

# Subject Name : Wireless Sensor Network

## Subject Code : IT 801

### Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
04	00	02	06	5	03	70	30	20	30	150

### Learning Objectives:

After complete this course, students should be able to list various applications of wireless sensor networks, describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks. Also implement and evaluate new ideas for solving wireless sensor network design issues.

### Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Sensor networks overview	4
2	Basic Wireless Sensor Technology	5
3	Wireless Transmission Technology and Systems	6
4	Fundamentals of MAC Protocols	8
5	Routing Protocols for Wireless Sensor Networks	8
6	Transport Control Protocols for Wireless Sensor Networks	7
7	Middleware for Wireless Sensor Networks	8
8	Performance and Traffic Management	8
9	Operating Systems for Wireless Sensor Networks	6

**Total hours (Theory): 60**

**Total hours (Lab): 30**

**Total hours: 90**

## Detailed Syllabus:

Sr. No	Topic	Lecture Hours	Weight age(%)
1	<b>Sensor networks overview:</b> Introduction, Applications of WSN, Range of Applications, Design issues	4	7
2	<b>Basic Wireless Sensor Technology:</b> Sensor node architecture, Hardware and Software, Sensor Taxonomy, WSN Operating Environment, Trend	5	8
3	<b>Wireless Transmission Technology and Systems:</b> Introduction, Radio Technology Primer, Propagation & Propagation Impairments, Available Wireless Technologies	6	11
4	<b>Fundamentals of MAC Protocols:</b> Performance Requirements, Common Protocols, MAC Protocols for WSNs, Schedule-Based Protocols, Random Access-Based Protocols, Sensor-MAC Case Study, Protocol Overview, Periodic Listen and Sleep Operations, Schedule Selection and Coordination, Schedule Synchronization, Adaptive Listening, Access Control and Data Exchange.	8	13
5	<b>Routing Protocols for Wireless Sensor Networks:</b> Routing Challenges and Design Issues in Wireless, Sensor Networks, Network Scale and Time-Varying Characteristics, Resource Constraints, Sensor Applications Data Models, Routing Strategies in Wireless Sensor Networks, WSN Routing Techniques, Flooding and Its Variants, Sensor Protocols for Information via Negotiation, Low-Energy Adaptive Clustering Hierarchy, Power-Efficient Gathering in Sensor Information Systems, Directed Diffusion, Geographical Routing.	8	13
6	<b>Transport Control Protocols for Wireless Sensor Networks:</b> Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, CODA (Congestion Detection and Avoidance), ESRT (Event-to-Sink Reliable Transport), RMST (Reliable Multisegment Transport), PSFQ (Pump Slowly, Fetch Quickly), GARUDA, ATP (Ad Hoc Transport Protocol), Problems with Transport Control Protocols, Performance of Transport Control Protocols, Congestion, Packet Loss Recovery.	7	12
7	<b>Middleware for Wireless Sensor Networks:</b> Introduction, Network Management Requirements, Traditional Network Management Models, Simple Network Management Protocol, Telecom Operation Map, Network Management Design Issues, Example of Management Architecture: MANNA, Other Issues Related to Network Management, Naming, Localization.	8	13
8	<b>Performance and Traffic Management:</b> WSN Design Issues, MAC Protocols, Routing Protocols, Transport Protocols, Performance Modeling of WSNs, Performance Metrics, Basic Models, Network Models.	8	13
9	<b>Operating Systems for Wireless Sensor Networks:</b> Operating System Design Issues, Examples of MANTIS, SenOS, MagnetOS	6	10

### **Instructional Method and Pedagogy:**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

### **Reference Books:**

1. Wireless Sensor Networks: Technology, Protocols, and Applications by Kazem Sohraby/wiley.
2. Wireless Sensor Networks by Zhao Feng/ Elsevier India
3. Security in Wireless Sensor Networks by Piotr Szczechowiak/ Lap Lambert Academic Publishing
4. Wireless Sensor Networks by Raghavendra Sivalingam Znati/ Springer India
5. Building Wireless Sensor Networks by Robert Faludi/ O'reilly

### **List of Practical:**

Sr. No	Name of Experiment
1	Introduction of Wireless sensor network applications and its simulation.
2	Network Simulator installation of wireless sensor network.
3	Write TCL script for transmission between mobile nodes.
4	Write TCL script for sensor nodes with different parameters.
5	Generate tcl script for udp and CBR traffic in WSN nodes.
6	Generate tcl script for TCP and CBR traffic in WSN nodes.
7	Implementation of routing protocol in NS2 for AODV protocol.
8	Implementation of routing protocol in NS2 for DSR protocol.
9	Implementation of routing protocol in NS2 for TORA protocol.
10	Study other wireless sensor network simulators (Mannasim. Contiki.)