| Course Code | 402-01 |
|---|---|
| Course Title | Internet of Things (IoT) |
| Credit | 4 |
| Course Category | Minor Course |
| Level of Course | 200-299 ( Intermediate Level ) |
| Teaching per Week | 4 Hrs |
| Minimum weeks per Semester | 15 (Including Class work, examination, preparation etc.) |
| Last Review / Revision | A.Y. 2023-2024 |
| Implementation Year: | A.Y. 2024-2025 |
| Medium of Instruction | English |
| Purpose of Course | The purpose of the "Introduction to IoT" course is to provide students with a foundational understanding of the Internet of Things (IoT) ecosystem. Through this course, students will gain insight into the concepts, technologies, and applications that underpin IoT networks and devices. They will explore the interconnected nature of IoT systems, learn about sensors, actuators, and connectivity protocols, and understand how data is collected, transmitted, and analyzed in IoT environments. Ultimately, the course aims to equip students with the knowledge and skills to comprehend the potential of IoT in various industries, and to critically evaluate IoT solutions for addressing real-world challenges. |
| Course Objective | To understand the concepts and protocols related to Internet of Things. To get an idea where the application areas are available for the Internet of Things to be applied. |
| Pre-requisite | Basic Knowledge of Networking |
| Course Out come | **CO1:** Understand the Concept of IoT: Students will be able to define the Internet of Things (IoT) and explain its significance in connecting physical devices, sensors, and actuators to the internet to enable data exchange and automation.<br>**CO2:** Identify IoT Components and Technologies: Students will be able to identify and describe the key components of IoT systems, including sensors, actuators, microcontrollers, communication protocols, and cloud platforms.<br>**CO3:** Explain IoT Communication Protocols: Students will be able to explain various communication protocols used in IoT networks, such as Wi-Fi, Bluetooth, Zigbee, and MQTT, and understand their strengths, weaknesses, and applications.<br>**CO4:** Analyze IoT Applications and Use Cases: Students will be able to analyze real-world IoT applications and use cases across different industries, such as smart homes, healthcare, transportation, agriculture, and industrial automation.<br>**CO5:** Design and Implement Simple IoT Solutions: Students will be able to design and implement simple IoT solutions using hardware components, microcontrollers, sensors, actuators, and basic programming languages.<br>**CO6:** Evaluate IoT Security and Privacy Considerations: Students will be able to identify and assess security and privacy challenges in IoT |

| Mapping between Course Outcomes (CO) and Program Specific Outcomes (PSO): | | PS01 | PS02 | PS03 | PS04 | PS05 | PS06 | PS07 | PS08 |
|---|---|---|---|---|---|---|---|---|---|
| | CO1 | | | X | | | | | |
| | CO2 | X | X | | | | X | | |
| | CO3 | | | | | X | | X | |
| | CO4 | X | | X | | | | | X |
| | CO5 | | | X | | | X | | |
| | CO6 | | X | | | | | | X |

systems, understand common vulnerabilities and threats, and explore strategies for securing IoT devices and data.

**Course Content**

**Unit 1: Introduction to Internet of Things**

    1.1 Definition & Characteristics of IoT
    1.2 Introduction to IoT Architecture
    1.3 Physical Design of IoT
        1.3.1    Things in IoT
        1.3.2    IoT Protocols (Ethernet , WIFI , WIMAX, LR-WPAN(Wireless personal area network), 2G/3G/4G Mobile Communication, IPV6,6LOWPAN,MQTT, WEB SOCKET)
    1.4 Logical Design of IoT
        1.4.1    IoT Functional Blocks
        1.4.2    IoT Communicational Models
- Request – Response
    - Publish –Subscribe
    - Push –Pull
- Exclusive Pair

**Unit 2. IoT and M2M**
    2.1 Introduction M2M
    2.2 Introduction to Sensor Technology
    2.3 Difference between IoT and M2M,
    2.4 Security for IoT
    2.5 IoT Enabling Technologies
        2.5.1 Wireless Sensor Networks
        2.5.2 Big Data Analytics,
        2.5.3 Embedded Systems.

**Unit 3.Sensors and Actuators in IoT**
    3.1 Definition of Sensors
    3.2 Types of sensors and its usage
    (Temperature, Humidity, Gas Detector, Ultrasonic, Fire detector, Light, Sound, IR, Water Level)
    3.3 Introduction to Actuators
    3.4 Types of Actuators
    3.5 Difference between Sensors & Actuators

**Unit 4.Introduction to Raspberry pi and Arduiano**
    4.1 Introduction on IoT Devices
    4.2 Basic Building blocks of an IoT Device
    4.3 Introduction to Raspberry pi
        (Concepts, purpose, Application areas)
    4.4 Components of Raspberry pi
    4.5 Introduction to Arduiano
        (Concept, purpose and Application areas)
    4.6 Difference between Raspberry pi and Arduiano

**Unit 5. Case Study**
5.1 IoT for Smart city applications
5.2 IoT for Smart Home

| | 5.3   IoT  for Health & Lifestyle |
|---|---|
| **Reference Books** | 1.  Internet of Things , A Hands – On Approach, Arshdeep Bahga, Vijay Madisetti published by Arshdeep Bahga& Vijay Madisetti<br>2.  Internet of Things architecture and Design Principles, Raj Kamal, McGrawhill Education private limited, 2017<br>3.  Learning Internet of Things, Peter Waher, / Packt Publishing Limited,  2015<br>4.  The Internet of Things, Hakima Chaouchi, Wiley,2017<br>5.  Getting started with the Internet of Things: by CunoPfister, O"Reilly Media.<br>6.  The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)<br>7.  "Building Arduino Projects for the Internet of Things: Experiments with Real-World Applications", Author: Adeel Javed, Publisher:Apress, ISBN:978-1484219393<br>8.  "Understanding the Internet of Things: A Conceptual and Pragmatic Approach",   Author: David Evans,Publisher: O'Reilly Media, ISBN: 978-1491924565<br>9.  "Designing Connected Products: UX for the Consumer Internet of Things",  Author: Claire Rowland, Elizabeth Goodman, Martin Charlier, and Ann Light,  Publisher: O'Reilly Media, ISBN: 978-1449372569<br>10. "IoT Inc: How Your Company Can Use the Internet of Things to Win in the Outcome Economy",  Author: Bruce Sinclair, Publisher:McGraw-Hill Education, ISBN: 978-1260025899 |
| **Teaching Methodology** | Class Work, Discussion, Self-Study, Seminars and/or Assignments |
| **Evaluation Method** | 50% Internal assessment.<br>50% External assessment. |