GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code: ME02000941

Subject Name: Flexible Manufacturing System

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Nil
Rationale:	The course Flexible manufacturing system (FMS) is the most automated and technologically sophisticated of the machine cell types used to implement advance manufacturing. It covers multiple automated stations and is capable of variable routings among stations, while its flexibility allows it to operate as a mixed model system. The FMS knowledge integrates many of the advanced technologies of manufacturing like automation, CNC machines, distributed computer control, and automated material handling and storage.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
1	Compare traditional and flexible manufacturing system
2	Examine Group technology and Computer Aided Process Planning
3	Utilize Data processing and Interfacing of Computers in FMS.
4	Categorize material transport system and storage in FMS.
5	Determine bottleneck problems, its extensions and sizing in FMS.

Teaching and Examination Scheme:

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

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction: Mathematical Models of Production Performance: Production rate, Production capacity, Utilisation and availability, Lead time, and Work	08	20

	in progress. Economic Differentiation and justification of traditional manufacturing to flexible manufacturing system. Concept of FMS, Types and Components of FMS, Integration in Data Processing Systems. Examples of FMS installations.		
2.	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.	04	10
3.	Computer Aided Process Planning: Traditional Process planning, Data required for Process Planning, computer Aided Process Planning types, Backward and Forward approach, feature based CAPP and CAD based CAPP.	04	10
4.	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.	08	18
5.	Interfacing of computers - Machine tool controllers and handling systems: communications standards - programmable Logic Controllers (PLC's), Interfacing, Computer aided Project planning, dynamic part scheduling	06	14
6.	Material Transport system and Storage: Conveyors, AGVs, Industrial robots in material handling, AS/RS.	07	14
7	FMS Planning and Implementation issues, Quantitative analysis of FMS: Bottleneck model, Extended Bottleneck model and sizing the FMS.	08	14
	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**
10	**10**	**25**	**25**	**20**	**10**

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

References/Suggested Learning Resources:

(a) Books:

1. The design and operation of FMS, IFS publication, Paul Ranky, 1983.
2. Automation Production systems, Computer Integrated Manufacturing, Prentice Hall, Mikell P Groover,
3. Flexible Manufacturing, David J. Parrish, Butterworth-Heinemann, 1990.

4. Computer Aided Manufacture by Chien Chang and Richard A Wysk, Prentice HALL
5. CAD / CAM / CIM by P. Radhakrishnan, S. Subramanyan, New Age International.
6. Global Manufacturing, YORAM KORAM
7. Manufacturing Engineering and Technology, Pearson, Serope Kalpakjian, Schimid.
8. CAD/CAM theory and Practice, McGraw-Hill, Ibrahim Zeid.

(b) Open-source software and website:

Suggested Course Practical List:

1. Case study base on industry visit

As per the course content and course outcome.

List of Laboratory/Learning Resources Required:

Suggested Activities for Students: Any activity based on above syllabus content

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