Program : **Diploma in Mechanical Engineering / Tool & Die Engineering / Manufacturing Technology**	
Course Code : **5023A**	Course Title: **Modern Production Processes**
Semester : **5**	Credits: **4**
Course Category: **Program Elective / Core / Core**	
Periods per week: **4 (L:4, T:0, P:0)**	Periods per semester: **60**

Course Objectives:

- To impart knowledge of modern manufacturing systems management, including selection of jigs & fixtures in mass production,
- To identify different surface modification methods used to improve physical and mechanical properties of substrate surfaces
- To introduce various non-conventional machining processes and their applications
- To familiarize the principle, features and applications of automation through computer integrated manufacturing.

Course Prerequisites:

Topic	Course Code	Course Name	Semester
Various coordinate systems, concept of 2D and isometric drawing.		Basic CAD Lab	1
3D modeling basics		Advanced CAD Lab	2
Lathe, drilling and milling machines		Machine Tools	3
Machine shop practice		Mechanical workshop - III & IV	4

Course Outcomes:

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

COn	Description	Duration (Hours)	Cognitive Level
CO1	Summarize the applications of Jigs &fixtures in mass production, procedure and application of powder metallurgy and surface modification methods.	12	Applying

CO2	Appreciate the application of non- conventional machining process	17	Applying
CO3	Compare the constructional features of Numerical Control and Computer Numerical Control machines and develop part programs using ISO format for given simple components	14	Applying
CO4	Identify the elements of Computer Integrated manufacturing system	15	Applying
	Series Test	2	

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3						
CO3	3	2					
CO4	3						2

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

Course Outline

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Summarize the applications of Jigs &fixtures in mass production, procedure and application of powder metallurgy and surface modification methods**		
M1.01	Appreciate the importance and selection of jigs and fixtures in mass production	4	Applying
M1.02	Describe the procedure and applications of powder metallurgy.	3	Understanding
M1.03	Illustrate the procedure and applications of surface modification methods	5	Applying
Contents: Importance of Jigs & fixtures in mass production- introduction-design considerations - applications- types- box type jig, indexing jig, Angle plate jig, channel jig -fixtures-fixtures			

for turning, drilling, milling, and grinding.
Powder metallurgy and surface modification techniques- Powder metallurgy-applications of P/M- procedure of P/M- pros and cons- Surface modification methods – Applications- Physical vapor deposition- chemical vapor deposition- diffusion coating- Metal spraying- organic coatings- (brief explanation with line sketch)

CO2	**Appreciate the principle of Non-conventional machining process**		
M 2.01	Describe the significance of non-conventional machining process and their classification.	3	Understanding
M 2.02	Illustrate various non-conventional machining processes.	10	Understanding
M 2.03	Demonstrate the applications, advantages and limitations of various non-conventional machining processes.	4	Applying
	Series Test – I	1	

Contents:
Non-conventional Machining Processes: Introduction – need- classifications- brief overview Ultrasonic Machining-principle, -Description of equipment, applications- Electric Discharge Machining: Principle, Description of equipment, Dielectric fluid-tools (electrodes)- applications-Wire cut EDM: Principle, Description of equipment- applications- Abrasive Water Jet Machining- principle, description of equipment, application; Laser Beam Machining: principle, description of equipment, application- Electro Chemical Machining- comparison

CO3	**Compare the constructional features of Numerical Control and Computer Numerical Control machines and develop part programs using ISO format for given simple components**		
M 3.01	Identify the components and processes and classification of NC and CNC machines	3	Understanding
M 3.02	Describe various preparatory and Miscellaneous functions in CNC part programming and develop a part program for the production simple components in turning, drilling and milling	8	Applying
M 3.03	Describe the principle, steps and applications of Rapid prototyping and 3D printing.	3	Applying

Contents:
Basic concepts of NC and CNC machines-Introduction- construction details – classification: motion type, control loop system**,** axis- Components and their functions- types of motion control -Automatic tool changer - tool magazine – types of tool magazine- comparison of NC and CNC machines- Machining centers- machine axes conventions
Programming CNC machines- Preparatory functions (M)- miscellaneous functions(G)-

structure of part programming- Part programming of machine simple turning, milling, drilling components. Rapid Prototyping (RP) in product design- application-steps - 3D printing- applications			
CO4	**Identify the elements of Computer Integrated manufacturing system.**		
M 4.01	Understand the need, benefits and features of CIM	4	Understanding
M 4.02	Identify Flexible Manufacturing System layout for given using group technology concepts and familiarize with computer aided process planning	6	Applying
M 4.03	Recognize use of robotics in the field of manufacturing.	5	Understanding
	Series Test – II	1	
Contents: Computer integrated manufacturing system- Evolution of manufacturing Systems- need of automation-benefits of CIM-basic structure of CIM- Direct Numerical Control-Computer Aided Process Planning. Flexible manufacturing system- Definition, objective and Need- components- group technology- part family -Classification -Single Machining Cell-Flexible manufacturing cell-FMS-Automated guided vehicle (AGV)- FMS Layouts and their salient features- Single line- dual line- loop- ladder- Carousel- robot centered. Robotics- Introduction; Definition- Robot anatomy (parts) and its working- Types of joints- Configuration of robots; Cartesian, Cylindrical, Spherical, Scara- applications of industrial robots			

Text / Reference:

T/R	Book Title/Author
T1	Production Technology – HMT, Banglore, Tata Mc-Graw Hill
T2	Production Technology- Machining Techniques and automated machine tool systems- R K Jain- Khanna publishers
R1	CNC machines – Pabla B. S. & M. Adithan, New Age international limited.
R2	Non-conventional Machining Processes- Jagadeesha T- IK International Publishing house Pvt Ltd.House
R3	Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing- Ian Gibson , David Rosen, Brent Stucker - Springer

R4	Automation, Production systems and Computer integrated manufacturing systems- Mikell P Groover
R5	Exploring Advanced Manufacturing Technologies – Stephen F. Krar & Arthur Gil, Industrial Press
R6	Industrial Robotics- Groover -McGraw Hill Education

Online resources

Sl No	Website Link
1	https://nptel.ac.in/courses/112107144/
2	https://nptel.ac.in/courses/112105212/
3	https://nptel.ac.in/courses/112102103/
4	https://nptel.ac.in/courses/112104289/
5	https://nptel.ac.in/courses/112/105/112105249/