** Definition, advantages, dis-advantages, wire frame entities- analytic entities and synthetic entities. **SURFACE MODELING:** Definition, advantages, disadvantages, surface entities-analytic entities and synthetic entities. **SOLID MODELING:** Definition, constructive solid geometry, advantages, | **CO2** |

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|---|---|---|
| | modelling entities. Curve representation: Implicit and explicit forms of straight line, circle, ellipse, cubic spline and Bezier curve, differences between Bezier curve and, cubic spline curve and Introduction to Data exchange formats. formats. | |
| **III** | **PART PROGRAMMING:** NC, NC modes, NC elements, CNC machine tools and their applications, Parts and power transmission in CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming- APT language, simple problems in manual part programming and Computer Aided Part Programming. Direct Numerical Control, Adaptive Control. | **CO3** |
| **IV** | **GROUP TECHNOLOGY:** Part family, coding and classification, Optiz and MICLASS classification system, benefits of group technology - production flow analysis, types and advantages.<br>FMS: Introduction, types of FMS, Equipment, Tool management systems, Layouts, FMS Control. | **CO4** |
| **V** | COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of manufacturing systems, machine tools and related equipment, material handling systems, material requirement planning, MRP, Enterprise resource planning, computer control systems, human labor in manufacturing systems, CIMS benefits, computer aided quality control, Computer aided processes planning – variant process planning and generative process planning-Implementation considerations. | **CO5** |

| **Learning Resource** |
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| **Text books**: |
| **TEXT BOOKS:**<br>1. Automation, Production systems & Computer integrated Manufacturing/ M.P. Groover/Pearson Education<br>2. Mastering CAD / CAM / Ibrahim Zeid / McGraw-Hill |
| **Reference books** |
| 1. CAD / CAM Principles and Applications/PN Rao / McGraw-Hill<br>2. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson<br>3. Computer Numerical Control Concepts and programming / Warren S Seames /<br>Thomson learning, Inc<br>4. Product manufacturing and cost estimation using CAD/CAE/ Kuang Hua<br>Chang/Elsevier Publishers |

| **E-Resources & other digital Material:** |
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| https://ocw.mit.edu/courses/16-810-engineering-design-and-rapid-prototyping-january-iap-2005/bc0d838ef78b9804aed4ae00bd58e4a2_l4.pdf?utm<br>https://nptel.ac.in/courses/110105155?utm |