GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3171510
Semester – VII
Subject Name: FLEXIBLE MANUFACTURING SYSTEM

Type of course: Professional Elective

Prerequisite: Nil

Rationale:
The course aims to impart basic knowledge of FMS system & its parameters.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to FMS** Limitations with conventional manufacturing, Need for FMS Introduction, Definition, Basic Component of FMS, Significance of FMS, General layout and configuration of FMS, Principle Objectives of FMS, Benefits and limitations of FMS, Area of Application of a FMS in Industry, Various Hardware and Software required for an FMS, CIM Technology, Hierarchy of CIM, FMS Justification.	**08**
2	**Manufacturing Cell** Introduction, Description and Classifications of Cell, Unattended Machining, Cellular versus Flexible Manufacturing.	**04**
3	**Group Technology:** Introduction, objectives, part families, algorithms and models for G.T. - Rank order clustering, Bond energy, mathematical model for machine – component cell formation. Design and manufacturing attributes. Parts classification and coding, concept of composite job machine group, cell group tooling, design rationalization.	**08**

4	**Turning and Machining Centres** Introduction, Types ,Construction and Operation Performed on Turning enter, Automated Features and Capabilities of Turning Centres, General Advantages and Disadvantages of Vertical and Horizontal Machining Centres, Pallet and Part Loading and Programming Options in Machining Centres, Automated features and capabilities of a Machining Centre.	**06**
5	**Cleaning and Deburring Equipment** Introduction, Wash Station and Operation Description, Deburring Station and Operation Description, Importance of Cleaning and Deburring in Automated Manufacturing.	**04**
6	**Automated Material Movement and Storage System** Introduction, Types of AGV and Their principle of working, Advantages, Limitation and General AGV Guide path, Robots, Benefits of using Industrial Robots, Basic components and benefits of Automated Storage and Retrieval Systems, Conveyors and Pallet Flotation System, Queuing Carrousels and Automatic Work Changers, Coolant and Chip Disposal and Recovery system.	**06**
7	**Distributed data processing in FMS** –DBMS and their applications in CAD/CAM and FMS – distributed systems in FMS -Integration of CAD and CAM - Part programming in FMS, tool data base - Clamping devices and fixtures data base.	**04**
8	**FMS Installation and Implementation** FMS Installation, FMS implementation	**05**
	Total Hours	**45**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**10**	**30**	**30**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Flexible Manufacturing System by H. K. Shivanand, M. M. Benal, V. Koti, New Age Pub.

2. Automation, Production Systems and Computer Integrated Manufacturing Groover

3. M.P, Prentice Hall of India

4. CAD/CAM – Groover M.P, Zimmers E.W, Prentice Hall of India.

5. Approach to Computer Integrated Design and Manufacturing Nanua Singh, John Wiley and Sons, 1998.

6. Principles of CIM , Vajpayee, PHI

7. Flexible Manufacturing Cells and Systems by Luggen

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand FMS & its applications.	15
CO-2	Implement Group Technology.	15
CO-3	Application of Turning & Machining Centres in FMS.	30
CO-4	Understand various types of AGVS and create automated material movement system	25
CO-5	Analyse and implementation of FMS	15

List of Experiments:

Experiments based on above contents and should include below mentioned topics.

1. Study about Introduction to FMS
2. Study Group Technology
3. Study about FMS Components and Interfaces
4. Study about Automated Material Handling Systems
5. Study about Automated Material Handling System
6. Study about Turning centre

7. Study about Machining centre

8. Case study on FMS

Design based Problems (DP)/Open Ended Problem:

1. Review of various methods for experimental measurements of friction in metal forming processes.

2. To plot the forming limit diagram and to study the effect of various strain paths on formability

3. To review research paper on experimental strain measurement in sheet metal forming processes

List of Open Source Software/learning website:

1. http://nptel.ac.in/courses/110106044/37

2. www.nptel.ac.in