

<p align="center"><b>IoT &amp; WIRELESS SENSOR NETWORKS</b>  <b>B.E., VII Semester, Electronics &amp; Communication Engineering</b>  <b>/Telecommunication Engineering</b>  <b>[As per Choice Based Credit System (CBCS) Scheme]</b></p>			
<b>Course Code</b>	<b>17EC752</b>	<b>CIE Marks</b>	<b>40</b>
<b>Number of Lecture Hours/Week</b>	<b>03</b>	<b>SEE Marks</b>	<b>60</b>
<b>Total Number of Lecture Hours</b>	<b>40 (8 Hours / Module)</b>	<b>Exam Hours</b>	<b>03</b>
<b>CREDITS – 03</b>			
<p><b>Course Objectives:</b> This course will enable students to:</p> <ul style="list-style-type: none"> <li>• Understand various sources of IoT &amp; M2M communication protocols.</li> <li>• Describe Cloud computing and design principles of IoT.</li> <li>• Become aware of MQTT clients, MQTT server and its programming.</li> <li>• Understand the architecture and design principles of WSNs.</li> <li>• Enrich the knowledge about MAC and routing protocols in WSNs.</li> </ul>			
<b>Module-1</b>			
<p><b>Overview of Internet of Things:</b> IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M communication, Examples of IoT. Modified OSI Model for the IoT/M2M Systems, data enrichment, data consolidation and device management at IoT/M2M Gateway, web communication protocols used by connected IoT/M2M devices, Message communication protocols (CoAP-SMS, CoAP-MQ, MQTT, XMPP) for IoT/M2M devices. <b>L1, L2</b></p>			
<b>Module-2</b>			
<p><b>Architecture and Design Principles for IoT:</b> Internet connectivity, Internet-based communication, IPv4, IPv6, 6LoWPAN protocol, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS, FTP, TELNET and ports.</p> <p><b>Data Collection, Storage and Computing using a Cloud Platform:</b> Introduction, Cloud computing paradigm for data collection, storage and computing, Cloud service models, IoT Cloud- based data collection, storage and computing services using Nimbits. <b>L1, L2</b></p>			
<b>Module-3</b>			
<p><b>Prototyping and Designing Software for IoT Applications:</b> Introduction, Prototyping Embedded device software, Programming Embedded Device Arduino Platform using IDE, Reading data from sensors and devices, Devices, Gateways, Internet and Web/Cloud services software development.</p> <p>Programming MQTT clients and MQTT server. Introduction to IoT privacy and security. Vulnerabilities, security requirements and threat analysis, IoT Security Tomography and layered attacker model. <b>L1, L2, L3</b></p>			
<b>Module-4</b>			

**Overview of Wireless Sensor Networks:**

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

**Architectures:** Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture-Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design principles for WSNs, Service interfaces of WSNs Gateway Concepts.

**L1, L2, L3**

**Module-5****Communication Protocols:**

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols(CSMA,PAMAS), Schedule based protocols (LEACH, SMACS, TRAMA) Address and Name Management in WSNs, Assignment of MAC Addresses, Routing Protocols-Energy-Efficient Routing, Geographic Routing, Hierarchical networks by clustering.

**L1, L2, L3**

**Course Outcomes:** At the end of the course, students will be able to:

- Describe the OSI Model for the IoT/M2M Systems.
- Understand the architecture and design principles for IoT.
- Learn the programming for IoT Applications.
- Identify the communication protocols which best suits the WSNs.

**Text Books:**

1. Raj Kamal, "Internet of Things-Architecture and design principles", McGraw Hill Education.
2. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
3. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

**Reference Books:**

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, And Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.