GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering
Level: Diploma
Branch: Mechanical Engineering
Subject Code: DI05019031
Subject Name: Computer Aided Design and Manufacturing

w. e. f. Academic Year:	2026-27
Semester:	5th
Category of the Course:	PEC-03

Prerequisite:	• Basic engineering graphics and 2D/3D modeling • Fundamentals of manufacturing processes • Basic computer knowledge • Exposure to AutoCAD/3D modeling (covered in Sem 4)
Rationale:	This course builds upon prior knowledge of 3D modeling (covered in Semester 4) and focuses on advanced CAD/CAM and CNC machining concepts. It aims to bridge the gap between design and manufacturing by providing hands-on exposure to CNC programming, CAM toolpath generation, and digital manufacturing workflows. The course aligns with Industry 4.0 practices and prepares students for modern production environments.

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Apply advanced CAD techniques for complex product design
02	Explain construction and working of CNC machines
03	Develop CNC part programs for turning and milling operations.
04	Generate and simulate CAM toolpaths
05	Integrate CAD–CAM–CNC workflow in manufacturing

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.	**CAD/CAM Fundamentals** 1.1 CAD/CAM overview and integration 1.2 Digital manufacturing concept 1.3 Applications in industry	**04**	**9**
2.	**Advanced Geometric & Parametric Modeling** 2.1 Feature-based modeling 2.2 Surface modeling 2.3 Advanced assembly (top-down approach) 2.4 Design intent & constraints	**08**	**18**
3.	**CNC Machine Technology** 3.1 CNC architecture 3.2 Drives and feedback systems 3.3 Tooling and workholding 3.4 CNC setup and calibration	**07**	**16**
4.	**CNC Programming** 4.1 Advanced G & M codes 4.2 Turning & milling programs 4.3 Tool compensation 4.4 Subprograms and macros	**10**	**22**
5	**CAM & Toolpath Generation** 5.1 CAM workflow 5.2 Toolpath strategies (roughing, finishing) 5.3 Tool selection & parameters 5.4 Simulation & verification	**07**	**16**
6	**CAD–CAM Integration** 6.1 Model to machining workflow 6.2 Post-processing 6.3 CNC data transfer (DNC)	**05**	**11**
7	**Recent Trends in CAD/CAM** 7.1 Industry 4.0 7.2 Digital Twin 7.3 Additive Manufacturing 7.4 Automation integration	**04**	**8**
	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	Create 3D models Using Surface modeling features.	2	04
2	Create assembly of minimum 8 parts Using mating conditions and generate exploded views.	3	04
3	Write manual CNC part program (G & M codes) for a turning operation. Simulate and verify using CNC software.	4	02
4	Write manual CNC part program for a milling operation (slot/contour). Simulate and verify.	5	04
5	Write manual CNC part program for a drilling operation. Simulate and verify.	5	04
6	Generate CNC toolpath using CAM software for a given 2D/3D model. Select tool, set parameters, and simulate.	5	04
7	Generate CNC toolpath using CAM software for a given 2D/3D model. Select tool, set parameters, and simulate.	6	04
8	Post-process the CAM program and interpret output for use in CNC machines.	6	02
		Total	**28**

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 8
2.	**CNC Machine Trainer Kits (Minimum 1 each):** • CNC Lathe Trainer • CNC Milling Trainer	5 to 8

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