



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

AD-HOC & SENSOR NETWORKS								
VI Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSD36	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisites: Mobile Computing								

### I. COURSE OVERVIEW:

This course provides an introduction to Ad Hoc and Wireless Sensor Networks, focusing on their architectures, routing protocols, and key challenges. It explores energy-efficient communication, MAC protocols, and transport issues in WSNs. The course also addresses sensor network security, attack prevention, and key management. Practical exposure is provided through sensor platforms like TinyOS, ContikiOS, and simulators such as NS2 and TOSSIM.

### II. COURSES OBJECTIVES:

**The students will try to learn:**

- I. The challenges and key design issues involved in routing within Ad Hoc and Wireless Sensor Networks.
- II. Various routing protocols including broadcast, multicast, and geo-casting used in ad hoc and sensor network environments.
- III. The fundamentals of wireless sensor networks, including lower layer (MAC, physical) and upper layer (transport, application) issues.

### III. COURSE OUTCOMES:

**At the end of the course, students should be able to:**

- CO1 Understand the fundamental concepts, applications, and challenges of Ad Hoc and Wireless Sensor Networks.
- CO2 Analyze the design considerations and classify various routing protocols used in Ad Hoc networks.
- CO3 Apply MAC and routing protocols to improve performance in Wireless Sensor Network scenarios.
- CO4 Evaluate energy-efficient architectures and protocols used in sensor node communication.
- CO5 Identify and assess security threats, layer-wise attacks, and mitigation strategies in WSNs.
- CO6 Use simulation tools like NS2, TOSSIM, or COOJA to model and test wireless sensor network applications.

#### **IV. COURSE CONTENT:**

##### **MODULE –I: AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS (9)**

Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV), On-Demand Routing protocols – Ad hoc On-Demand Distance Vector Routing (AODV).

##### **MODULE –II: SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES (10)**

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

##### **MODULE-III: WSN NETWORKING CONCEPTS AND PROTOCOLS (10)**

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS.

Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols- Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

##### **MODULE-IV: SENSOR NETWORK SECURITY (10)**

Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

##### **MODULE-V: SENSOR NETWORK PLATFORMS AND TOOLS (9)**

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

#### **V. TEXTBOOKS:**

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

#### **VI. REFERENCE BOOKS:**

1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols. Google Cloud Platform in Action" .
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

#### **VII. ELECTRONICS RESOURCES:**

1. <https://www.tutorialspoint.com/what-is-ad-hoc-network>
2. <https://www.udemy.com/topic/wireless-sensor-network/>
3. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-973-communication-system-design-spring-2006>

#### **VIII. MATERIALS ONLINE**

1. Course outline description
2. Tutorial question bank
3. Tech talk 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. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)