



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechanical Engineering(CAD/CAM) /
Mechatronics Engineering

Subject Code: DI05000301

Subject Name: Advance Manufacturing System

w.e.f. Academic Year:	2026-27
Semester:	5 th
Category of the Course:	PEC-03

Prerequisite:	Basic knowledge of manufacturing processes and material behaviour from subjects like Manufacturing Engineering-I and II. Fundamental understanding of computer operations and usage of graphical software environments. Exposure to basic mechanical design concepts and machine elements.
Rationale:	<p>Manufacturing processes converts raw material to finished product for customer usage. Now a day's customer is the king in the market and needs and desires of customer has increased the varieties and features in products. This has increased the complexities at almost all the stages of manufacturing. In modern manufacturing system it is very important to listen voice of customer and deploy his needs in entire manufacturing system. In modern era of the liberalized economy, we are facing world class competition in our own country. Global industries in the form of advanced manufacturing systems, is compelling Indian industries to reorganize their manufacturing strategies for competing on the dimensions of cost, quality, flexibility and deliverability. Hence it is important for us to understand the various modern-manufacturing systems available today.</p> <p>Recent advance manufacturing system / techniques / electronics devices provide precision machine control compare to conventional machines. With higher accuracy quality and productivity. Objective of leaning this subject is to make aware the students about the advance manufacturing practices/systems being implemented at leading industries across the globe, which ultimately leads to more customer satisfaction in terms of low cost and high quality.</p>

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Identify role of computers and information technology in manufacturing systems with concept of technological life cycle and product life cycles.
02	Develop an FMS (Flexible Manufacturing System) layout for given simple part family, using group technology concepts to and make proper grouping as per their attributes.
03	Recognize use of Automation and control technology in industries.
04	Discuss use of robotics Industrial automation, programmable logic controllers in modern manufacturing system and Industry 4.0.
05	Apprehend and describe application of recent trends in modern manufacturing system.

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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to Advance Manufacturing System. 1.1 Manufacturing system definition & Features of Manufacturing system. 1.2 Components and types of manufacturing system. 1.3 Role of computers and information technology in manufacturing and manufacturing systems. 1.4 Product life cycle its importance & Technology life cycle. 1.5 Scope, trends and challenges in Indian and global market.	03	08
2.	Group Technology (GT) & Cellular Layout. 2.1 GT - concept, definition, need, scope, & benefits. 2.2 Production layout-types, features and applications. 2.3 GT Layout -concept, need, benefits, comparison with conventional layout with examples. 2.4 GT- codification systems- types, method of coding and examples. 2.5 Part features- concept, types and examples. 2.6 Part family- concept, method to form and approach to form cell using part families. 2.7 Types and comparison of cell: manual and automatic cell, assembly cell. 2.8 Cell layout.	07	17
3.	Flexible Manufacturing Cell and System. 3.1 Flexible Manufacturing Cell (FMC) System (FMS) a –concept, definition and comparison with other manufacturing systems. 3.2 Major elements of FMC/FMS and their functioning: i. Tool handling system. ii. Material handling system. iii. Automated guided Vehicles. iv. Automated storage and retrieval system (AS/RS). v. Main frame computer. 3.3 FMS layout - concept, types and applications. 3.4 Data required developing an FMS layout. 3.5 Signal flow diagram and line balancing in FMS. 3.6 Alternatives Approaches to flexible manufacturing system.	06	17



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4.	<p>Automation and control technology. 4.1 Introduction to Automation & Basic elements of Automated System. 4.2 Level of Automation. 4.3 Introduction to Industrial control system. 4.4 Process industries versus discrete manufacturing. 4.5 Continuous versus discrete control. 4.6 Sensors and Actuators used in Automation.</p>	05	09
5.	<p>Robotics. 5.1 Robots-concept, definition, benefits and various areas of application in Manufacturing systems. 5.2 Terminology used in Robotics. Robots-types, physical configuration, classification and selection criterion. 5.3 Axes nomenclature of Robots. Types and uses of Manipulators & Grippers. 5.4 Sensors- types, classifications, working principle and applications of position, force & torque, proximity, vision, velocity & acceleration sensors. 5.5 Overview of robot programming methods & languages.</p>	06	14
6.	<p>Discrete control Programmable Logic Controller (PLC). 6.1 Introduction to Discrete Process Control. 6.2 Logic Control. 6.3 Sequence Control. 6.4 Introduction and need of Programmable Logical Controller (PLC). 6.5 Components of PLC.</p>	04	09
7.	<p>Industry 4.0. 7.1 Historical evolution, origin and key understandings of Industry 4.0 7.2 Need, Design principal and current and future trends in Industry 4.0 7.3 .Industry 4.0 Technologies 7.4 Environmental Management and its technology in Industry 4.0</p>	04	09
8.	<p>Recent Trends in manufacturing system. 8.1 Computer Aided Process Planning (CAPP) – concept, types, features, methods and importance and introduction to concurrent engineering. 8.2 Computer Integrated Manufacturing (CIM): need, block diagram, functional areas covered and their importance. Computer Aided Inspection (CAI) – concept, benefit, types, working and examples. Coordinate Measuring Machine (CMM) - its working and applications. Concept of reverse engineering. 8.3 Factory of future (FOF) and smart factory. 8.4 Artificial intelligence concept, definition and application areas. 8.5 Lean Manufacturing and waste reduction, Toyota Production System principles and Methodologies. 8.6 Just in Time (JIT) manufacturing – Pull and push types of manufacturing systems.</p>	10	17



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	8.7 Green Manufacturing.		
	8.8 Additive manufacturing: concept and types.		
	Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
27	28	15	00	00	00

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

Sr. No	Title of Book	Author	Publication with place, year and ISBN
1	Computer Integrated Design & Manufacturing	Bedworth, Wolfe and Anderson	McGraw Hill International Publication
2	Introduction to Robotics	Arthur J. Critchlow	McMillan publication
3	Robotics for engineers	Yorom Koran	McGraw Hill Publication
4	Automation, Production and Computer integrated Manufacturing	Mikell P. Groover	PHI
5	Materials and Processes in Manufacturing	E.P. DeGarmo, J.T. Black, R. Kohser & B. Klamecki	Hoboken, NJ: John Wiley & Sons Inc.
6	Industry 4.0 Current Status and Future Trends	Edited by Jesús Hamilton Ortiz	Intech Open(Published in UK)
7	CAD/CAM/CIM	P. Radhakrishnan & S. Subranarayan	New Age Intentional
8	Computer Aided Design & Manufacturing	Dr. Sadhu Singh	KP
9	Computer Integrated Manufacturing	S. K. Vajpayee	PHI
10	Practical Robotics	William C. Burns Jr. & Janet Evans Worthington	PHI



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Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Prepare drawing, process plan and feature matrix of given/selected component. Select GT coding system and assign GT code to each in batch.	1,2	04
2	Preparation of FMS layout: Develop part family, Assume additional data such as Quantity, Numbers of shifts, Working hours and days & Utilization factor of FMS unit. Prepare process time matrix. Determine type and number of work stations. Perform necessary calculations and prepare conceptual FMS layout.	3	06
3	Prepare report/Case study on Industrial Automation and process control system.	4	02
4	Demonstrate working of following: Robot, Sensors and PLC & Prepare Sketches of the same.	3	06
5	Prepare report /Case study on Industry 4.0	5,7	02
6	Demonstration and simulation of computer integrated manufacturing system on various free access software.	6	02
7	Prepare report /Case study on lean manufacturing and green manufacturing.	8	02
8	Prepare report/Case study on Computer aided process planning and concurrent engineering.	8	02
9	Industrial visit. Visit report and Presentation.	-	04
Total			30

List of Laboratory/Learning Resources Required:

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to user in uniformity of practical in all institutions across the state.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1.	Kits on robotics.	4
2.	Set of sensor / transducer demonstration and operation trainer kit. (This should include sensors/transducers as per syllabus.)	4
3.	Analog to digital and digital to analog trainer modules.	4
4.	Digital logic trainer board.	4
5.	PLC trainer or Demo software.	4

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