

# GUJARAT TECHNOLOGICAL UNIVERSITY

## ELECTRONICS & COMMUNICATION (WIRELESS COMMUNICATION TECHNOLOGY) (44)

ADHOC NETWORKS  
**SUBJECT CODE:** 2724403  
 M. E. Semester – II

**Type of course:** Core

**Prerequisite:** Fundamentals of Communication (Analog/Digital), basics of Wireless communication, The concept of Data Communication & Networking, Basic Knowledge of existing Cellular Networks ( 2G, 2.5G, 3G, etc.)

**Rationale:** To Provide knowledge of fundamental concepts, Design issues and solution to the issues of Wireless Ad-hoc Networks. The course provide knowledge of various architectures, working merits and demerits of Ad-hoc Wireless Network protocols. This course also provide knowledge of various application areas and current applications of Ad-hoc Wireless Networks.

### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
4	0	2#	5	70	30	20	10	10	10	150

### Content:

Sr.No.	Course Contents	Total Hrs	% Weightage
1	<b>FUNDAMENTALS:</b> Introduction, Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, IEEE 802.11 Standard, Origin of Ad hoc Packet Radio Networks – Technical Challenges, Architecture of PRNETs, Components of Packet Radios, Comparison of Cellular and Ad-hoc Wireless Networks, Applications of Ad-hoc Wireless Networks, Challenges and Issues of Ad hoc Wireless Networks.	6	14 - 16 %
2	<b>AD HOC ROUTING PROTOCOLS :</b> Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols, Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), Cluster Switch Gateway Routing (CSGR), Ad hoc On-Demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA), Signal Stability Routing (SSR), Location Aided Routing (LAR), Zone Routing Protocol (ZRP), Zone Based Hierarchical Link State Routing Protocol, Power Aware Routing (PAR).	10	19 – 21 %

3	<b>MULTICASTROUTING IN ADHOC NETWORKS:</b> Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols , An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree–Based Multicast Routing Protocols, Mesh–Based Multicast Routing Protocols, Summary of Tree and Mesh based Protocols, Energy–Efficient Multicasting, Multicasting with Quality of Service Guarantees , Application– Dependent Multicast Routing, Comparisons of Multicast Routing Protocols	10	19 – 21 %
4	<b>TRANSPORT LAYER AND SECURITY PROTOCOLS:</b> Introduction, Issues in Designing a Transport Layer Protocol for Ad hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks, Classification of Transport Layer Solutions, TCP over Ad hoc Wireless Networks, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks	7	14 – 16 %
5	<b>QoS IN ADHOC WIRELESS NETWORKS:</b> Introduction, Issues and Challenges in Providing QoS in Ad hoc Wireless Networks, Classifications of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad hoc Wireless Networks.	6	12 – 14 %
6	<b>ENERGY MANAGEMENT IN ADHOC WIRELESS NETWORKS:</b> Introduction, Need for Energy Management in Ad hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes , Transmission Power Management Schemes, System Power Management Scheme.	6	12 – 14 %
7	<b>WIRELESS SENSOR NETWORKS:</b> Introduction, Sensor Network Architecture	3	5- 8 %

**Reference Books:**

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004.
2. C. K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall, PTR, 2001.
3. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 2000

**Course Outcome:**

After learning the course the students should be able to:

1. Understand the needs of Ad-hoc Wireless Network.
2. Comparison of Ad-hoc Wireless Network with existing Cellular Network in different aspects
3. Understand the concepts, working, merits and demerits of various Ad-hoc network protocols.
4. Understand the various areas of applications of Ad-Hoc Wireless Network.

**List of Experiments:**

Based on syllabus

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

1. Optimize DSDV (Destination Sequenced Distance Vector) protocol for enhancement of low control overhead.
2. Optimize AODV (Ad hoc On-Demand Distance Vector Routing) Protocol for enhancement of minimum bandwidth utilization.

**Major Equipment:** Matlab, Network Simulator Softwares (NS2, NS3)

**List of Open Source Software/learning website:** Network Simulator Softwares (NS2, NS3)

**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.