

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (SIGNAL PROCESSING & COMMUNICATION) (41)

ADHOC AND WIRELESS SENSOR NETWORK

SUBJECT CODE: 2724115

SEMESTER: II

Type of course: Major Elective-II

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:

- Ad - Hoc networks fundamentals, implementation challenges, and routing, security and applications
- Sensor networks fundamentals, major areas of thrust, energy efficiency, routing, security and applications

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		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

Contents:

Sr.No.	Course Contents	TotalHrs	% Weightage
1	<p>Introduction: Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, IEEE 802.11Standard, 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.</p>	7	10-12%
2	<p>Adhoc Network Protocols : Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols. 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, 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</p>	8	20-22%
3	<p>QoS and Energy Management in Adhoc Wireless Networks: 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. Need for Energy Management in Ad hoc Wireless Networks, Classification of Energy Management Schemes, Battery</p>	7	18-22%

	Management Schemes , Transmission Power Management Schemes, System Power Management Scheme.		
4	Introduction and Overview of Wireless Sensor Networks: Background of Sensor Network Technology, Applications of Wireless Sensor Networks, Basic Wireless Sensor Technology : Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends	4	12-14%
5	Wireless Sensor Network Protocols: MAC Protocols for WSNs: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC case study, Routing Protocols for WSNs: Background, Data Dissemination and Gathering, Routing Challenges and design Issue, Flooding, SPIN and LEACH protocols for WSNs. Transport Protocol Design Issues in WSNs.	6	18-20%
6	Operating Systems for Wireless Sensor Networks: Introduction, Examples of Operating Systems: TinyOS, Mate, MagnetOS	4	10-12%

Reference Books:

1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Prentice Hall, PTR, 2004.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks", A John Wiley & Sons Inc. Publication, 2007
3. Carlos de Moraes Cordeiro and Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks : Theory and Applications", Second Edition, World Scientific Publishers, 2011
4. C. K. Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall, PTR, 2001
5. Wireless Sensor Networks Signal Processing and Communications by Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong Pub: John Wiley & Sons.

Course Outcome:

After learning the course the students should be able to:

1. Understand the needs of Wireless Adhoc and Sensor Network in current scenario of technology.
2. Students will be able to describe current technology trends for the implementation and deployment of wireless adhoc/sensor networks.
3. Students will be able to discuss the challenges in designing MAC, routing and transport protocols for wireless adhoc/sensor networks.
4. Students will be able to explain the principles and characteristics of wireless sensor networks.

List of Experiments:

Based on syllabus

Open Ended Problems:

1. Design and simulate DSDV (Destination Sequenced Distance Vector) protocol in NS2.
2. Design and simulate AODV (Ad hoc On-Demand Distance Vector Routing) Protocol in NS2

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