

Course Title:				Human Machine Interface for Manufacturing				
Course Code:				MEL DE 614				
Course Coordinator				Dr.Sanjay Mohan				
Credits				<u>3</u>				
Evaluation Scheme Total 100 Marks								
Quiz (Total 20 Marks)				Assignment/Project (Total 20 marks) (Minimum Two Assignments or one Project)		Mid-Term	Major Examination	Total
Quiz I (5 marks)	Quiz II (5 marks)	Quiz III (5 marks)	Quiz IV (5 marks)			20 marks) (1 ½ Hour Duration)	(40 marks) (3 Hour Duration)	100 Marks
WEEKS				TOPICS TO BE COVERED				
Week 1				Introduction to Human-Machine Interfaces (HMIs): Definition, importance, and evolution in manufacturing. Principles of Human-Centered Design: User experience, usability, and ergonomics.				
Week 2				Types of HMIs in Manufacturing: Touchscreens, Graphical User Interfaces (GUIs), and Augmented Reality (AR). Case Studies illustrating the impact of effective HMIs on manufacturing efficiency and operator performance.				
Week 3				Manufacturing Automation and Integration: Introduction to HMI design principles and guidelines. Information Architecture: How to structure information effectively for users.				
Week 4				Visual Design: Importance of aesthetics and clarity in HMI design. Interaction Patterns: How users interact with interfaces.				
Week 5				Introduction to tools and techniques for HMI prototyping and development.HMI Prototyping and Development: Tools for interface design, including software and rapid prototyping methods. Usability Testing: Techniques for testing the usability of interfaces. Integration of Sensors and Actuators with HMIs: Visualizing and controlling real-time data. Industry best practices for designing intuitive and efficient HMIs in manufacturing environments.				
Week 6				Emerging HMI Technologies: Overview of natural language processing (NLP), gesture recognition, and haptic feedback in HMIs. Artificial Intelligence (AI) and Machine Learning (ML) in HMIs: Integration for predictive maintenance and decision support. Human-Robot Collaboration (HRC): Design considerations, including safety standards. Case studies showcasing innovative applications of advanced HMI technologies in smart manufacturing.				
Week 7				HMI Deployment and Optimization: Deployment strategies for HMIs in manufacturing settings. System Integration: Ensuring HMI compatibility with existing infrastructure. Scalability: Scaling HMI solutions in larger manufacturing environments.				
Week 8				Optimization Techniques for HMI Performance: Response time optimization, interface customization, and user feedback analysis. Maintenance and Troubleshooting of HMIs: Diagnostic tools, remote monitoring, and software updates. Evaluation Methodologies:				

	Assessing the effectiveness and usability of HMIs in manufacturing
Week 9	Case Study Discussions and Applications: Review and analyze case studies showcasing successful HMI implementation in real-world manufacturing environments. Emphasis on evaluating the effectiveness of different HMI technologies.
Week 10	Mid-Term Review: Recap of all major topics covered up to this point. Discussion of key concepts, challenges, and strategies for HMI design, prototyping, and deployment. Practice questions and sample case studies to prepare for mid-term exam.
Week 11 (17th -21st March, 2025)	Mid-Term
2nd May, 2025	Showing of Mid-Term Answer Sheets
Week 13	User-Centered Design for Advanced HMI Systems: Address the challenges and considerations when designing for diverse user groups, including unskilled labor or multi-lingual workforces.
Week 14	Emerging Trends in Smart Manufacturing: Discuss the future of HMIs in manufacturing, including the Internet of Things (IoT), smart factories, and integration with Industry 4.0 standards.
Week 15	Project Presentations: Students present final projects or assignments showcasing their understanding of HMI design and its application in manufacturing environments
Week 16	HMI Evaluation and Usability Testing: Methods to evaluate HMI systems in live manufacturing settings. Practical evaluation methods and case studies.
Week 17 (5th -9th May, 2025)	Revision Week
Week 18 (13th – 22nd May, 2025)	Major Examinations
29th May, 2025	Showing of Major Exams Answer Sheets

Course Outcomes:

CO1: Master the principles of Human Machine Interfaces (HMIs) and their applications in manufacturing

CO2: Design intuitive and efficient HMIs using human-centered design principles and advanced technologies

CO3: Develop HMIs that enhance operator performance, productivity, and safety in manufacturing environments.

CO4: Implement HMIs integrated with sensors, actuators, and artificial intelligence for real-time data visualization and control.

CO5: Deploy and optimize HMIs for seamless integration into manufacturing systems.

Recommended Books:

1. Human-Machine Interface Technology Advancements and Applications Edited By Ravichander Janapati, Usha Desai, Shrirang Ambaji Kulkarni, Shubham Tayal

Calendar of Quizzes/Assignment etc. to be provided as per below details and exact dates to be fixed in consultation with other course coordinators to avoid overlap of Quizzes of different courses.

Component	Date
Quiz-I	27 th -31 st , January 2025
Quiz-II	24 th -28 th February, 2025
Assignment-I	10 th -12 th February, 2025
Mid-Term	17-21 st March, 2025
Assignment-II/ Project Submission	21 st – 24 th April, 2025
Quiz-III	7 th – 11 th April, 2025
Quiz-IV	28 th April-2nd, May, 2025
Major Exam	13 th – 22 nd May, 2025

Note:

1. One surprise Quiz may be fixed out of Quiz-II, Quiz-III or Quiz-IV.
2. In case of any deviation in evaluation methodology for courses such as AEC/VAC/SEC shall be mentioned accordingly. Thus, same shall be approved by the next BOS of school if not done earlier.

Signature of Course Coordinator :