GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering
Level : Diploma
Branch: Automation and Robotics
Subject Code : DI04041081
Subject Name : CAD - CAM

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	Professional Elective - II

Prerequisite:	Basic knowledge of engineering graphics and orthographic projections, including interpretation of 2D and 3D drawings. Familiarity with manufacturing processes and material behaviour from subjects like Manufacturing Engineering-I and II. Fundamental understanding of computer operations and usage of graphical software environments. Exposure to basic mechanical design concepts and machine elements.
Rationale:	In the modern engineering and manufacturing environment, the use of computers for design and production has become essential. This subject introduces students to the integration of Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) technologies, enabling them to conceptualize, model, simulate, and manufacture components with precision and efficiency. Students will learn to create 3D models, generate assembly drawings, and prepare CNC part programs using modern CAD software. The course also provides hands-on experience with CNC machines, part programming, and simulation, bridging the gap between design and manufacturing. Emphasis is placed on feature-based modeling, tool selection, machine operation, and automation in CNC environments. This course equips diploma engineering students with practical skills and industry-relevant knowledge, preparing them for careers in design, production, and automation domains. It supports the national initiative of "Make in India" by fostering competencies in digital manufacturing and smart machining technologies.

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand the fundamentals of CAD and various modeling techniques including solid, surface, and feature-based modeling.
02	Create 3D part models and assemble components using parametric CAD software.
03	Demonstrate the working principles and constructional features of CNC machines.
04	Develop CNC part programs using ISO G and M codes for turning and milling operations, and simulate them using relevant software.
05	Demonstrate the integration of CAD and CAM software for automated part programming and simulation.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to CAD/CAM** 1.1 Definition and importance of CAD and CAM 1.2 Advantages, applications, and limitations 1.3 Overview of CAD/CAM integration and digital manufacturing 1.4 Hardware and software used in CAD/CAM	**04**	**10**
2.	**Geometric Modeling** 2.1 Types of geometric modeling: Wireframe, surface, solid modeling 2.2 Introduction to 2D and 3D CAD environments 2.3 Parametric modeling and constraints 2.4 Assembly modeling and exploded views	**08**	**18**
3.	**Computer Graphics and Visualization** 3.1 Graphic display devices and user interfaces 3.2 2D and 3D transformations (translation, scaling, rotation – concepts only) 3.3 Viewing and rendering techniques 3.4 CAD software commands (basic to intermediate)	**06**	**13**
4.	**Introduction to CNC Technology** 4.1 Basics of CNC: NC vs. CNC, DNC concepts 4.2 Components of CNC machine: control panel, servo motors, feedback systems 4.3 Types of CNC machines: turning center, machining center 4.4 Advantages, limitations, and applications.	**06**	**13**
5	**CNC Programming – Turning and Milling** 5.1 Coordinate systems and axis conventions 5.2 G-codes and M-codes for turning and milling	**10**	**22**

	5.3 Manual part programming with examples 5.4 Tool path generation and canned cycles 5.5 Introduction to simulation and verification software		
6	**Computer-Aided Manufacturing** 6.1 CAM software overview and toolpath creation 6.2 Post-processing and data transfer 6.3 Basics of tool selection and cutting parameters 6.4 CAM-CNC integration for automated manufacturing workflows	**05**	**11**
7	**Recent Trends in CAD/CAM** 7.1 Introduction to Digital Twin, Industry 4.0, and Smart Manufacturing 7.2 Role of CAD/CAM in additive manufacturing 7.3 Automation and robotics integration with CAM systems 7.4 Basics of virtual prototyping and simulation	**06**	**13**
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	20	40	00	00	00

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

Sr. No	Title of Book	Author	Publication with place, year and ISBN
1	CAD/CAM Principles and Applications	P. N. Rao	Tata McGraw Hill, Latest Edition
2	Computer Aided Manufacturing	Rao, Kundra, Tiwari	Tata McGraw Hill, Latest Edition
3	Mastering CAD/CAM	Ibrahim Zeid	McGraw Hill Education
4	Automation, Production Systems and CIM	Mikell P. Groover	Pearson Education
5	CNC Machines	B. S. Pabla, M. Adithan	New Age International Publishers

6	Introduction to CNC Machines	N. K. Mehta	Khanna Publishers, New Delhi
7	AutoCAD for Engineers and Designers	Sham Tickoo	CADCIM Technologies
8	Numerical Control and Computer Aided Manufacturing	T.K. Kundra, P.N. Rao, N. K. Tewari	Tata McGraw Hill
9	Computer Graphics, C Version	Donald Hearn, M. Pauline Baker	Pearson Education
10	SolidWorks / Fusion 360 / Creo Training Manuals	(Latest industry-authorized editions)	(As per software developer/publisher)

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Introduction to CAD interface Explore the workspace, coordinate systems, and basic sketching in CAD software.	1,2	02
2	Create 2D sketches and convert them to 3D models Using solid modeling features like extrude, revolve, sweep, etc.	2	04
3	Create assembly of 2–3 parts Using mating conditions and generate exploded views.	2	04
4	Perform basic rendering and section Perform basic rendering and section	3	02
5	Write manual CNC part program (G & M codes) for a turning operation. Simulate and verify using CNC software.	4	02
6	Write manual CNC part program for a milling operation (slot/contour). Simulate and verify.	5	04
7	Generate CNC toolpath using CAM software for a given 2D/3D model. Select tool, set parameters, and simulate.	5	04
8	**Generate CNC toolpath using CAM software for a given 2D/3D model. Select tool, set parameters, and simulate.**	6	04
9	**Post-process the CAM program and interpret output for use in CNC machines.**	6	04
		Total	**30**

List of Laboratory/Learning Resources Required:
These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to user in uniformity of practical in all institutions across the state.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1.	**Computer Systems** – Minimum 10 computers with: • i5/i7 processor (or equivalent) • 8 GB RAM or higher • Dedicated graphics card (2 GB or more recommended) • Windows or Linux OS	1 to 9
2.	**CNC Machine Trainer Kits (Minimum 1 each):** • CNC Lathe Trainer • CNC Milling Trainer	5 to 9

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