

COURSE TITLE	IOT FOR MECHANICAL ENGINEERING
COURSE CODE	01ME1724
COURSE CREDITS	4

Objective:

- 1 The course is prepared to provide the basic understating of IoT in manufacturing

Course Outcomes: After completion of this course, student will be able to:

- 1 Identify the requirement of IoT, IIoT, AR, VR and machine learning related smart manufacturing system.
- 2 Implement of smart manufacturing system in casting, welding and machining.
- 3 Analyse the outcome of IoT, IIoT, AR, VR and machine learning related system in smart manufacturing.
- 4 Evaluate the role of emerging Industry 4.0 technologies such as AR/VR, digital twins, collaborative robots, and blockchain with conventional manufacturing system
- 5 Evaluate industrial case studies for adoption and integration of smart manufacturing technologies.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction to IoT in Manufacturing Introduction to Industry-4.0, Industrial revolution, Automation and types of automation, Automation and types of automation, Type of sensors, Convergence of Automation and IIoT	5
2	Industrial IoT in manufacturing Smart factory and connectivity, Basics of Industrial IoT, IoT Architectures, Processors and controllers, Communication Protocol for Industrial IIoT, Robotics in IIoT	8
3	Machine Learning in Manufacturing Introduction and classification of machine learning, Maintenance using ML, Types of maintenance, Monitoring using ML, Machine Learning use case in manufacturing, Machine Learning use case in manufacturing, Economical analysis of ML implementation	7
4	AR-VR in Manufacturing Introduction to AR-VR, Difference between AR-VR, Value creation through AR-VR, Industrial application of Augmented Reality, AR-VR use cases in manufacturing	6

Contents : Unit	Topics	Contact Hours
5	Advancement in Industry-4.0 Introduction to collaborative robots and its use cases, Introduction to 5G in manufacturing and its application, Introduction to Digital Twin, Introduction to Block Chain in manufacturing, Use cases of Blockchain in aerospace and automobile	8
6	IoT Case Studies IoT Case studies based on industrial Automation, Transportation, Smart cities, smart supply chain, Remote site monitoring	8
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Identify the challenges of any one manufacturing process Identify the challenges of any one manufacturing process	2
2	Implementation of IoT in metal cutting for process parameter monitoring Implementation of IoT in metal cutting for process parameter monitoring	2
3	Implementation of IoT in welding for process parameter monitoring Implementation of IoT in welding for process parameter monitoring	2
4	Implementation of IoT for predictive maintenance Implementation of IoT for predictive maintenance	2
5	Implementation of IoT in casting for process parameter monitoring Implementation of IoT in casting for process parameter monitoring	2
6	Demonstration of AR for lathe machine maintenance Demonstration of AR for lathe machine maintenance	2
7	Case study on AR-VR in manufacturing Case study on AR-VR in manufacturing	2
8	Implementation of digital and analog sensor for manufacturing processes Implementation of digital and analog sensor for manufacturing processes	2
9	Implementation of IoT for automatic inspection system Implementation of IoT for automatic inspection system	2
10	Case study on Machine Learning in manufacturing Case study on Machine Learning in manufacturing	2
11	Introduction to Ladder Logic in PLC Introduction to Ladder Logic in PLC	2
12	Case study on digital twin in manufacturing Case study on digital twin in manufacturing	2
Total Hours		24

Textbook :

- 1 Industry 4.0: The Industrial Internet of Things, Alasdair Gilchrist , Apress, 2016
- 2 Industry 4.0: Entrepreneurship and Structural Change in the New Digital Landscape, Tesseleno Devezas, João Leitão, Askar Sarygulov , Springer International Publishing, 2017

References:

- 1 Machine Learning, Machine Learning, Tom M. Mitchell, McGraw-Hill , 2017
- 2 Emerging Technologies of Augmented Reality: Interfaces and Design, Emerging Technologies of Augmented Reality: Interfaces and Design, Michael Haller, Mark Billinghurst, Bruce Thomas, IGI Publishing, 2011
- 3 Product Lifecycle Management (PLM): A Digital Journey Using Industrial Internet of Things (IIoT), Product Lifecycle Management (PLM): A Digital Journey Using Industrial Internet of Things (IIoT), Uthayan Elangovan, CRC Press, 2020
- 4 Industrial Internet of Things: Cyber Manufacturing Systems, Industrial Internet of Things: Cyber Manufacturing Systems, Brecher, Christian.; Jeschke, Sabina.; Rawat, Danda B., Springer, 2017
- 5 Practical Industrial Internet of Things Security: A Practitioner's Guide to Securing Connected Industries, Practical Industrial Internet of Things Security: A Practitioner's Guide to Securing Connected Industries, Sravani Bhattacharjee and Reza M. Parizi, Packt Publishing, 2018

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	20.00	20.00	15.00	15.00

Instructional Method:

- 1 Through Power point presentation

Supplementary Resources:

- 1 <https://colab.research.google.com>
- 2 developer.vuforia.com