

## Course Title: Introduction to Industry 4.0

### Objective of the Course:

This course provides a foundational understanding of Industry 4.0 technologies and their applications in modern manufacturing and production systems. Students will learn about key concepts, technologies, and implications of Industry 4.0 through lectures, case studies, and hands-on activities.

### Course Objectives:

1. Understand the concept and significance of Industry 4.0.
2. Identify key technologies driving Industry 4.0 transformation.
3. Explore practical applications of Industry 4.0 in manufacturing.
4. Analyze the impact of Industry 4.0 on workforce and business models.
5. Evaluate challenges and opportunities associated with Industry 4.0 adoption.

### Syllabus:

#### Introduction to Industry 4.0 (2 hours)

- Definition and evolution of Industry 4.0
- Key principles and objectives
- Implications for manufacturing and society

#### Cyber-Physical Systems (4 hours)

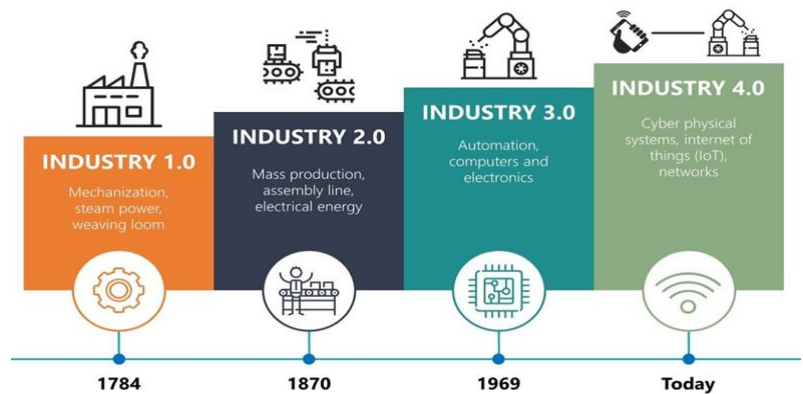
- Fundamentals of cyber-physical systems
- Integration of hardware and software
- Case studies of CPS in manufacturing

#### Internet of Things (IoT) and Big Data (4 hours)

- Concepts and architecture of IoT
- Sensors, connectivity, and data collection
- Basics of big data and analytics
- IoT and big data applications in manufacturing

#### Artificial Intelligence and Machine Learning (4 hours)

- Overview of AI and machine learning
- AI applications in manufacturing
- AI-powered automation and optimization



### Robotics and Automation (4 hours)

- Introduction to robotics technologies
- Automated manufacturing processes

### Digital Twins and Virtual Reality (4 hours)

- Concept of digital twins
- Virtual reality (VR) and augmented reality (AR) applications
- Simulation and visualization in manufacturing

### Security and Challenges in Industry 4.0 (4 hours)

- Cybersecurity in smart manufacturing
- Ethical considerations and challenges
- Barriers to Industry 4.0 adoption

### Industry 4.0 Applications and Future Trends (4 hours)

- Real-world examples of Industry 4.0 implementations
- Emerging trends and future outlook

