COURSE CONTENT

AD-HOC & SENSOR NETWORKS

VI Semester: CSE / CSM / CSD

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
24X0525	Foundation	3	0	0	3	40	60	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Prerequisites:
1. A course on "Computer Networks".
2. A course on "Mobile Computing".

Course Overview:

This course introduces the fundamental concepts and technologies underpinning Mobile Ad Hoc Networks (MANETs) and Wireless Sensor Networks (WSNs), focusing on the design, implementation, and performance evaluation of various communication protocols. As wireless and ad hoc networks are increasingly integrated into applications such as disaster recovery, military communication, and environmental monitoring, understanding their operation and challenges become crucial.

Course Objectives:

1. To understand the concepts of sensor networks.
2. To understand the MAC and transport protocols for ad hoc networks.
3. To understand the security of sensor networks.
4. To understand the applications of adhoc and sensor networks.

Course Outcomes: After Completion of the Course, Students should be able to

1. Understand the fundamental characteristics, applications, and challenges of Mobile Ad Hoc Networks (MANETs).
2. Understand the broadcast storm problem and evaluate different rebroadcasting and multicasting schemes in MANETs.
3. Identify the challenges of using TCP in MANETs and discuss protocol enhancements.
4. Understand the architecture, classification, and applications of Wireless Sensor Networks (WSNs), focusing on lower layer communication protocols.
5. Analyze upper-layer protocols in WSNs and explore adaptive methods for dynamic environments, including integration with mobile robots.

UNIT - I

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms- Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT - II

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint

Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT - III

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

REFERENCE BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols, C. Siva Ram Murthy and B. S. Manoj, Pearson Education,2004.
2. Guide to Wireless Sensor Networks, Sudip Misra, Isaac Woungang, and Subhas Chandra Misra, Springer International Edition,2012.
3. Wireless Mesh Networking, Thomas Krag and Sebastin Buettrich, O'ReillyPublishers,2007.
4. Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group,2010.

ELECTRONIC RESOURCES:

1. https://www.geeksforgeeks.org/computer-networks/differences-between-wireless-adhoc-network-and-wireless-sensor-network/
2. https://www.w3schools.com/cybersecurity/cybersecurity_network_transport.php
3. https://www.codechef.com/certification/data-structures-and-algorithms/prepare

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)