B. E. MECHANICAL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII
COMPUTER AIDED DESIGN AND MANUFACTURING

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...g Hours /Week (L:T:P)	18ME72	CIE Marks	40
	3:0:0	SEE Marks	60
	03	Exam Hours	03

Learning Objectives:

To impart knowledge of CIM and Automation and different concepts of automation by developing mathematical models.

To make students to understand the Computer Applications in Design and Manufacturing [CAD / CAM) leading to Computer integrated systems. Enable them to perform various transformations of entities on display devices.

To expose students to automated flow lines, assembly lines, Line Balancing Techniques, and Flexible Manufacturing Systems.

To expose students to computer aided process planning, material requirement planning, capacity planning etc.

To expose the students to CNC Machine Tools, CNC part programming, and industrial robots.

To introduce the students to concepts of Additive Manufacturing, Internet of Things, and Industry 4.0 leading to Smart Factory.

Module-1

Introduction to **CIM and Automation:** Automation in Production Systems, automated manufacturing systems, types of automation, reasons for automating, Computer Integrated Manufacturing, computerized elements of a CIM system, CAD/CAM and CIM. Mathematical models and matrices: production rate, production capacity, utilization and availability, manufacturing lead time, work-in- process, numerical problems.

Automated **Production Lines and Assembly Systems:** Fundamentals, system configurations, applications, automated flow lines, buffer storage, control of production line, analysis of transfer lines, analysis of flow line without storage, partial automation, analysis of automated flow lines with storage buffer, fundamentals of automated assembly systems, numericals.

Module-2

Design and Computer Graphics Software: The design process, applications of computers in design, software configuration, functions of graphics package, constructing the geometry.

Transformations: 2D transformations, translation, rotation and scaling, homogeneous transformation matrix, concatenation, numerical problems on transformations.

Computerized Manufacture Planning and Control System: Computer Aided Process Planning, Retrieval and Generative Systems, benefits of CAPP, Production Planning and Control Systems, typical activities of PPC systems, computer integrated production management system, Material Requirement Planning, inputs to MRP system, working of MRP, outputs and benefits, Capacity Planning, Computer Aided Quality Control, inventory control

Module-3

Manufacturing Systems: Fundamentals of Group Technology and Flexible Manufacturing Systems, FMS, FMS components, Material handling and storage system, applications, benefits, computer systems, FMS planning and design issues, Automated Storage and Retrieval Systems, AS/RS and automatic parts identification systems and data capture.

Line Balancing: Line balancing algorithms, methods of line balancing, numerical problems on largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights method, Mixed Model line

computerized line balancing methods.

Numerical Control: Introduction, components of CNC, CNC programming, manual part
ming, G Codes, M Codes, programming of simple components in turning, drilling and milling
s, programming with canned cycles. Cutter radius compensations.
echnology: Robot anatomy, joints and links, common robot configurations, robot control systems,
and repeatability, end effectors, sensors in robotics. Robot programming methods: on-line and off-
ods. Robot industrial applications: material handling, processing and assembly and inspection.

Manufacturing Systems: Basic principles of additive manufacturing, slicing CAD models for AM,
s and limitations of AM technologies, Additive manufacturing processes: Photo polymerization,
etting, binder jetting, material extrusion, Powder bed sintering techniques, sheet lamination, direct
position techniques, applications of AM.

Automated Factory: Industry 4.0, functions, applications and benefits. Components of Industry
t of Things (IOT), IOT applications in manufacturing, Big-Data and Cloud Computing for IOT, IOT
manufacturing, influence of IOT on predictive maintenance, industrial automation, supply chain
n, supply-chain & logistics, cyber-physical manufacturing systems.

tcomes: At the end of the course, the student will be able to:
e Automation, CIM, CAD, CAM and explain the differences between these concepts. Solve
le problems of transformations of entities on computer screen
ain the basics of automated manufacturing industries through mathematical models and analyze
ent types of automated flow lines.
se the automated flow linestoreduce time and enhance productivity.
ain the use of different computer applications in manufacturing, and able to prepare part

mple jobs on CNC machine tools and robot programming.
ize and appreciate the modern trends in Manufacturing like additive manufacturing, Industry 4.0
pplications of Internet of Things leading to Smart Manufacturing.

per pattern:
uestion paper will have ten full questions carrying equal marks.
ull question will be for 20 marks.
will be two full questions (with a maximum of four sub- questions) from each module.
ull question will have sub- question covering all the topics under a module.
udents will have to answer five full questions, selecting one full question from each module.

Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
tomation, Production Systems nd Computer-Integrated anufacturing	Mikell P Groover	Pearson Learning.	4th Edition,2015
D / CAM Principles and pplications	P N Rao	Tata McGraw-Hill	3rd Edition, 2015
D/CAM/CIM	Dr. P. Radhakrishnan	New Age International Publishers, New Delhi.	3rd edition
Books			
AD/CAM"	Ibrahim Zeid	Tata McGraw Hill.	
inciples of Computer Integrated anufacturing	S.Kant Vajpayee	, Prentice Hall of India, New Delhi.	1999

			Upper Saddle River, NJ, 2007.
Work Systems And The Methods, Measurement And Management of Work	Groover M. P.,Pearson	Prentice Hall	1996.
Computer Automation in Manufacturing	Boucher, T. O., Chapman & Hall	London, UK,	2nd Ed 1989.
Introduction to Robotics: Mechanics And Control	Craig, J. J.	Addison-Wesley Publishing Company	
Internet of Things (IoT): Digitize or Die: Transform your organization. Embrace the digital evolution. Rise above the competition	Nicolas Windpassinger	Amazon.	
Internet of Things: A Hands-on Approach"	ArshdeepBahga and Vijay Madisetti	Universities Press	2nd Ed. (2015)
Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing,	Ian Gibson, David W. Rosen, Brent Stucker		2011
Understanding Additive Manufacturing	Andreas Gebhardt, Hanser Publishers		
Understanding Additive Manufacturing",	Andreas Gebhardt,	Hanser Publishers,	2011