

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: COMPUTER INTEGRATED MANUFACTURING
(COURSE CODE: 3385506)

Diploma Programme in which this course is offered	Semester in which offered
Fabrication Technology	8 th Semester

1. RATIONALE

Today computer integrated manufacturing systems are widely used in industries. This course develops capability in students to demonstrate and use of CIM in fabrication industry. Students can demonstrate and use automated assembly lines, group technology, Flexible manufacturing systems for welding, material handling and identification technology. Students can utilize various automated inspection systems/instruments in fabrication industries. Students can prepare planning and scheduling of process equipment fabrication using various CAPP softwares.

2. LIST OF COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skill in the students so that they are able to acquire following competency:

- **Use knowledge and skills of computer integrated manufacturing in fabrication industry**

3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes-

- Describe scope of C.I.M. in fabrication technology.
- Describe scope of group technology in fabrication industry.
- Prepare CAPP (Computer Aided Process Planning) for fabrication process equipment.
- Describe FMS (Flexible manufacturing System) in welding shop.
- Describe automated inspection system.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
4	-	2	6	70	30	20	30	

Legends: L-Lecture; T-Tutorial/Teacher Guided Student Activity; P-Practical; C-Credit; ESE-End Semester Examination; PA- Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-Topics
Unit –I Introduction to Manufacturing Systems	1 a. Understand importance and scope of CIM in fabrication/ manufacturing industry	INTRODUCTION AND SCOPE OF CIM IN FABRICATION INDUSTRY 1.1 Components of manufacturing system 1.2 Classification scheme for manufacturing system 1.3 Overview of classification scheme 1.4 Scope of CIM in fabrication industry 1.5 CIM hardware and software 1.6 Benefits of CIM in fabrication industry
Unit–II Automated Production & Assembly lines	2 a. Demonstrate automated production and assembly lines.	AUTOMATED PRODUCTION & ASSEMBLY LINES 2.1 Fundamentals of manual assembly lines 2.2 Fundamentals of automated production lines 2.1.1 System configuration 2.1.2 Work part transport mechanism 2.1.3 Storage buffers 2.1.4 Control of production lines 2.3 Application of automated production lines 2.4 Fundamental of automated assembly system 2.4.1 System configuration 2.4.2 Parts delivery at work station 2.4.3 Applications
Unit–III Cellular Manufacturing	3 a. Demonstrate Implementation of cellular manufacturing system in industries.	GROUP TECHNOLOGY AND CELLULAR MANUFACTURING 3.1 Part families 3.2 Parts classification and coding 3.3 Production flow analysis 3.4 Cellular manufacturing 3.5 Application of group technology
Unit-IV Flexible Manufacturing Systems	4 a. Demonstrate flexible manufacturing system.	FLEXIBLE MANUFACTURING SYSTEMS 4.1 Introduction of FMS 4.2 FMS components 4.3 Types of FMS 4.4 FMS application and benefits 4.5 FMS planning and implementation issues

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-Topics
Unit –V Material Handling & Identification Technologies	<p>5 a. Demonstrate automated material handling system.</p> <p>5 b. Demonstrate automated storage/retrieval system.</p>	<p>AUTOMATED MATERIAL HANDLING AND IDENTIFICATION TECHNOLOGIES</p> <p>5.1 Introduction to material handling 5.2 Material transport equipment 5.3 Conventional and automated storage / retrieval system(AS/RS) 5.4 Overview of Automatic identification and data capture methods</p>
Unit –VI Inspection principles & practices	<p>6 a. Demonstrate automated inspection system.</p>	<p>INSPECTION PRINCIPLES & PRACTICES</p> <p>6.1 Inspection fundamental 6.2 Automated inspection 6.3 When and where to inspect 6.3.1 Offline and online inspection 6.3.2 Product inspection vs. process monitoring 6.3.3 Distributed inspection vs. final inspection 6.4 Contact vs. non-contact inspection techniques 6.5 Coordinate measuring machine (CMM) 6.6 Machine vision</p>
Unit–VII Computer Aided Process Planning & Concurrent Engineering	<p>7 a. Demonstrate computer aided process planning.</p> <p>7 b. Demonstrate concurrent engineering and lean manufacturing.</p>	<p>COMPUTER AIDED PROCESS PLANNING & CONCURRENT ENGINEERING</p> <p>7.1 Introduction of Process planning 7.2 Retrieval CAPP system 7.3 Generative CAPP system 7.4 Concurrent Engineering 7.5 Advance manufacturing planning 7.6 Lean production and waste in manufacturing</p>

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I	Introduction to Manufacturing Systems	9	7	7	0	14
II	Automated Production & assembly lines	7	0	0	7	7
III	Cellular Manufacturing	10	0	7	7	14
IV	Flexible Manufacturing Systems	9	7	7	0	14
V	Material Handling & Identification Technologies	7	0	7	0	7
VI	Inspection principles & practices	7	0	0	7	7
VII	Computer Aided Process Planning & Concurrent Engineering	7	0	7	0	7
TOTAL		56	14	35	21	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's Revised taxonomy)

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

7. SUGGESTED LIST OF EXERCISE/PRACTICAL/EXPERIMENTS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, If these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus overall development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes

S. No.	Unit No.	Exercise /Practical (Outcomes in psychomotor domain)	Approx. Hrs. Required
1.	I	Demonstrate scope of CIM in fabrication/manufacturing industry.	2
2.	I	Demonstrate different CIM hardware and software.	2
3.	II	Demonstrate automated assembly line.	2
4.	III	Perform an activity to define part family of an object and classify with opitz coding system.	2
5.	IV	Demonstrate flexible manufacturing system in fabrication industries.	2
6.	V	Demonstrate automated storage/retrieval (AS/RS) system.	2
7.	V	Demonstration of automated guided vehicles and their application in fabrication/manufacturing industries.	2
8.	V	Identification of various types of material handling and transport equipment.	2
9.	VI	Demonstration of automated inspection system for an object.	2
10.	VI	Demonstration of dimensional measurement using coordinate measuring machine (CMM).	2
11.	VI	Demonstrate machine vision system with application.	2
12.	VII	Demonstrate computer aided process planning	2
13.	VII	Demonstrate Concurrent Engineering.	2
14.	VII	Demonstrate lean production and waste reduction in fabrication industries.	2
Total Hrs.			28

8. SUGGESTED LIST OF PROPOSED STUDENTACTIVITIES

Following is the list of proposed student activities:

- 8.1 Prepare sketchbook of drawing of various topics of syllabus
- 8.2 Prepare a question bank.
- 8.3 10 min PPT presentation on the given topic from the syllabus and beyond the syllabus
- 8.4 Report writing on various topics from syllabus and beyond syllabus
- 8.5 Fill up lab manual.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Arrange industrial visit.
- ii. Arrange expert lecture.
- iii. Show video films/animation films/photographs of different automated manufacturing process and discuss their features.

10. SUGGESTED LEARNING RESOURCES**A. List of Books**

S. No.	Title of Books	Author	Publication
1.	Automation, Production systems and Computer-Integrated Manufacturing	Mikell P. Groover	PHI Learning Pvt. Ltd.
2.	CAD/CAM/CIM	P. Radhakrishanan S. Subramaniam V. Raju	New Age Publications
3.	CAD/CAM Principles and Applications	P. N. Rao	Tata MacGraw hill Education Pvt. Ltd. New Delhi
4.	Computer Integrated Manufacturing	A. Alavudeen N. Venkateshwaran	PHI Learning Pvt. Ltd.
5.	Welding Technology	O. P. Khanna	Dhanpat Rai Publication
6.	N. C. Programming	Pabla	
7.	Computer Numerical Control	Hans B. Kief T. Frederick waters	

B. List of Major Equipment/Instrument

- i. Computers
- ii. Working model of automated storage and retrieval system.
- iii. Machine vision system
- iv. Coordinate measuring machine
- v. Automated assembly line
- vi. A3 size colour laser printer
- vii. Automated guided vehicles
- viii. Pick and place robot
- ix. Assembly robot
- x. Split A.C.

C. List of Software/Learning Websites

- i. CAPP software

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. P. B. Pathak**, I/C HOD, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. B. K. Gandhi**, Sr. Lecturer, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. S. Y. Merchant**, Sr. Lecturer, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. K. B. Pipavat**, Lecturer, Deptt. of Fabrication Technology, Sir B.P.I., Bhavnagar

Co-coordinator and Faculty Members from NITTTR Bhopal