Program : **Diploma in Mechanical Engineering/Tool and Die Engineering / Manufacturing Technology**	
Course Code : **6021B**	Course Title: **Computer Integrated Manufacturing**
Semester : **6/6/6**	Credits: **5**
Course Category: **Program Elective/ Program Elective/ Program Elective**	
Periods per week: **5 (L:4, T:1, P:0)**	Periods per semester: **75**

Course Objectives:

- To introduce computer integration in all aspects of production system.
- To identify the features of CAM and industrial robotics.
- To provide an eye opening to the present scenario of a manufacturing plant so that the student can better understand their future job roles.
- To familiarize with the automation related to material handling, storage, inspection and manufacturing system

To familiarize with the automation related to material handling, storage, inspection and manufacturing system

Course Prerequisites:

Topic	Course code	Course name	Semester
Basic knowledge on machining, machine tools and manufacturing		Machine tools	3
		Manufacturing technology	2

Course Outcomes:

On completion of the course, the students will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Outline the automation opportunities and strategies.	25	Understanding
CO2	Familiarize the computer integration in design phase of product development.	14	Understanding

CO3	Identify the features of CAM and industrial robotics.	20	Understanding
CO4	Describe the automation related to material handling, storage, inspection and manufacturing system.	14	Understanding
	Series test	2	

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2						
CO2	2						
CO3	2						
CO4	2						

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Outline the automation opportunities and strategies.**		
M1.01	Identify the opportunities for computerization in manufacturing system.	2	Understanding
M1.02	Discuss about automation, its elements and types	16	Understanding
M1.03	Discuss the principles and strategies for automation	7	Understanding

Contents:

Concept of Computer Integrated Manufacturing (CIM); Opportunities for Automation and Computerization in a Production System - Facilities and Manufacturing Support Systems;

Basic elements of automation, Advanced automation functions, Levels of automation;

Sensors - Desirable features, common types of sensors used in automation;

Actuators - common types of actuators used in automation;

Types of Automation - Programmable Automation, Flexible Automation and Fixed Automation; Reasons for Automation;

USA principle, Ten Strategies for Automation and Process Improvement; Automation Migration Strategy - Manual Production, Automated Production, Automated Integrated Production.

CO2	**Recognize the computer integration in design phase of product development.**		
M2.01	Describe about the product development.	4	Understanding
M2.02	Describe the computer aided designing, analysis and prototyping.	10	Understanding
	Series Test - I	1	

Contents:

Product Development - Product Development Cycle and Product Development Spiral.

Sequential and Concurrent Engineering (Introduction Level Only), Comparison.

Computer Aided Design (CAD): Definition, Advantages, CAD hardware (Name and function) and software (Name Only); Geometric Modelling - Wireframe, Surface and Solid Modelling.

Engineering Analysis - Types; Design Review and Evaluation.

Rapid Prototyping - Liquid Based, Solid Based and Powder Based.

CO3	**Identify the features of CAM and industrial robotics.**		
M3.01	Describe CAM, CAPP and GT	3	Remembering
M3.02	Explain the Variant and Generative techniques in CAPP	4	Understanding
M3.03	Describe MPS, MRP, CRP and inventory control with aid of computer.	3	Remembering
M3.04	Discuss about CNC and industrial robotics.	10	Understanding

Contents:

Computer Aided Manufacturing (CAM)- Definition;

Computer Aided Process Planning (CAPP)- Definition; Group Technology (Introduction Level treatment of cellular manufacturing, part family and its methods), Variant and Generative CAPP.

Master Production Schedule (MPS), Material Requirements Planning (MRP), Capacity Requirement Planning (CRP) and Inventory Control with the aid of Computer (Introduction Level only).

CNC and DNC- Features and Advantages;

Machining Centres - Turning centre, Milling Centre.

Industrial Robots- Definition, Anatomy, Types of End effectors, Degrees of Freedom [DOF]; Classification of Robots- Articulated, Polar Configuration, SCARA, Cartesian Co-ordinate, Delta; Applications of Robot.

CO4	**Discuss the automation related to material handling, storage, inspection and manufacturing system.**		
M4.01	Describe various automated material handling and storage systems	4	Understanding
M4.02	Describe various automated inspection technologies.	5	Understanding
M4.03	Describe the manufacturing systems and factors for selection.	5	Understanding
	Series Test - II	1	

Contents:

Material handling - Fixed Routing and Variable Routing; List of Material Handling Equipments for Each Routing.

Storage - Automated Storage/Retrieval System (AS/RS) and Carousel Storage System (Introduction Level Only).

Inspection Technologies - Comparison of Contact and Non-Contact Inspection Techniques, CMM and Machine Vision (Introduction with Simple Diagram).

Manufacturing Systems - Factors for Selection, Types - Single Station Cell, Multistation Fixed Routing, Multistation variable Routing (Introduction Level Only].

Text / Reference:

T/R	Book Title/Author
T1	Mikell P. Groover, Automation, Production Systems and Computer-Integrated Manufacturing. 4th edn. Pearson.
T2	P.Radhakrishnan S.Subramanyan and V. Raju, CAD/CAM/CIM. 4th edn. New Age International Publishers.
R1	S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill.

Online resources:

Sl.No	Website Link
1	https://nptel.ac.in/courses/112/104/112104289/
2	https://www.sciencedirect.com/search?qs=computer%20integrated%20manufacturing
3	https://en.wikipedia.org/wiki/Computer-integrated_manufacturing