GUJARAT TECHNOLOGICAL UNIVERSITY

Advanced Wireless and Mobile Networks
SUBJECT CODE: 3712311

Type of course: Elective

Prerequisite: None

Rationale: Wireless communications is one of the fastest growing segments of the telecommunication industry. Wireless communication systems such as cellular, cordless, satellite phones, wireless local area networks are used widely. However, wireless transmission has many challenges such as wireless medium unreliability, power management, spectrum use, security, locations/routing.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to Wireless Networks Evolution of Wireless Networks, Challenges	1	2
2	Wireless communications Principles and fundamentals – Introduction, Electromegnetic spectrum, Wireless propagation characteristics and modeling, Analog and Digital Data Transmission, Modulation Techniques for wireless systems,Multiple access for wireless systems, Performance increasing techniques for wireless networks, the cellular concept,The Ad hoc and Semi Ad hoc Concepts,Wireless services, Data delivery approaches	6	10
3	WIRELESS CELLULAR NETWORKS – First Generation(1G) Cellular systems- Inroduction Second Generation(2G) Cellular systems- GSM,GPRS,cordless telephony Third Generation(3G) Cellular systems – Introduction,3G spectrum allocation, Third generation service classes and applications, third generation standards Fourth Generation(4G) Cellular systems – Introduction, 4G services and applications	5	8
4	Wireless LAN – Infrared vs radio transmission, infrastructure and ad hoc network, IEEE 802.11	6	15
5	Mobile Network Layer- Mobile IP, Dynamic host configuration protocol, Mobile ad hoc networks	6	10
6	Personal Area networks(PAN) Introduction to PAN Technology and Application, Bluetooth, Home RF.	4	10
7	WiMAX -	4	10

	WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover		
8	Mobile Transport Layer – Traditional TCP,classical TCP improvements, TCP over 2.5/3G wireless networks	4	10
9	Wireless application protocol – Architecture, wireless datagram protocol,wireless transport layer security, wireless transaction protocol,wireless session protocol,wireless application environment	5	10
10	Security Issues in Wireless systems – Need for wireless network security,attacks on wireless networks, security services, Wired equivalence privacy(WEP) protocol, Weaknesses in WEP,	3	10
11	ADVANCED TOPICS IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks	4	5

Reference Books:

1, Schiller J., Mobile Communications, Addison Wesley 2000
2. P.Nicopolitidis,M.S.Obaidat,G.I.Papadimitriou,A.S.Pomportsis, "wireless networks", WILEY 2014
2. Stallings W., Wireless Communications and Networks, Pearson Education 2005
3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002
4. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000
5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200

After completion of course, students would be able to:

1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
2. Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks. Design wireless networks exploring trade-offs between wire line and wireless links.
4. Develop mobile applications to solve some of the real world problems.

List of Experiments:

1. Create network of wireless nodes by connecting laptops, mobiles or create wireless network through simulator and perform Time division multiple access.
2. Create network of wireless nodes by connecting laptops, mobiles or create wireless network through simulator and perform frequency division multiple access.
3. Create network of wireless nodes by connecting laptops, mobiles or create wireless network through simulator and perform code division multiple access.
4. Write an experiment on network simulator to measure the quality of service parameters end to end delay and throughput for ad hoc network of different number of nodes.
5. Write an experiment to perform denial of service attack on wireless network.
6. Write an experiment on simulator to generate vehicular ad hoc network.

Major Equipment:

Computer systems having following minimum technical configurations
Processor:i3 or i5 or higher
RAM : minimum 4 GB
HDD : 1 TB
Internet and wifi connectivity
Licence Window/Linux operating system

List of Open Source Software/learning website:

1) **nptel.ac.in**