FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor Of Technology (Mechanical Engineering)**

Semester: **VII**

Course Code: **202090701**

Course Title: **Computer Aided Manufacturing**

Course Group: **Professional Core Course-XVI**

Course Objectives: Students will learn fundamentals of CNC machine technology and programming for CNC Turning Centre and Machining Centre along with advanced manufacturing tools like, Group Technology, FMS, Robot Technology and Production Management Systems.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25 / 9	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction:** CAM Concepts and comparison with conventional technology, Type of manufacturing systems, Different CNC Applications, Benefits of CAM, Role of management in CAM, Concepts of Computer Integrated Manufacturing, Impact of CIM on personnel, Role of manufacturing engineers, CIM Wheel.	04
2	**CNC Machine hardware and Programming:** NC and CNC Technology: Types, Classification, Specification and components, Construction Details, Controllers, Sensors and Actuators, CNC hardware: Re circulating ball screw, anti-friction slides, step/servo motors. Axis designation, CNC tooling. Fundamentals of Part programming, Types of format, Part Programming for lathe and milling machine operations, canned Cycles, parametric subroutines, Automated Part Programming	12
3	**Programmable Logic Controllers:** Relay Device Components, architecture and Programming of PLC, Components of PLC, tools for PLC logic design.	02

4	**Group Technology and CAPP:** Part families, part classification and coding, PFA, Cellular manufacturing, composite part concepts, quantitative analysis in cellular manufacturing, applications of group technology. Introduction to Process Planning and computer aided process planning, Different types of CAPP system, application and benefits.	**06**
5	**Flexible Manufacturing System:** Introduction & Types of flexibility in FMS, Components of FMS, Applications and benefits, FMS planning and implementation issue. Automated material handling system: Types and Application, Automated Guided Vehicles, Automated Storage and Retrieval System, Tool Management system in CNC.	**07**
6	**Industrial Robotics:** Introduction: Laws of Robotics, Robot Anatomy: Joints and Links, Common configurations, Joint drive systems, Robot control systems, End effectors: Grippers and tools. Sensors, Robot Applications, Robot Programming, Robot Kinematics.	**07**
7	**Production Planning and Control Systems:** Introduction, Material Requirement Planning, Capacity Planning, Inventory Control, Manufacturing resource planning (MRP-II) and ERP. Just in Time philosophy, Concepts of Expert System in Manufacturing and Management Information System.	**07**
	Total	**45**

List of Practicals / Tutorials:

1	Introduction of CIM and CAM lab facility
2	To prepare a part program of the given component for a CNC Lathe machine
3	To prepare a part program using single and multi-pass canned cycles for CNC Lathe Machine
4	To develop a code of the given components and formation of machine cell using PFA
5	To develop a part program of a given components for CNC milling using FANUC controller
6	To use various canned cycle for pocket milling, subprogram and mirroring facility in a part program using FANUC controller
7	To produce components on CNC Lathe and CNC Milling machines
8	To study robotics and FMS systems for an industrial application
9	To Demonstrate working of CNC laser engraver and CNC wood router machine
10	To develop codes using Automated Part Programming for CNC Lathe and vertical Milling machine

Reference Books:

1	Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Groover, Pearson Education.
2	Computer Aided Manufacturing by Tien Chien Chang, Pearson Education.
3	Robotics Technology and Flexible Automation, by S R Deb, S Deb, McGraw Hill Education Private Limited
4	Flexible Manufacturing Cells and System -William. W. Luggen Hall, England Cliffs, Newjersy.
5	P.Radhakrishnan, "Computer Numerical Control ", New Central Book Agency, 1992.
6	Computer integrated manufacturing -S. Kant Vajpayee – Prentice Hall of India.
7	System Approach to Computer Integrated Manufacturing. Nanua Singh, Wiley and sons Inc, 1996.

8	Computer Aided Manufacturing- Rao, Tewari, Kundra, McGraw Hill, 1993.
9	CAD/CAM, Principles and Applications –P N Rao, McGraw Hill, 2010.
10	CAD/CAM, Introduction, -Ibrahim Zeid, Tata McGraw Hill, 2007.

| **Supplementary learning Material:** | |
| 1 | NPTEL resources |

Pedagogy:
- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Industrial/ Field visits
- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
10	20	25	25	10	10	

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.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the concept of CAM and CIM along with hardware requirements.	10
CO-2	Develop part program for manufacturing different geometries on CNC Turning Centre and machining Centre and understanding PLC technology for Industry	30
CO-3	Learn fundamentals of Group technology, FMS and robotics.	45
CO-4	Understand and apply PPC, MRP, MRP2, JIT and expert system concepts for manufacturing.	15

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025