SARVAJANIK UNIVERSITY

Sarvajanik College of Engineering and Technology

Bachelor of Technology

Mechanical Engineering Department
B. Tech. Semester VI

Course Name: **Computer aided Manufacturing** **Course Code: BTME19622**
Type of course: **Honors - CAD/CAM**
Prerequisite: Engineering Graphics and Design and basic knowledge of Manufacturing Processes
Rationale of Course: This course is designed to develop the knowledge and experience of manufacturing using computers and numerical controllers. Students will be able to implement the concept of manual part programming. This course provides fundamentals of computer integrated manufacturing, flexible manufacturing system, group technology and cellular manufacturing.

Teaching and Examination Scheme:

Teaching scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	200
3	0	4	5	60	25	15	60	40	

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 course

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Introduction to Computer Aided Manufacturing:** Introduction, historical background, CAM Concepts, objectives and scope, nature and type of manufacturing system, evolution, role of management in CAM, numerical control of machine tools, functions, classification, role of computers in manufacturing, automation, types of automation, concepts of	**6**	**12 %**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	computer integrated manufacturing (CIM), CIM wheel, open loop and closed loop, CNC systems, multipoint control unit		
2.	**CNC Part Programming:** Specification of CNC system, tooling for NC Machines, constructional details of CNC machines, axis designation, coordinate system, CNC tooling, ISO- G and 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, sub-routines, canned cycles, parametric programming, automatically programmed tool (APT) language, APT language structure, APT Geometry, motion commands, post processor commands, repetitive programming, compilation and control commands.	**13**	**30 %**
3.	**Elements of CNC Machine:** Slide ways, motion transmission elements, automatic tool changers and multiple pallet systems, feedback devices – encoders and transducers, sensors, actuators, spindle drives and axes drives, tooling for CNC machines-tool preset and qualified tools, work and tool holding devices.	**6**	**12 %**
4.	**Flexible Manufacturing System:** Introduction and components of FMS, need of FMS, general FMS consideration, objectives, types of FMS, FMS layout and advantages, manufacturing cells, JIT and GT applied to FMS, FMC, tool management, industrial robotics and material handling, automated storage and retrieval system (AS/RS),	**10**	**23 %**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	automated guided vehicles (AGVS), rail guided vehicle (RGV), flexible fixturing, flexible assembly systems, FMS scheduling, sequencing, FMS layout and essentials, tool management, tool supply system, tool monitoring system.		
5.	**Group Technology and CAPP:** Introduction, part families, part classification and coding systems, cell design, machining cells, production flow analysis, rank order clustering, composite part concepts, approaches to process planning, different CAPP system, implementation consideration, commercial process planning system, application and benefits, cellular manufacturing, computer aided production management- Introduction, PPC fundamentals, problems with traditional PPC, use of computer in PPC such as CAPP, MRPI, MRPII, CAGC etc. Process and product planning, concurrent engineering.	**10**	**23 %**

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

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	**30**	**30**	**10**	**10**	**5**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create

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 Books:

Sr. No.	Title of book /article	Author(s)	Publisher	Publication year	Publication edition
1	CAD/CAM Theory and Practice	I. Zeid and R Sivasubramanian	McGraw Hill Education	2009	2nd
2	CNC Programming (Fanuc Control)	S. K. Sinha	Galgotia Publications	2011	9th
3	CAD/CAM: Computer Aided Design and Manufacturing	M. P. Groover and E. W. Zimmers	Prentice Hall India (Pearson Education)	2008	--
4	Computer Aided Manufacturing	C. Elanchezhian, T. S. Sunder and G. S. Sundar	New Delhi	2006	4th
5	Automation, Production Systems, and Computer-Integrated Manufacturing	Mikell Groover	Pearson	2014	4th

Course Outcomes (COs):

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Identify CNC machine structures and system drives.	12
CO-2	Analyze basics and advancement in NC and CNC for automatic manufacturing.	30
CO-3	Create manual and APT part programs for various profiles for lathe and milling machine.	12
CO-4	Determine the role of FMS and JIT in material movement in manufacturing.	23
CO-5	Apply the concepts of group technology, cellular manufacturing and computer aided process planning in automation.	23

Mapping of (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

	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	2	1	--	1	2	1	1	2	1	--	--	1	2	3	1
CO-2	3	3	2	1	2	1	1	1	1	--	--	2	3	3	1
CO-3	3	3	2	1	3	1	--	1	2	2	--	2	3	2	2
CO-4	3	2	3	3	3	2	2	1	--	1	2	1	2	2	2
CO-5	3	2	2	3	3	2	1	1	2	2	2	2	2	3	2
Rationale*	**14**	**11**	**9**	**9**	**13**	**7**	**5**	**6**	**6**	**5**	**4**	**8**	**12**	**13**	**8**

Rationale - Mapping of COs with POs and COs with PSOs:

According to CO-PO mapping, this course will help students to develop the knowledge of use of computers in manufacturing. This course will help to analyse complex engineering problems in manufacturing, reaching substantiated conclusions; moreover students can create, select, and apply appropriate techniques, resources and modern engineering and software tools to complex engineering activities with an understanding of the limitations. According to CO and PSO mapping, this course will be useful for students to analyse, plan and design different mechanical systems aided with computer software to enhance their soft skills and to excel in professional life.

This course highly maps with Program outcomes 1, 2,3,4,5 and Program Specific Outcomes 1, 2. It states that the course will develop engineering knowledge, problem analysis, design / development of solutions, conduct investigations of complex problems, modern tool usage and finally it will lead to convert conceptual knowledge of mechanical engineering to real life applications with the use of modern computing tools.

List of Practical:

1. Demonstration of CNC Milling machine with user interface and calculating the co-ordinates of given geometry in absolute end increment mode for cutter path.
2. Create the CNC programme for a given geometry using mirror and subroutine.
3. Write the CNC programme for a given geometry for drilling cycles.
4. Introduction and programming of canned cycle of milling machine.
5. Perform the various turning operation on CNC turning/lathe.
6. Perform the various drilling operation on CNC milling/machining centre.
7. Case-study on flexible manufacturing system.
8. Case-study on group technology.

Major Equipment:

1. CNC trainer machine for cutting and milling
2. Computational and software facilities.

List of open learning website:

1. https://onlinecourses.nptel.ac.in/noc22_me10
2. https://nptel.ac.in/courses/112102102