# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

| Course Code | Course Name | Teaching Scheme (Hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | L | T | P | Total |
| ITC8042 | Wireless Sensor Networks | 4 | - | - | 4 | - | - | 4 |
| | | Examination Scheme | | | | | | |
| | | ISE | | MSE | | ESE | | |
| | | 10 | | 30 | | 100 (60%Weightage) | | |

| Pre-requisite Course Codes | |
|---|---|
| After successful completion of the course, student will be able to: | |

| | | |
|---|---|---|
| **Course Outcomes** | CO1 | Summarize the architecture of wireless sensor networks. |
| | CO2 | Identify applications of wireless sensor networks. |
| | CO3 | Discuss the challenges in designing MAC and routing protocols for wireless sensor networks. |
| | CO4 | Compare different operating systems and its performance issues. |
| | CO5 | Summarize WSN standards and future trends in WSN. |

| Module No. | Topics | Ref. | Hrs. |
|---|---|---|---|
| 1 | **Overview and Introduction of Wireless Sensor Network** Background of Sensor Network Technology; Types of Application; Challenges for WSNs: Characteristics requirements, Required mechanism; Basic Sensor Network Architectural Elements; Sensor Network scenarios: Types of sources and sinks, single-hop versus multi hop networks, Multiple sinks and sources, three types of mobility; Some examples of sensor nodes: Mica Mote family, EYES nodes, BT nodes. | 1,3 | 06 |
| 2 | **Applications of Wireless Sensor Network** Category1(C1WSNs), Category2(C2WSNs), Range of Applications, ExamplesofCategory1 WSN (C1WSNs) Applications and Examples of Category 2WSN(C2WSNs) Applications. | 1,3 | 04 |
| 3 | **MAC Protocols** Fundamentals of(wireless) MAC protocols, Requirements and design considerations for MAC Protocols in WSN, Low duty cycle protocols and wakeup concepts, STEM,S-MAC, Mediation device protocol, Wakeup radio concepts, Contention-based protocols, CSMA protocols, PAMAS, Schedule-based protocols, LEACH, SMACS, Traffic-adaptive medium access protocol(TRAMA),IEEE 802.15.4 MAC protocol, Slotted CSMA-CA protocol. | 2 | 09 |
| 4 | **Network and Transport layer Protocol** | 2,4 | 07 |

| | | | |
|---|---|---|---|
| | Network layer :Data Dissemination and Gathering, Routing Challenges and Design Issues, Routing Strategies :Flooding and it's variants, Power- Efficient Gathering in Sensor Information Systems, Geographical routing<br>Transport layer :<br>Transport protocol Design issues, Examples of Existing Transport Control Protocols: CODA, ESRT, RMST, PSFQ, GARUDA, ATP; Performance of Transport Control Protocols: Congestion, packet loss recovery. | | |
| 5 | **Operating Systems, Performance and Traffic Management Issues**<br>Operating System Design Issues, Examples of<br>Operating Systems: Tiny OS, Mate, Magnet OS, MANTIS,OSPM,EYES OS, SenOS, EMERALDS, Pic OS , WSN Design Issues, Performance Modeling of WSNs | 5 | 07 |
| 6 | **WSN standards and Future trends in wireless sensor networks**<br>Wireless sensor network standards-IEEE 802.15.4Low rate WPAN standard, The ZIGBEE alliance etc .Future trends in wireless sensor networks: Wireless Multimedia Sensor Networks, Sensor Network Applications in Challenging Environments | 2 | 06 |
| 7 | **Security**<br>Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4andZigBee security. | 5 | 09 |
| | **Total hours of instructions** | | 48 |

**References:**

1. Feng Zhao, Leonidas Guibas ,"*Wireless Sensor Networks: An Information Processing*

   *Approach*", Morgan Kaufmann Series in Networking2004.

2. Kazem Sohraby, Daniel Minoli, TaiebZnati., "*Wireless Sensor Networks: Technology, Protocols, and Applications*", Wiley Student Edition.

3. Waltenegus Dargie and Christian Poellabauer.,"*Fundamentals of Wireless Sensor Networks-Theory & Practice*",John Wiley publication, 2010.

4. J.Zheng and A. Jamalipour, "*Wireless Sensor Networks :A Networking Perspective* "John Wiley publication, 2009.

5. Edgar H. Callaway Jr,*" Wireless Sensor Networks- Architectures and Protocols",* AUERBACH Publications, CRC Press, 2004.