



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Diploma Engineering College  
Semester-4(Diploma)

**Subject:** Advance manufacturing system-DETME14214

**Type of course:** Minor

**Prerequisite:** Manufacturing processes

**Rationale:** In the world of globalization, customer demands for a variety of products with high quality at affordable prices. To sustain in stiff competition and deliver products on time, industries are needed to accommodate new managerial philosophy and automated machinery to reduce time of production and cost. The ability to rearrange the existing machineries and to adopt quick change in product variety and demand give a knife edge to industries. Looking to the needs of industries, this course is offered to make students competent to operate advanced manufacturing systems. Thus, this course is a preferred course by mechatronics engineers.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

*Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*





**Course Content:**

Unit No	Course content	Hrs.	% Weightage
1	<b>Advanced Manufacturing Systems</b> AMS in industries, Evolution of transformation and manufacturing systems. Components, working and features of Computer Numerical Control machine. <b>Group Technology</b> Group technology - concept, need, scope, and benefits, codification systems, types, importance, part families, part classification and coding systems. Group technology Layout -concept, need, importance, comparison with conventional layout with examples/case study, benefits. Computer Aided Process Planning – conventional process planning and examples, CAPP concept, types, features, methods and importance.	10	20
2	<b>Cellular Manufacturing</b> Cellular Manufacturing- concept, definition, application and benefits. Part family and cell formation. Composite component and key machine concepts. Cell layout and design: Job and tool movement within cell. Types of cell manual and automatic cell, assembly cell, comparison of cell and Flexible Manufacturing Cell. Common troubles and remedies in sensor operations.	11	30
3	<b>Flexible Manufacturing System</b> Flexible Manufacturing Unit, turn-mill centers, multiple centers, advanced machining centers, etc. Transfer line- concept, meaning, features and examples. Flexible Manufacturing System -concept, meaning and benefits, major elements and their role. FMS: layout concept, types and their benefits. Automated Guided Vehicles in FMS- concept, definition, types, functions. Signal flow diagram, line balancing, Automated Storage and Retrieval System, case examples of FMS for specific components/group of components. Flexible assembly system.	8	15
4	<b>Just In Time and Concurrent Engineering</b> JIT concept need and reasons to include this concept in AMS. Unnecessary elements in conventional manufacturing system with reference to JIT. JIT implementation requirement. Concurrent engineering. Concept, terminology, definitions and objective in Concurrent engineering. <b>Computer Integrated Manufacturing (CIM)</b> CIM: concept, need, definition, block diagram and explanations, importance and features of each terms involved. Computer Aided Inspection- concept, types, working and application examples and benefits. Coordinate Measuring Machine (CMM) - its working and applications. Material requirement planning (MRP). Protocols in CIM- their features, functions and applications	16	35





**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<b>Case Studies</b> Analyze real-world manufacturing challenges and develop solutions in small groups. Upload report on GMIU web portal.	10
2	<b>Collaborative Design Challenge</b> Organize students into teams to design a product using advanced manufacturing techniques, requiring them to research, plan, and present their design along with a manufacturing strategy, emphasizing teamwork and problem-solving skills. Upload report on GMIU web portal	10
3	<b>Presentation Assignments</b> Have students create and deliver presentations on specific advanced manufacturing technologies. Upload report on GMIU web portal	10
Total		30

**Suggested Specification table with Marks (Theory):60**

<b>Distribution of Theory Marks</b> (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	25%	25%	25%	20%	5%	-

**Course Outcome:**

After learning the course, the students should be able to:	
CO1	Understand AMS, Group Technology, and CAPP concepts.
CO2	Understand cellular manufacturing concepts, design, and troubleshooting.
CO3	Learn Flexible Manufacturing Systems, layouts, AGVs, ASRS, and flexible assembly concepts.
CO4	Grasp JIT, Concurrent Engineering, CIM, CAI, CMM, and MRP concepts and applications.





**List of Practical:**

Sr. No	Descriptions	Unit No	Hrs.
1	<b>Layout Analysis:</b> Identify and analyze the types of layouts (e.g., process, product, cellular) used in selected industries, pinpoint faults, and suggest layout improvements.	1	2
2	<b>Part Feature Analysis:</b> Collaborate to identify different part features and develop a part-to-machine matrix to categorize part families.	1	4
3	<b>Part Coding Generation:</b> Use data processing software to generate part codes based on the data collected in the previous exercise.	2	2
4	<b>Process Planning:</b> Select an industrial component requiring multiple operations and develop a comprehensive process plan detailing four parts with more than five different operations.	2	2
5	<b>FMS Layout Identification:</b> Identify and analyze appropriate Flexible Manufacturing System (FMS) layouts for various manufacturing sectors, such as automotive, tool, machinery, and aerospace.	3	4
6	<b>AGV and AS/RS Simulation:</b> Simulate the planning and implementation of Automated Guided Vehicles (AGVs) and Automated Storage and Retrieval Systems (AS/RS) for a selected company.	3	2
7	<b>Advantages of JIT and Concurrent Engineering:</b> Quantify the benefits of Just-In-Time (JIT) manufacturing and concurrent engineering across various factors in specific industries.	4	2
8	<b>CIM Implementation Strategies:</b> Select an industry and identify the steps and strategies for implementing Computer-Integrated Manufacturing (CIM).	4	4
9	<b>Material Requirement Planning (MRP):</b> Generate a material requirement plan for a specific product available in the workshop, focusing on inventory levels and lead times.	4	4
10	<b>Process Optimization:</b> Conduct a study on existing processes within a selected industry and propose optimization strategies to enhance efficiency and reduce waste.	4	4
		Total	30





**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Reference Books:**

- [1] Automation, Production and Computer integrated Manufacturing by Groover, Mikell P PHI Learning, New Delhi (2013)
- [2] Flexible Manufacturing System by Shivanand H.K., Benal M.M., Koti V. New age publisher, New Delhi
- [3] Computer Integrated Manufacturing by Vajpayee S.K. PHI Learning, New Delhi (2013)
- [4] Computer Integrated by Bedworth, Wolfe and Anderson McGraw Hill New Delhi
- [5] Computer aided manufacturing by Rao,P ; Tewari,N and Kundra, T.K TMH Publication New Delhi
- [6] CAD/CAM/FOF, Vol I, II, and III by Juneja, Pujara and Sagar TMH Publication New Delhi
- [7] Computer integrated manufacturing by Rohg James A.; Kraebber Henry W. Pearson Publication New Delhi

