Lok Jagruti Kendra University
University with a Difference

Diploma in Mechanical Engineering

LJ Polytechnic

Course Code: 025060507

Computer Integrated Manufacturing

Programme / Branch Name	Diploma in Mechanical Engineering					
Course Name	Computer Integrated Manfucaturing				**Course Code**	025060507
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Material Science
- ✓ Manufacturing Processes
- ✓ Machine Tools & Techniques
- ✓ Computer Applications

3. Rationale

Knowledge of Computer Integrated Manufacturing (CIM) after getting conversant with conventional manufacturing methods becomes essential for diploma engineers. The subject encompasses an entire range of manufacturing activities with the help of different methods. The course intends to help the students work on group technology, material planning, and handling. The subject makes aware the students of the advanced manufacturing practices/methods being implemented at leading industries across the globe, which ultimately leads to more customer satisfaction in terms of low cost and high quality.

4. Objectives

- ✓ Explain the role of computers and information technology in manufacturing.
- ✓ Using group technology concepts, create an FMS (Flexible Manufacturing System) layout for a given simple part family and group the components appropriately based on their characteristics.
- ✓ Recognize the utilization of robotics and new developments in the industrial industry.
- ✓ To develop an ability to function on multi-disciplinary teams.
- ✓ To develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- ✓ Work on multi-disciplinary projects to enhance skills, make effective oral presentations, and prepare technical documents effectively.
- ✓ Apply knowledge gained throughout the course in a final open-ended problem to build a factory system.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1.	**Introduction to CIM**	1.1. Explain the traditional product cycle with diagram and show all elements on it. 1.2. Explain advantages and benefits of the given CIM system. 1.3. Explain the given CAD/CAM/CIM product cycle. 1.4. Compare the given traditional product cycle with its counter CAD/CAM/CIM product cycle.	• Defitnition, scope and elements of CIM system-benefits. • Tradition product cycle diagram: role of marketing, R&D, design, PPC, quality control and sales departments. • Current production needs: production rate, quality, accuracy • Elements of CIM: CAD, CAPP, CAMC and Computer Aided Business Function (CABF) • CAD/CAM/CIM product cycle diagram	15	6
2.	**Group Technology & CAPP**	2.1. Select type of production layouts for given parts. 2.2. Select and develop GT codes for given parts. 2.3. Identify features and develop part families of the given parts. 2.4. Prepare cell layout of given part family. 2.5. Computer Aided Process Planning	• GT-concept, definition, need, scope & benefits. • Production layout-types, features and applications. • GT Layout-concept, need, benefits, comparison with conventional layout with example. • GT-codification systems-types, method of coding and examples. • Part family-concept, method to form and approach to form cell using part families. • Types and comparison of cell: manual and automatic cell, assembly cell. • Steps of cell design and cell layout.	20	10

			• CAPP- approaches, implementation techniques. • Advantages of CAPP.		
3.	**Flexible Manufacturing System (FMS) & AS/RS**	3.1. Identify role of major elements of FMS. 3.2. Develop simple FMS layout for given data and family of components. 3.3. Classify the FMS based on Flexibility for given types of layouts. 3.4. Justify the use of FMS for the given situation with examples. 3.5. Automated storage and retrieval system (AS/RS).	• FMS-introduction, concept, definition and need. • Major elements of FMS-workstations, material handling and storage system, computer control system. • Classification based on flexibility. • Classification based on types of layouts-inline layout, rotary layout, rectangular layout, loop layout, ladder layout. • Application and benefits of FMS, advantages and disadvantages of FMS. • AS/RS-introduction, objective, basic components, types, application. • Advantages of automated storage system.	30	12
4.	**Robotics**	4.1. Describe the importance of robotics in industry. 4.2. Select appropriate sensor for given application. 4.3. Explain the functions of the actuators used in robot. 4.4. Explain given types of grippers usedin robot. 4.5. Justify the use of robot in the given industrial situation.	• Introduction to robotics-difinition of robot and robotics, advantages, disadvantages. • Basic compoents of robot-manipulator, end effectors, actuators, sensors, controller. • Robot joits-linear, orthogonal, rotational, twisting and revolving. • Degree of freedom of robot.	20	8

			• Actuators- mechanical, hydraulic, pneumatic and electric. • End effectors- grippers and tyes. • Robot sensors- classification of sensors. • Basic configuration of robot. • Application of robot.		
5.	**Automation**	5.1. Explain the main lements of the given automation system. 5.2. Explain the given types of automations with respect to their characteristics. 5.3. Justify the need of automation for the given situation. 5.4. Explain the kind of strategies to be considered while designing automation in industry for the given situation.	• Automation-define, need, high and low cost automation, examples of automation. • Elements of automation-power source, control unit and feedback control. • Types of automations-fixed, programmable, flexible. Comparison of types of automations. • Stretegies in automation- simplification, specialization, multiple, integration of work stations, online inspection, process control and optimization.	15	6
				Total Hours	**42**

6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills, so that students can acquire the competencies/programme outcomes. Following is the list of practicals/exercises.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	Presentation on "How it's made"	Download movies / content and will present with the concept "How it's made".	4
2.	Prepare drawing of part brought and Select GT coding system and assign GT code to each part.	Prepare drawing of part, process plan, feature matrix and assign GT code to each part.	4
3.	Develop part family and perform necessary calculations and prepare conceptual FMS layout.	Prepare process time matrix, Determine type and number of work stations.	4
4.	Demonstrate working of robot (anyone) and sensors.	Application of sensors.	8
5.	Mini project	Prepare report; includes sketches, specifications, observation tables, parameters, truth tables, applications, etc.	4
6.	Seminar presentation	Prepare the seminar and make presentation on power point.	4
		Total Hours	**28**

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	Ap %	C %	E %	An %
1.	Introduction to CIM	28	35	21	-	8	8
2.	Group Technology & CAPP	44	35	7	-	7	7
3.	Flexible Manufacturing System (FMS) & AS/RS	35	45	16	-	4	-
4.	Robotics	35	44	-	-	7	14
5.	Automation	30	40	15	-	-	15

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) CAD/CAM/CIM by P. Radhakrishnan, New Age International Publishers.
2) Industrial Robotics by Groover, McGraw Hill Education.

9. Reference Books

1) Automation, Production Systems, and Computer-Aided Manufacturing by Mikell P. Groover, Hall International Publication.
2) Introduction to Robotics by Arthur J. Critchlow, McMillan Publication.
3) Computer Integrated Manufacturing by S.K. Vajpayee, PHI.
4) Basic Electronics by Mehta, V.K., S. Chand Publication.

10. Open Sources (Website, Video, Movie)

1) http://www.youtube.com/watch?v=M3eX2PKM1RI
2) https://nptel.ac.in/courses/112/103/112103277/
3) http://www.vlab.com
4) https://www.youtube.com/watch?v=Br2eEpiiwvU
5) https://www.youtube.com/watch?v=PDSmRPh6TaM
6) https://www.youtube.com/watch?v=YYdgLAlogpY
7) https://www.youtube.com/watch?v=S8zDRu72HD0
8) https://www.youtube.com/watch?v=eqXQ80vlgqE&list=PLGs0VKk2DiYxkoe2XNxDvVHqL5XG4dMWi
9) https://www.youtube.com/watch?v=Ynhp8Wi2qwM