

<b>Savitribai Phule Pune University</b> <b>Fourth Year of Artificial Intelligence and Data Science (2020 Course)</b> <b>417526: Computer Laboratory II: Industrial Internet of Things</b>		
<b>Teaching Scheme:</b> <b>PR: 04 Hours/Week</b>	<b>Credit</b> <b>02</b>	<b>Examination Scheme and Marks</b> <b>Term Work (TW): 50 Marks</b> <b>Practical (PR): 25 Marks</b>
<b>Prerequisites Courses:</b> Internet of Things Laboratory (217531)		
<b>Companion Course:</b> Elective III: Industrial Internet of Things (417523(B))		
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• To explore the needs and fundamental concepts of IIoT</li> <li>• To elucidate the roles of sensors and protocols in IIoT</li> <li>• To design and assemble IIOT system for various applications</li> </ul>		
<b>Course Outcomes:</b> On completion of the course, learner will be able to– <b>CO1:</b> Understand IIoT technologies, architectures, standards, and regulation <b>CO2:</b> Build IIOT systems that include hardware and software and be exposed to modern and exciting hardware prototyping platforms <b>CO3:</b> Use the technology behind IIOT to develop real applications and improve them through smart technologies		
<b>Instructions:</b> <ol style="list-style-type: none"> <li>1. Practical work can be performed on a suitable development board (Arduino/ Raspberry pi)</li> <li>2. Perform total 5 experiments from Group A and one mini-project from Group B</li> </ol>		
<b>Virtual Laboratory</b> <ol style="list-style-type: none"> <li>1. <a href="https://nielit.gov.in/node/12096">https://nielit.gov.in/node/12096</a></li> <li>2. <a href="https://www.fp-lims.com/en/industrial-internet-of-things-iiot-lims/">https://www.fp-lims.com/en/industrial-internet-of-things-iiot-lims/</a></li> </ol>		
<b>List of Assignments</b>		
<b>Group A</b>		
1. Write a program for building a small-scale IIoT network using wireless communication protocols		
2. Write a program for sending alert messages to the user for controlling and interacting with your environment.		
3. Write an Arduino/ Raspberry pi program for interfacing with PIR sensor Experiment		
4. Write a Program to design and develop a user interface for monitoring and controlling CPS system		
5. Write a program for sending sensor data to the cloud and storing it in a database		
6. Write a program for developing an IIoT application for energy monitoring and optimization		
7. Write a program for implementing IIoT-enabled robotics and automation solutions		
8. Write a program for implementing security measures in an IIoT system		
9. Write a program for performing industrial data analysis using relevant tools and techniques		
<b>Group B</b>		

Develop any one of following Mini Project-

1. Smart Parking System
2. IIoT based smart energy meter
3. Smart Agriculture system
4. Automation using controller via Bluetooth
5. TEMPERATURE CONTROLLED FAN /COOLER USING CONTROLLER
6. Automatic street light
7. Smart Baggage Tracker
8. Build a small sensor network using Raspberry Pis and various sensors (e.g. temperature, humidity, vibration, etc.) to monitor a small manufacturing process. You can use a platform like Node-RED to visualize and analyze the data collected by the sensors.
9. or any suitable advanced mini project to build IIOT system

### Learning Resources

#### Text Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

#### Reference Books:

1. Industrial Internet of Things (IIoT): Intelligent Analytics for Predictive Maintenance, R. Anandan, Suseendran Gopalakrishnan, Souvik Pal, Noor Zaman, Wiley publication
2. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.

#### e-Books:

1. How Protocol Conversion Addresses IIoT Challenges: White Paper ByRed Lion.
2. <https://www.ibm.com/topics/industry-4-0>
3. <https://www.wevolver.com/article/the-engineer-s-guide-to-industrial-iiot-and-industry-4-0>

#### MOOC Courses:

1. [https://onlinecourses.nptel.ac.in/noc20\\_cs69/preview](https://onlinecourses.nptel.ac.in/noc20_cs69/preview)
2. <https://www.coursera.org/specializations/developing-industrial-iiot/courses>
3. <https://www.coursera.org/learn/industrial-internet-of-things>
4. <https://www.coursera.org/learn/internet-of-things-sensing-actuation>

### The CO-PO Mapping Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P O 12
CO1	2	2	2	-	-	-	-	-	-	-	-	2
CO2	2	2	1	2	2	2	-	-	-	-	-	2
CO3	2	2	2	2	-	-	2	-	2	2	-	2