BMEE401L	Computer Integrated Manufacturing	L	T	P	C
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Pre-requisite	**BMHA202L , BMHA202P / BMEE306L , BMEE306P**	**Syllabus version**			
		1.0			

Course Objectives

1. To impart knowledge of CIM, various concepts of automation and applications.
2. To provide in-depth knowledge on digital manufacturing, IoT and Industry 4.0.

Course Outcomes

At the end of the course, the student will be able to

1. Differentiate the concepts of automation, CIM, CAD, and CAM.
2. Develop CNC part programs.
3. Interface real-time simulation with intelligent CNC machine tools using Digital Twins.
4. Apply CAM software tools for solving real time component machining.
5. Analyze the automated flow lines through FMS.
6. Visualize the concepts of future automated factory environments to digital transformation.

Module:1	**Basics of CIM and Automation**	**6 hours**

Introduction to Automation, Basic elements of automated systems- levels of automation, Advanced automation functions, Automation to Autonomy. Introduction to Computer Integrated Manufacturing, computerized elements of a CIM system, Evolution of Computer Integrated Manufacturing, Nature and role of the elements of CIM System, Product life cycle Management and Collaborative Product Development.

Module:2	**Computer Numerical Control**	**6 hours**

Principles elements of CNC system, Typical CNC Machine Tools, Designation of Axis and Motion of CNC Machines, Practical design considerations for CNC machined parts, CNC Controllers-Open architecture, PC based, Look ahead functions, Parallel kinematic Machine Tools, Multitasking CNC machines.

Module:3	**CAM Programming**	**7 hours**

Manual part programming, Computer assisted part programming, Automated programming of CNC-machine tools, Machining of Free form surfaces, Tolerance based Machining, Automatic Feature Recognition in CAM Programming, Knowledge based machining,

Module:4	**Intelligent Manufacturing systems**	**6 hours**

Artificial Intelligence and Machine Learning impact on CNC Machining, Intelligent fully autonomous CNC Machine tool, **Real-Time Machine Monitoring**, Real-time CAM simulation for Digital Manufacturing and Digital Twins.

Module:5	**Computerized Manufacture Planning and Control System**	**6 hours**

Computer Aided Process Planning, Retrieval and Generative Systems, benefits of CAPP, computer integrated production management system, Integration CAD/CAPP/CAM/CNC based on STEP Standards, ISO14649 STEPNC in Machining, Computer Aided Quality Control, Shop floor control.

Module:6	**Group Technology and Flexible Manufacturing Systems**	**6 hours**

Fundamentals of Group Technology-types of part families and Flexible Manufacturing Systems, types of FMS, FMS components, Material handling and storage system, applications, benefits, computer control systems.

Module:7	**Future of Automated Factory**	**6 hours**

Digital Transformation in manufacturing-Trends and Challenges, Industry 4.0, functions, applications and benefits. Internet of Things (IOT), IOT applications in manufacturing, Big-Data and Data Analytics in manufacturing, Blockchain in Manufacturing, cyber-physical manufacturing systems.

Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Books				
1.	Mikell P Groover, Automation, Production Systems and Computer-Integrated Manufacturing, 2019, 5th edition, Pearson.			
2.	Xun Xu, Integrating Advanced Computer-Aided Design, Manufacturing, and Numerical Control: Principles and Implementations, 2015, IGI Global.			
3.	Radhakrishnan P, CADC/CAM/CIM, 2018, New Age International (P) Ltd.			
Reference Books				
1.	Kant Vajpayee S, Principles of Computer Integrated Manufacturing, 1999, Prentice Hall of India, New Delhi.			
2.	Rao P.N, Tewari N. K. Computer Aided Manufacturing Tata McGraw Hill Pub, 2017, New Delhi.			
3.	Ercan Oztemel, Intelligent Manufacturing Systems, Smart Factories and Industry 4.0: A General Overview, 2019, 1st Edition.			
4.	Yáñez, Fran, and Brea, Francisco Yáñez. The 20 Key Technologies of Industry 4. 0 and Smart Factories: The Road to the Digital Factory of the Future. 2017, Independently Published.			
Mode of Evaluation: CAT, Written assignment, Quiz, FAT				
Recommended by Board of Studies		09-03-2022		
Approved by Academic Council		No. 65	Date	17-03-2022