

Wireless Sensor Network

Code IT-874	Credit Hours 3-0
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Course Description

This course is designed to introduce state-of-the-art Architectures, Technologies, and Protocols used in Wireless Sensor Networks. In addition, the course will expose students to the platforms, tools, and software used for modern sensors research. Furthermore, the following topics will be covered in detail: Intro to Ad-hoc and sensor networks, Unique constraints and challenges in Single-Node Architecture, WSN coverage, and placement: Coverage problems in WSN, and Medium Access Control in wireless networks. Routing in sensor networks: Data-centric position-based routing- data aggregation- Clustered routing Algorithms, Congestion and flow control, Underwater sensor networks: Routing protocols, MAC protocols, Deployment issues, localization issues.

The intended learning outcomes for this course are to:

Gain a good understanding of the role of Wireless Sensor Networks and their applications in daily life; Gain an intuitive and quantitative understanding of architectures, protocols, and algorithms with an emphasis on fundamental concepts and principles of WSN and UWSN; Develop abilities to problem-solving and usage of WSN in the related applications.

Text Book:

1. Concepts, Applications, Experimentation, and Analysis of Wireless Sensor Networks, Hossam Mahmoud Ahmad Fahmy, Second Edition, 2021.

Reference Book:

2. QoS Routing Algorithms for Wireless Sensor Networks, K. R. Venugopal, Shiv Prakash T, M. Kumaraswamy, 2020.

Prerequisites

n/a

ASSESSMENT SYSTEM FOR THEORY

Quizzes	7.5%
Assignments	7.5%
Mid Terms	30%
Research Project	15%
ESE	40%

Teaching Plan

Week No	Topics	Learning Outcomes
1	Networking	Overview of networking and TCP/IP protocols
2-6	Wireless sensor networks	<p>Concepts, types, performance, and standards</p> <p>WSN Protocol Stack (application and transport layer)</p> <p>WSN Protocol Stack (physical, link, network layer)</p> <p>WSN applications (challenges, military, industrial),</p> <p>WSN applications (environmental, healthcare, multimedia),</p> <p>WSN applications (robotics, and daily life)</p>
7-8	Transport and cross-layer protocols	<p>Transport layer protocols including CODA, ESRT, RMST, Tiny TCP/IP, and STCP</p> <p>Cross-layer protocols (challenges, limitations, guidelines, and trends)</p>
9	MID TERM EXAM	
10-12	Higher-layer WSN protocols	<p>Quality of service (QoS)</p> <p>Address Routing, Medium Access Control</p> <p>Congestion and flow control in WSN</p>
13-14	AI-based WSN solutions	<p>WSN datasets</p> <p>Data pipeline for WSN solutions</p> <p>AI-based research on WSN</p>
15-17	WSN manufacturer, experimentation, and open research challenge	<p>Experimentation and Analysis (testbeds, ORBIT, MoteLab, Meerkats)</p> <p>Simulators and Emulators for WSNs (modeling and simulation, principles and practices)</p> <p>Challenges and open research problems in WSN</p>
18	End Semester Exam	