



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



Mechanical Engineering Department

B. Tech. Semester VII

Course Name : CAD/CAM **Course Code: BTME14711**

Type of course : Professional Elective Course

Prerequisite : Basic Knowledge of Engineering Drawing and Manufacturing Processes

Rationale of course : This course intends to introduce students to use of computers in the phases of product design viz. conceptualization, geometric modelling, graphical representation and in different manufacturing process with automation.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed-book tests. **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems. **TEE:** Term End Examination. **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course). **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in the course.

Content:

Sr. No.	Content	Total Hrs	Module Weightage
1	Fundamental of Computer Aided Design: Introduction, reasons for implementing a CAD system, computer aided process application, conventional design vs CAD, benefits, hardware, CAD softwares, CAD programming, concept of coordinate systems, various graphics exchange standards and database management systems.	05	10%
2	Computer Graphics: Scan conversions, DDA and Bresnham's algorithm for line and circle, geometric transformations: homogeneous representation; translation, scaling, reflection, rotation, shearing in 2D and 3D, window to viewport transformation.	07	15%



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3	<p>Curves, Surfaces & Solids:</p> <p>Curves – introduction, analytic curves, synthetic curves, Hermite cubic spline, Bezier curve, B-spline curve, introduction to NURBS, surfaces – introduction, surface entities, analytic surfaces, synthetic surfaces, such as Hermite cubic, Bezier, B-spline and coons. Solids – introduction geometry and topology, concept of half-spaces, boolean operations, solid entities, sweeps, solid manipulation, B-rep, CSG, Classification of geometric modelling – wire frame, surface and solid modelling, applications – representation of curves and surfaces – parametric form.</p>	09	20%
4	<p>Fundamentals of Computer Aided Manufacturing:</p> <p>Introduction, historical background, role of computers in manufacturing, automation, types of automation, concepts of computer integrated manufacturing, CIM wheel, open loop and closed loop, CNC systems, MCU.</p>	05	10%
5	<p>NC and CNC Machine Tools:</p> <p>Numerical Controls, types, evolution of controllers, components of NC/CNC system, specification of CNC system, Tooling for NC Machines, constructional details of CNC machines, axis designation, NC/CNC tooling, ISO G & M Codes, Fundamentals of manual part programming, types of format, word address format manual part Programming for drilling, lathe and milling machine operations, tool setting, cutter compensation, tool length offset method, canned cycles, parametric programming, Introduction to DNC.</p>	10	25%
6	<p>Group Technology, CAPP and Flexible Manufacturing System:</p> <p>Introduction, part families, part classification and coding systems, approaches to process planning, different CAPP system, application, and benefits.</p> <p>FMS: introduction & component of FMS, needs of FMS, general FMS consideration, objectives, types of flexibility and FMS, FMS layout and advantages, Automated material handling system: types and application, automated storage and retrieval system, automated guided vehicles.</p>	09	20%



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Percentage Distribution of Marks as per Revised Bloom’s Taxonomy (Theory/Practical):

Percentage Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	30	25	10	05	05

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyse, **E:** Evaluate, **C:** Create and above Levels

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference/Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher	Publication year	Publication Edition
1.	Mathematical Elements for Computer Graphics	David F. Rogers and J. Alan Adams	McGraw Hill	2017	2 nd
2.	CNC Programming (Fanuc Control)	K. K. Tiwati and S. K. Sinha	Galgotia Publications	2011	9 th
3.	Computer Aided Design and Manufacturing	M. P. Groover and E. W. Zimmers	Prentice Hall India (Pearson Education)	2003	1st
4.	CAD,CAM and Automation	Farazdak Haideri	Nirali Prakashan	2018	9 th
5	CNC Fundamentals and Programming	P. M. Agrawal, Dr. V. J. Patel	Charotar Publishing House Pvt. Ltd.	2022	3 rd

Course Outcomes (CO’s):

CO No.	CO Statement After learning this subject, students will be able to	Marks % Weightage
CO-1	Express basic fundamental principles of CAD and its application in the engineering field.	05
CO-2	Calculate algorithms of graphical entity generation and mathematical aspects of geometrical transformation.	15
CO-3	Compare the various surface and solid modelling techniques	25
CO-4	Express CAM concepts to manufacture components.	20
CO-5	Explain the fundamental principles of CAM and learn NC & CNC programming techniques	25
CO-6	Apply group technology, CAPP and FMS concept in manufacturing of product.	10



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Mapping of (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	1	1	2	1	2	1	0	0	0	1	0	0	2	2	0
CO-2	3	2	3	2	3	1	1	0	1	1	1	1	2	3	1
CO-3	3	2	3	3	3	2	1	0	1	1	1	1	3	3	1
CO-4	1	1	2	1	3	1	0	0	0	1	1	0	2	2	0
CO-5	2	2	3	3	3	2	1	0	1	1	1	1	3	3	1
CO-6	2	1	2	2	3	2	1	0	1	1	1	1	3	3	1
Rational e*	12	9	15	12	17	9	4	0	4	6	5	4	15	16	4

Rationale - Mapping of CO's with PO's and PSO's:

It will help to give fundamentals knowledge of drafting and modelling of different primitives also different manufacturing process using computer, develop the problem analysis skill in students as they are able to correlate with real life problems. Students will able design and manufacture different mechanical component by using modern computing and analysis software and also solve the technical problems.

This course highly maps with PO 1, 3, 4, 5 and PSO 1, 2. It states that the course will develop Engineering knowledge, Design / development of solutions, Conduct investigations of complex problems, Modern tool usage. This Course also focuses on Problem analysis, The engineer and society, Environment and sustainability, Ethics, Individual and teamwork, Communication, Project management and finance, Life-long learning, .

List of Practical:

- 1) Prepare C program for DDA line algorithm.
- 2) Prepare C program for different geometric transformations of entities.
- 3) Creating part drawings based on given sketches as per dimensions.
- 4) Applying CAD commands to build 3D models.
- 5) Prepare CNC part programming for turning operation.
- 6) Prepare CNC part programming for drilling operation.
- 7) Prepare CNC Milling program involving linear motion and circular interpolation.
- 8) Prepare CNC milling program involving contour motion and canned cycles.



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Major Equipment:

- 1) Computational facility
- 2) CNC Lab

List of Open learning website:

- 1) <https://nptel.ac.in/courses/112102102>
- 2) <https://archive.nptel.ac.in/courses/112/102/112102101/>
- 3) <https://nptel.ac.in/courses/112104031>

List of Open Source Software:

- 1) Free CAD