# GUJARAT TECHNOLOGICAL UNIVERSITY

## INFORMATION TECHNOLOGY (23)

WIRELESS ADHOC NETWORK

**SUBJECT CODE:** 2722312

SEMESTER: II

**Type of course:** Elective subject

**Prerequisite**: Fundamentals of wired and wireless network

**Rationale:** In the age of smartphones and laptops information sharing through ad hoc network is important

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| L | T | P | C | Theory Marks | | Practical Marks | | | | |
| | | | | ESE (E) | PA (M) | ESE (V) | | PA (I) | | |
| | | | | | | ESE | OEP | PA | RP | |
| 3 | 2# | 2 | 5 | 70 | 30 | 20 | 10 | 10 | 10 | 150 |

**Content:**

| Sr. No. | Topics | Teaching Hrs. | Module Weightage |
|---|---|---|---|
| **1** | Introduction:<br>Cellular and ad hoc wireless networks<br>Applications of ad hoc wireless networks<br>Issues in ad hoc wireless networks<br>Ad hoc wireless Internet | 4 | 10 |
| **2** | **MAC protocols For Ad Hoc Wireless Networks**<br>Introduction<br>Issues in designing a MAC Protocols for Ad Hoc Wireless Networks<br>Design goal for MAC protocols for Ad Hoc Wireless Networks<br>CLASSIFICATION OF MAC Protocols<br>Contention Based Protocols<br>Contention Based Protocols with Reservation Mechanism<br>Contention Based Protocols with Scheduling Mechanism<br>Other MAC protocols | 6 | 15 |
| **3** | **Routing Protocols For Ad Hoc Wireless Networks.**<br>Introduction<br>Issues in designing a Routing Protocols for Ad Hoc Wireless Networks<br>Classification Routing protocols<br>Table-Driven Routing Protocols<br>On-Demand Routing Protocols<br>Hybrid Routing Protocols<br>Routing Protocols with efficient Flooding Mechanism | 6 | 15 |
| **4** | **Multicast Routing Protocols For Ad Hoc Wireless Networks**<br>Issues in designing a Multicast Protocols for Ad Hoc Wireless Networks<br>Operation of Multicast Routing Protocols<br>Classification Multicast protocols<br>Tree Based Multicast Routing Protocols | 6 | 15 |

| | | | |
|---|---|---|---|
| | Mesh Based Multicast Routing Protocols<br>Energy Efficient Multicasting<br>Multicasting with quality of service Guarantees<br>Application-Dependent Multicasting Routing | | |
| **5** | **Transport Layer and Security Protocols For Ad Hoc Wireless Networks**<br>Introduction<br>Issues in designing a Transport Layer Protocols for Ad Hoc Wireless Networks<br>Design goal for Transport Layer protocols for Ad Hoc Wireless Networks<br>CLASSIFICATION OF Transport Layer Protocols<br>TCP over Ad Hoc Wireless Networks<br>Others Transport Layer protocols for Ad Hoc Wireless Networks<br>Security in Ad Hoc Wireless Networks<br>Network Security Requirements<br>Issues and challenges in Security provisioning<br>Network Security Attacks<br>Key Management<br>secure Routing in Ad Hoc Wireless Networks | 6 | 15 |
| 6 | **Quality of Service In Ad Hoc Wireless Networks**<br>Introduction<br>Issues and challenges in providing Qos in Ad Hoc Wireless Networks<br>Classification Qos solutions<br>MAC layer solutions<br>Network Layer solutions<br>Qos framework for Ad Hoc Wireless Networks | 5 | 10 |
| 7 | **Energy Management In Ad Hoc Wireless Networks**<br>Introduction<br>Need for energy Management in Ad Hoc Wireless Networks<br>Classification energy Management Schemes<br>Battery Management Schemes<br>Transmission Power Management Schemes<br>System Power Management Schemes | 5 | 10 |
| 8 | Ad hoc Networks Security<br>Introduction, secure routing | 4 | 10 |

**Reference Books:**


1. Ad Hoc Wireless Networks: Architectures and Protocols By C. Siva Ram Murthy, B.S. Manoj
2. Mobile ad hoc networking. Stefano Basagni, Macro Conti, Sivia Giordano, Ivan Stojmenovic, John Wiley & sons Inc.
3. Ad hoc mobile wireless networks principles, protocols and applications Subir Kumar Sarkar, T G Basavaraju, Puttamadappa, Auerbach publication.
4. Introduction to Wireless and Mobile Systems, 4th Edition Dharma P. Agrawal Qing-An Zeng


**Course Outcome:**

After learning the course the students should be able to:

1. Describe and analyze the issues in ad-hoc networks.
2. Describe current technology trends for the implementation and deployment of wireless ad-hoc networks.

3. Analyze the challenges in designing MAC, routing and transport protocols for wireless ad-hoc networks.

**List of Experiments:**

1. Study Zigbee.
2. Study ad hoc network formation in different operating system. Implement ad hoc network in one operating system.
3. Implement AODV routing protocol.
4. Implement Wireless LAN MAC scheme with RTS/CTS and without RTS/CTS and analyze the performance.
5. Create a small topology of nodes in C++/Java. Assign Energy to each node and Elect a node with highest energy to be Master node.
6. Which signal propagation loss models can be applied to ad hoc network? Implement models in C++/Java.
7. Create a small topology. Perform data transmission among nodes and calculate throughput. Use C++/Java/simulator.
8. Create a small topology. Assign symmetric keys and perform encryption. Use C++/Java/simulator
9. Implement DSR routing protocol.
10. Implement black hole attack. Take 3 nodes in topology. Node 1 sends packet to node 2. Node 2 doesn't forward packet to node 3 but drops all the packets. Use C++/Java/simulator

**Design based Problems (DP)/Open Ended Problem:**

1. Design MANET model that can be applied to business scenarios that can move MANET success beyond the academy and research labs.
   How to optimize Quality of service parameters in mobile ad hoc network including bandwidth utilization, power management

**Major Equipment:**

- Latest PC with required software

**List of Open Source Software/learning website:**

1. *Simulator Ns2,Ns3*
2. www.isi.edu/nsnam/ns/
3. *https://www.ietf.org/rfc*

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website