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| **ECX521** | **Wireless Sensor Networks** | **L-T-P: 3-0-0; Total 42 Lectures** |

***Prerequisite:*** Communication Engineering, Computer Communication Network

***Course Objective:***

Wide range of applications such as disaster management, military and security have fueled the interest in sensor networks during the past few years. Sensors are typically capable of wireless communication and are significantly constrained in the amount of available resources such as energy, storage and computation. Such constraints make the design and operation of sensor networks considerably different from contemporary wireless networks, and necessitate the development of resource conscious protocols and management techniques. This course provides a broad coverage of challenges and latest research results related to the design and management of wireless sensor networks. Covered topics include network architectures, node discovery and localization, deployment strategies, node coverage, routing protocols, medium access arbitration, fault-tolerance, and network security.

***Course Content:***

**Unit-I:** Introduction Examples of available sensor nodes; Sample sensor networks applications; Design challenges

**Unit-II:** Design Model Contemporary network architectures; Operational and computational models; Performance metrics; Software and hardware setups.

**Unit-III:** Network Bootstrapping Sensor deployment mechanisms; Issues of coverage; Node discovery protocols; Localization schemes; Network clustering

**Unit-IV**: Data dissemination and routing Query models; In-network data aggregation; Robust route setup; Coping with energy constraints

**Unit-V:** Physical and Link layers Radio energy consumption model; Power management; Medium access arbitration; Optimization mechanisms

**Unit-VI:** Dependability Issues Security challenges; Threat and attack models; Quality of service provisioning; Clock synchronization; Supporting fault tolerant operation

***Text Books:***

1. Protocols and Architectures for Wireless Sensor Networks, Holger Karl and Andreas Willig, Wiley, 2005.

2. Wireless Sensor Networks, Cauligi S. Raghavendra, Krishna Sivalingam, and Taieb M. Znati, Springer, 2005.

***Course Outcomes:***

Students would be able to –

CO1: Architect sensor networks for various application setups.

CO2: Explore the design space and conduct trade-off analysis between performance and resources.

CO3: Assess coverage and conduct node deployment planning.

CO4: Devise appropriate data dissemination protocols and model links cost.

CO5: Determine suitable medium access protocols and radio hardware.

CO6: Prototype sensor networks using commercial components.

CO7: Provision quality of service, fault-tolerance, security and other dependability requirements while coping with resource constraints.

CO8: Evaluate the performance of sensor networks and identify bottlenecks.