D. Y. Patil College of Engineering and Technology

Kasaba Bawada, Kolhapur

(An Autonomous Institute)

Accredited by NAAC with 'A' Grade

Department of Electronics & Telecommunication Engineering

Program Structure and Syllabus

Minor Degree

In

Internet of Things (IoT)

(To be implemented from academic year **2022-23)**

Minor Degree details

With a view to enhance the employability skills and impart knowledge in emerging areas which are usually not being covered in Undergraduate Degree credit framework, AICTE has come up with the concept of „Minor Degree" in emerging areas.

Minor specialization in EMERGING AREAS in Under Graduate Degree Courses is allowed where a student of another Department shall take the minimum additional Credits in the range of 18-20 and get a degree with minors in specialized area. These credits are in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline.

Knowledge of these emerging areas will help students in capturing the plethora of employment opportunities available in these domains. With the help of industry-academia experts, the institute has framed the curriculum of Minor Degrees. Following are the minor degrees offered by the various departments:

Sr. No.	Department	Minor Degree Offered
1	Architecture	Sustainable Energy Practices
2	Chemical Engineering	Food and Nutrition Technology
3	Civil Engineering	Environmental Sustainability
4	Mechanical Engineering	Robotics and Industry 4.0
5	Electronics & Telecommunication Engineering	Internet of Things (IoT)
6	Computer Science & Engineering	Web Development

Interested students studying in semester III can choose only one minor degree track offered by other department (excluding minors offered by their core undergraduate course). The final list of allocation will be displayed, following the eligibility criteria mentioned in the academic rules and regulations, before beginning of semester IV.

The minor degree will be run only when the minimum students count is 30 for respective track.

Students once enrolled for any minor degree are not permitted to change the track. However, a student can withdraw at any semester.

The fee for minor degree is to be paid in addition to the college fees. There will not be any fee concession/relaxation for any category student. The fee will not be refunded when withdrawn from the minor degree.

Minor degree courses will begin from semester IV onwards as per the structure of the respective tracks.

Sr. No	Course Code	Course Type	Name of the Course	Sem	Teaching Scheme Per Week			Credits	Total Marks	Evaluation scheme			
					L	T	P						
1	201ETMIL221	PCC	Introduction to IoT	IV	3	-	-	3	100	ISE MSE ESE	20 30 50	20 20	40
2	201ETMIP222	LC	Introduction to IoT Lab	IV	-	-	2	1	100	ISE ESE (POE)	25 25	10 10	20
3	201ETMIL323	PCC	IoT Protocols	V	3	-	-	3	100	ISE MSE ESE	20 30 50	20 20	40
4	201ETMIP324	LC	IoT Protocols Lab	V	-	-	2	1	100	ISE ESE (POE)	25 25	10 10	20
6	201ETMIL325	PCC	IoT System Design	VI	3	-	-	3	50	ISE MSE ESE	20 30 50	20 20	40
7	201ETMIP326	LC	IoT System Design Lab	VI	-	-	2	1	50	ISE ESE (POE)	25 25	10 10	10 10
8	201ETMIP327	PCC	Industry 4.0 and IIoT	VI	3	-	-	3	50	ISE MSE ESE	20 30 50	20 20	40
9	201ETMIP328	LC	Industry 4.0 and IIoT Lab	VI	-	-	2	1	50	ISE ESE (POE)	25 25	10 10	10 10
10	201ETMIP425	PROJ	Mini Project	VII	-	-	2	2	100	ISE ESE (POE)	50 50	40	40
				Total	**12**	**-**	**10**	**18**	**700**	**Total Credits: 18**			
										Total Contact Hrs.: 5/week			

Course Code	Definition
PCC	Professional Core Course
LC	Laboratory Course
PROJ	Project

Abbreviations:

ISE: In Semester Evaluation,

MSE: Mid semester Examination,

ESE: End Semester Examination

Course Plan:

Course Title: Introduction to Internet of Things (IoT)	
Course Code: 201ETMIL221	**Semester:** IV
Teaching Scheme: L-T-P: 3-0-0	**Credits :** 3
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks :** 50

Course Description: The course familiarizes students with basic terminologies of internet of things and the essential knowledge to get started in the field of IoT.

Course Objectives:

To make students

1. To know the IoT ecosystem.
2. To provide an understanding of the technologies and the standards relating to the Internet of Things.
3. To develop skills on IoT technical planning.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Understand the basics of Networking and Security.
2	Understand predecessor of IoT technology and emergence of Internet of Things
3	Understand architecture of Internet of Things
4	Recognize various devices, sensors, actuators, and various processing paradigms for IoT.

Contents	Hours
Unit No.01: Basics of Networking & Basics of Network Security: Network Types, Layered Network Models, Addressing , Internet of Things TCP/IP Transport layer, Security ,Network Confidentiality, Cryptography, Message Integrity and Authenticity, Digital signatures, Key Management, Internet Security & Firewall.	**6**
Unit No.02: Predecessors of IoT & Emergence of IoT– Introduction, Wireless Sensor Networks, Machine-to-Machine Communications, Cyber Physical Systems, Architectural components of CPS, IoT versus M2M, IoT versus CPS, IoT versus WoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components, Addressing Strategies in IoT.	**6**
Unit No.03: IoT Architecture -State of the Art – Architecture Reference Model, IoT reference Model, IoT Reference Architecture, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	**6**
Unit No.04: IoT Sensing - Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics, Data Formats.	**6**
Unit No.05: IoT Processing - Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading, Offload location, Offload decision making, Offloading considerations.	**6**
Unit No.06: IoT Case Studies: Agricultural IoT, Components of an agricultural IoT, Advantages of IoT in agriculture, Vehicular IoT, Components of vehicular IoT, Advantages of vehicular IoT, Healthcare IoT, Components of healthcare IoT, Advantages and risk of healthcare IoT, Case Studies.	**6**

Text Books:

1. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press
2. Bassi, Alessandro, et al, "Enabling things to talk", Springer-Verlag Berlin -2016

Reference Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017
2. Neil Cameron: Arduino Applied-Comprehensive Projects for Everyday Electronics, Apress.
3. Internet of Things, Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, John Wiley & Sons.
4. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers.

Course Plan:

Course Title: Introduction to Internet of Things (IoT) Lab	
Course Code: 201ETMIP222	**Semester:** IV
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 1
Evaluation Scheme: ISE Marks: 25	**ESE (POE):** 25

Course Description: The course familiarizes students with basic terminologies of internet of things and the essential knowledge to get started in the field of IoT.

Course Objectives:

01. To provide handson practice of IoT ecosystem, an understanding of the technologies and the standards relating to the Internet of Things.
02. The course will also develop skills on IoT technical planning.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Understand the basics of Networking and Security.
2	Understand predecessor of IoT technology and emergence of Internet of Things
3	Understand architecture for Internet of Things
4	Recognize various devices, sensors, actuators, and various processing paradigms for IoT.

	List of Experiments		
Expt. No.	**Name of Experiment**	**Type**	**Hrs**
1	Introduction to Arduino programming.	S	2
2	Introduction to Arduino Uno R3	S	2
3	To blink the LED with Arduino.	O	2
4	To interface push button with Arduino.	O	2
5	To interface LCD with Arduino.	O	2
6	To read the analog voltage using ADC on Arduino.	O	2
7	To detect occupancy of an area using PIR sensors	O	2
8	To interface real time clock IC DS1307 with Arduino.	O	2
9	To measure the distance of an object using ultrasonic sensor	O	2
10	To display temperature and humidity data.	O	2
11	To control LED using remote control.	O	2
12	To implement RFID based parking system.	O	2

***Perform any 10 experiment from above list.**

S - Study, O – Operation

Text Books:

1. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press
2. Bassi, Alessandro, et al, “Enabling things to talk”, Springer-Verlag Berlin -2016

Reference Books:

a. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017
b. Neil Cameron: Arduino Applied-Comprehensive Projects for Everyday Electronics, Apress.
c. Internet of Things, Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, John Wiley & Sons.
d. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers.

Course Plan:

Course Title: IoT Protocols	
Course Code: 201ETMIL323	**Semester:** V
Teaching Scheme: L-T-P: 3-0-0	**Credits :** 3
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks :** 50

Course Description: The course gives knowledge about various protocols designed for implementation of Internet of Things.

Course Objectives:

The main objective of the course is to make students.

1. To know the basic concept and architecture of embedded systems.
2. To make students to know different design protocols used for an embedded system for IoT applications.
3. To make students to gain knowledge about the IoT enabled technology.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Understand the basics of IoT Networking.
2	Learn working of IoT Connectivity/Medium access protocols
3	Understand about IoT network layer/communication protocols
4	Analyze various IoT Application layer Protocols.

Contents	Hours
Unit No. 01: Introduction to Things in IoT: Introduction, Edge Devices- Node MCU/ESP 32, Programming edge node, Introduction to Gateways, Gateways types and configurations, Gateway as an extension of the cloud, HTTP access method using API.	**6**
Unit No. 02: IoT Connectivity Technologies: RFID , NFC, Wi-Fi, Bluetooth low energy, IEEE 802.15.4, Zigbee, Thread, Wireless HART, Z-Wave, LoRa, NB-IoT.	**6**
Unit No. 03: IoT Communication Technologies– Introduction, Constrained nodes, Constrained networks, Types of constrained devices, Low power and lossy networks, Infrastructure protocols, Internet protocol version 6 (IPv6), RPL,6LoWPAN, Content-centric networking (CCN), Discovery Protocols, Physical web, Multicast DNS (mDNS), Universal plug and play (UPnP), Data Protocols, MQTT, CoAP, AMQP, XMPP, REST, WebSocket, Identification Protocols, EPC, URIs, Device Management, Semantic Protocols, JSON-LD, Web thing model.	**8**
Unit No. 04: IoT Interoperability: Introduction, Taxonomy of interoperability, Standards, DLNA, Konnex, UPnP, Frameworks, universal, IoTivity, HomeKit.	**4**
Unit No. 05: IOT Associated Technologies: Introduction, Virtualization, Advantages of virtualization, Types of virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Importance of SLA, Metrics for SLA.	**6**
Unit No. 06: Cloud Computing- Cloud Implementation, Cloud simulation, An open-source cloud: Open Stack, A commercial cloud: Amazon web services (AWS), Sensor-Cloud: Sensors-as-a-Service, Importance of sensor-cloud, Architecture of a sensor-cloud platform	**6**

Text Books:

1. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press.
2. Hanes et al “IoT Fundamentals”, Cisco Press.

Reference Books:

1. Rahul Dubey, “An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications”, Cengage India Publication.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Keyapplicationsand Protocols”, Wiley, 2012.
3. RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, Internet of Things, John Wiley and Sons.
4. Klaus Elk, “Embedded Software for the IoT”.
5. Perry Xiao, “Designing Embedded Systems and the Internet of Things (IoT) with the ARM Mbed”.
6. Elizabeth Gootman et. al, “Designing Connected Products”, Shroff Publisher/O‟Reilly Publisher.

Course Plan:

Course Title: IoT Protocols Lab	
Course Code: 201ETMIP324	**Semester:** V
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 1
Evaluation Scheme: ISE Marks: 25	**ESE (POE):** 25

Course Description: The course gives knowledge about various protocols designed for implementation of Internet of Things.

Course Objectives:

The main objective of the course is

1. To provide hands-on practice on the architecture of embedded systems and different design protocols used for an embedded system for IoT applications.
2. To make Students to gain knowledge about the IoT enabled technology.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Understand the basics of IoT Networking.
2	Learn working of IoT Connectivity/Medium access protocols
3	Understand about IoT network layer/communication protocols
4	Analyze various IoT Application layer Protocols.

	List of Experiments		
Expt. No.	**Name of Experiment**	**Type**	**Hrs**
1	To connect to WiFI and implement Soft API on IOT nodes.	O	2
2	To Create a standalone web server that controls outputs (two LEDs).	O	2
3	To build a web server with a slider to control the LED brightness.	O	2
4	To create an SMS notification system that sends an SMS when sensor readings are above orbelow a certain threshold.	O	2
5	To make HTTP GET and HTTP POST requests to get values, post JSON objects and URLencoded requests with IOT node.	O	2
6	To implement client-server communication between two IOT nodes.	O	2
7	To implement WebSocket communication protocol to control IOT node.	O	2
8	To send emails with the IOT node using an SMTP Server	O	2
9	To make HTTP POST requests to post JSON data or URL encoded values to Thing Speak.	O	2
10	To make HTTP GET requests to decode JSON data from OpenWeatherMap.org and plotvalues in charts using Thing Speak.	O	2
11	To use MQTT communication protocol to publish messages and subscribe to topics.	O	2
12	To create a simple LoRa Sender and LoRa Receiver with the RFM95 transceiver module.	O	2

***Perform any 10 experiment from above list.**

O - Operational

Text Books:

1. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press.
2. Hanes et al “IoT Fundamentals”, Cisco Press.

Reference Books:

1. Rahul Dubey, “An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications”, Cengage India Publication.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Keyapplicationsand Protocols”, Wiley, 2012.
3. RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, Internet of Things, John Wiley and Sons.
4. Klaus Elk, “Embedded Software for the IoT”.
5. Perry Xiao, “Designing Embedded Systems and the Internet of Things (IoT) with the ARM Mbed”.
6. Elizabeth Gootman et. al, “Designing Connected Products”, Shroff Publisher/O‟Reilly Publisher.

Course Plan:

Course Title: IoT System Design	
Course Code: 201ETMIL325	**Semester:** VI
Teaching Scheme: L-T-P: 3-0-0	**Credits :** 3
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks :** 50

Course Description: The course emphasizes on design, requirements, data interfacing capabilities of IoT in industrial applications.

Course Objectives:

1. To give students knowledge about different IoT architectures, interfacing sensors and actuators with different IoT architectures.
2. To apply Cloud computing, Machine learning and Data analytics for industrial applications based on IoT.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Learn Python for Machine learning applications
2	Understand Raspberry PI along with critical protocols and its communication to cloud.
3	Design web/cloud based IoT applications.
4	Install, configure and use of AWS CLI and SDK on a Linux system with applications of various AWS services.

Contents	Hours
Unit No. 01: Introduction to Raspberry Pi & Gateways: Introduction, Edge Devices- Raspberry Pi, A short tour of Linux operating system, Programming edge node, Introduction to Gateways, Gateways types and configurations, Gateway as an extension of the cloud, HTTP access method using API, Introduction and installing the Raspbian Stretch OS, Headless.	**6**
Unit No. 02: Interfacing of Raspberry Pi: A short tour of Linux operating system - Computer and Rpi configuration to connect Rpi remotely without Ethernet cable via SSH, IP address, Rpi - Testing the GPIO pins through Scripts, Raspberry pi3 interfacing with Sensor DHT11, Raspberry pi pythonlibrary install and reading sensor feed, Storing sensor data in cloud and in database, MySQL server on Raspi.	**6**
Unit No. 03: IoT and data analytics: IoT and Data Management, Data cleaning and processing, Data storage models. Search techniques, Deep Web, Semantic sensor web, Semantic Web Data Management, Searching in IoT, Real-time and Big Data Analytics for The Internet of Things,	**6**
Unit No. 04: Data Processing: Heterogeneous Data Processing, High-dimensional Data Processing, Parallel and Distributed Data Processing.	**7**
Unit No. 05: Cloud of Things: IoT Physical Servers, Cloud Offerings, and IoT Case Studies, Introduction to Cloud Storage Models, Communication API, Eclipse IoT, AWS IoT, Google Cloud IoT, ThingWorx.	**6**
Unit No. 06: Python Libraries for Machine Learning: Pyhton basics and its libraries for machine learning, NumPy, Pandas, SciPy, MatPlotLib and SciKit Learn	**5**

Text Books:

1. Sudip Misra, Chandana Roy and Anandarup Mukherjee, “Introduction to Industrial Internet ofThings and Industry 4.0”, CRC Press
2. Rahul Dubey, “An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications”, Cengage India Publication

Reference Books:

1. Richardson, M., & Wallace, S. (2012). Getting started with raspberry PI. " O‟Reilly Publisher Media, Inc."
2. Shrirang Ambaji Kulkarni: Introduction to IOT with Machine learning and Image Processing using Raspberry Pi, CRC Press
3. Rao, M. (2018). Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing Ltd

Course Plan:

Course Title: IoT System Design Lab	
Course Code: 201ETMIP326	**Semester:** VI
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 1
Evaluation Scheme: ISE Marks: 25	**ESE (POE):** 25

Course Description: The course emphasizes on design, requirements, data interfacing capabilities of IoT in industrial applications.

Course Objectives:

1. To give students hands-on experience using different IoT architectures and provide skills for interfacing sensors and actuators with different IoT architectures.
2. To apply Cloud computing, Machine learning and Data analytics for industrial applications based on IoT.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Learn Python for Machine learning applications
2	Understand Raspberry PI along with critical protocols and its communication to cloud.
3	Design web/cloud based IoT applications.
4	Install, configure and use of AWS CLI and SDK on a Linux system with applications of various AWS services.

	List of Experiments		
Expt. No.	**Name of Experiment**	**Type**	**Hrs**
1	Rpi3 introduction and installing the Raspbian Stretch OS.	S	2
2	Overview of the graphic user interface for Raspian Linux distribution and operate the Raspberry Pi in "headless mode".	S	2
3	Testing the GPIO pins of Rpiby python programs and scripts.	O	2
4	Raspberry pi3 python library installation and reading sensor feed.	O	2
5	'Plug and play ' type cloud platform overview for integration to IoT devices.	O	2
6	To create a standalone web server with a Raspberry Pi that displays temperature and humidity readings with a DHT11 sensor (Connected to 8266).	O	2
7	Control two outputs of an ESP8266 using MQTT protocol.	O	2
8	Real time license plate recognition using raspberry pi	O	2
9	Design a face recognition robot using Raspberry pi.	O	2
10	Environment setup for Android Things with Raspberry pi.	O	2
11	Implement an artificial neural network that can recognize keywords in speech.	O	2
12	Design a line follower robot using Raspberry pi.	O	2

***Perform any 10 experiment from above list.**

S – Study, O - Operational

Text Books:

1. Sudip Misra, Chandana Roy and Anandarup Mukherjee, “Introduction to Industrial Internet of Things and Industry 4.0”, CRC Press
2. Rahul Dubey, “An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications”, Cengage India Publication

Reference Books:

1. Sudip Misra, Chandana Roy and Anandarup Mukherjee, “Introduction to Industrial Internet of Things and Industry 4.0”, CRC Press
2. Rahul Dubey, “An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications”, Cengage India Publication
3. Richardson, M., & Wallace, S. (2012). Getting started with raspberry PI. " O‟Reilly Publisher Media, Inc."
4. Shrirang Ambaji Kulkarni: Introduction to IOT with Machine learning and Image Processing using Raspberry Pi, CRC Press
5. Rao, M. (2018). Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3and JavaScript to build exciting IoT projects. Packt Publishing Ltd

Course Plan:

Course Title: Industry 4.0 and Industrial Internal of Things (IIoT)	
Course Code: 201ETMIL327	**Semester:** VI
Teaching Scheme: L-T-P: 3-0-0	**Credits :** 3
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks :** 50

Course Description: This course focuses on how industrial processes have changed through integration of modern Technology along with introduction Industrial Internet of Things (IIoT).

Course Objectives: The objectives of the course are

1. To integrate modern technologies such as sensors, communication, and computational processing.
2. To role of Cyber Physical System (CPS) and IoT for industrial transformation.
3. To Students will also learn how to apply IoT in industries to modify the various existing industrial systems.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Study sensing and actuation in industries.
2	Understand the basics of industrial IoT (IIoT).
3	Apply Big data analytics and Software defined networks in IIoT.
4	Study IIoT security and various IIoT application domains.

Contents	Hours
Unit No. 01: Introduction: Globalization, The Fourth Revolution, LEAN Production Systems; Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management,Augmented Reality and Virtual Reality.	**6**
Unit No. 02: Basics of Industrial IoT: IIoT introduction, Industrial Processes-Part I, Part II, Industrial Sensing & Actuation; Industrial IoT: Business Model and Reference Architecture: Part I, Part II, Industrial IoT-Layers: IIoT Sensing- Part I, Part II, IIoT Processing-Part I, Part II, IIoT Communication-Part I	**6**
Unit No. 03: IIoT-Big Data Analytics: Introduction, Machine Learning and Data Science Part I, Part Il. Data Center Networks.	**6**
Unit No. 04: IIoT and Software Defined Networks: Software Defined Networks: SDN in IIoT-Part I, Part II,	**6**
Unit No. 05: Industrial IoT Security: Fog Computing in IIoT, Security in IIoT-Part I, Part II, Plant Safety and Security (Including AR and VR safety applications), Facility Management.	**4**
Unit No. 06: Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Health care, Power plants, Inventory Management & quality control, case studies.	**8**

Books:

1. Sudip Misra, Chandana Roy and AnandarupMukherjee, “Introduction to Industrial Internet of Things and Industry 4.0”, CRC Press
2. G Veneri Antonio, “Hands-on Industrial Internet of Things”, Packt Publication.

Course Plan:

Course Title: Industry 4.0 and Industrial Internal of Things (IIoT) Lab	
Course Code: 201ETMIP328	**Semester:** VI
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 1
Evaluation Scheme: ISE Marks: 25	**ESE (POE):** 25

Course Description: This course focuses on how industrial processes have changed through integration of modern Technology along with introduction of Industrial / Internet of Things (IIoT).

Course Objectives:

The objective of the course is

1. To integrate modern technologies such as sensors, communication, and computational processing.
2. To role of CPS and IoT for industrial transformation.
3. To make Students to learn how to apply IoT in industries to modify the various existing industrial systems.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Learn Python for Machine learning applications
2	Understand Raspberry PI along with critical protocols and its communication to cloud.
3	Design web/cloud based IoT applications.
4	Install, configure and use of AWS CLI and SDK on a Linux system with applications of various AWS services.

	List of Experiments		
Expt. No.	**Name of Experiment**	**Type**	**Hrs**
1	Smart Home Assistant with cloud integration	O	2
2	Intelligent and Weather Adaptive Street Lighting system	O	2
3	Development of Agricultural IoT Gateway	O	2
4	Connected Agri Warehouses cloud enabled infrastructure	O	2
5	Soldier health & Position tracking system with LORA Communication	O	2
6	e-health monitoring system for remote patient health monitoring	O	2
7	Smart Biometric Attendance System with Raspberry Pi	O	2
8	Cloud integrated smart attendance system	O	2
9	Automatic Vehicle Accident Alert System using AWS IoT.	O	2
10	Design and implement a RFID based smart attendance system.	O	2
11	Design and implement a smart liquid level monitoring system.	O	2
12	Design a Smart factory for Industry 4.0 (Sketch)	O	2

***Perform any 10 experiments from above list.**

O – Operational

Books:

1. Sudip Misra, Chandana Roy and AnandarupMukherjee, “Introduction to Industrial Internet of Things and Industry 4.0”, CRC Press
2. G Veneri Antonio, “Hands-on Industrial Internet of Things”, Packt Publication.

Course Plan:

Course Title: Mini Project	
Course Code: 201ETMIP425	**Semester:** VII
Teaching Scheme: L-T-P: 0-0-2	**Credits:** 2
Evaluation Scheme: ISE Marks: 50	**ESE (POE):** 50

Course Description:

Course Objectives: The main objective of Mini Project is

1. To let the students apply the theoretical knowledge.
2. To solve real time problems or situations.

Course Outcomes:

At the end of the course the student should be able to

Co. No.	Statement
1	Understand, plan, and execute a Mini Project with team.
2	Acquire knowledge within the chosen area of technology for project development.
3	Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
4	Communicate and report effectively project related activities and findings.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Ability to conceptualize interdisciplinary domain knowledge to specific branch of engineering.

2. Ability to acquire employability skills and deep knowledge in emerging and multidisciplinary areas.

3. To Carry out engineering projects in broad areas of engineering.

Guidelines:

- The mini project is desirable to be done in a group of 3 students. Each group has to prepare a title related to any engineering discipline, and the title must emulate any real-world problem.
- Submit an early proposal. This proposal is a 1-2page(s) report, describes what the project and the final product's outcomes. The project proposal should be submitted to the respective guide.