

GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT NAME: Mobile Computing and Wireless Communication

SUBJECT CODE: 2170710

B.E. 7th SEMESTER

Type of course: Core

Prerequisite: None

Rationale: Wireless communication provides mobility, flexibility, convenience. Wireless communication devices are used in various areas including healthcare. Wireless communication has opened up many areas for research also.

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)		
				PA	ALA	ESE	OEP			
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	<p>Introduction, Transmission Fundamentals-Signals for Conveying Information, Analog and Digital Data Transmission, Channel Capacity, TransmissionMedia, Multiplexing</p> <p>Communication Networks-LANs,MANs,andWANs,SwitchingTechniques,CircuitSwitching,Packet Switching,</p> <p>Protocols and the TCP/IP Suite- The Need for a Protocol Architecture,TheTCP/IP Protocol Architecture,The OSI Model,Internetworking</p>	10	20
2	<p>Cellular Wireless Networks-Principles of Cellular Networks,First-Generation Analog Second-Generation TDMA Second-Generation CDMA,Third-Generation Systems</p> <p>Antennas and Propagation-Antennas, Propagation Modes, Line-of-Sight Transmission, Fading in the Mobile Environment</p>	12	25

	<p>Modulation Techniques-Signal Encoding Criteria, Digital Data- Analog Signals, Analog Data-Analog Signals, Analog Data-Digital Signals</p> <p>Spread Spectrum-The Concept of Spread Spectrum,Frequency Hopping Spread Spectrum,Direct Sequence Spread Spectrum,Code Division Multiple Access,</p> <p>Coding and Error Control-Error Detection, Block Error Correction Codes , Convolutional Codes, Automatic Repeat Request</p>		
3	<p>Multiple access in Wireless System – Multiple access scheme, frequency division multiple access, Time division multiple access, code division multiple access, space division multiple access, packet radio access, multiple access with collision avoidance.</p> <p>Global system for mobile communication - Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM,PLMN interface, GSM addresses and identifiers, network aspects in GSM,GSM frequency allocation, authentication and security</p> <p>General packet radio service(GPRS) - GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, Applications of GPRS, Billing and charging in GPRS</p> <p>Wireless System Operations and standards - Cordless Systems,Wireless Local Loop, WiMAX and IEEE 802.16 Broadband Wireless Access Standards</p> <p>Mobile IP and Wireless Application. Protocol</p>	12	25
4	<p>Wi-Fi and the IEEE 802.11 Wireless LAN Standard – IEEE 802 architecture, IEEE 802.11 architecture and services, IEEE 802.11 Medium access control, IEEE 802.11 physical layer, Wi-Fi protected access.</p>	04	10
5	<p>Bluetooth, - Radio specification, baseband specification, link manager specification, logical link control and adaption protocol.</p>	04	10
6	<p>Android APIs, Android Architecture, Application Framework, The Application components, The manifest file, downloading and installing Android, Exploring the Development Environment, Developing and Executing the first Android application, Working with Activities, The LinearLayout Layout, The RelativeLayout Layout, The ScrollView Layout, The TableLayout Layout, The FrameLayout Layout, Using the TextView, EditText View, Button View, RadioButton, CheckBox, ImageButton, RatingBar, The options Menu, The Context Menu.</p>	07	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	10			

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

- **Wireless Communications & Networks, Second Edition, William Stallings by Pearson**
- **Mobile Computing Technology, Applications and service creation ,Asoke K Telukder, Roopa R Yavagal by TMH**
- **Android Application Development Black Book, Pradeep Kothari, dreamtech press.**
- **Wireless and mobile networks, Dr. Sunilkumar S. Manvi, Dr. Mahabaleshwar S.Kakkasageri by WILEY**
- **Wireless networks, P. Nicopolitidis, M.S. Obaidat, G.I. Papadimitriou, A.S. Pomportsis by WILEY**
- **Mobile Computing, Raj Kamal by Oxford**
- **Mobile Computing Theory and Practice-Kumkum Garg-Pearson**
- **Lauren Darcey and Shane Conder, Android Wireless Application Development, Pearson Education, 2nd ed. (2011).**

Course Outcome:

After learning the course the students should be able to:

- Understand mobile and wireless network systems such as 2G/3G/4G mobile telephony/data networks,
- Understand GSM and GPRS
- Understand the working of wireless local area network, Bluetooth.

List of Experiments:

- 1) Write a program to simulate Fixed Time Division Multiplexing. Take 12 stations. Every station has time slice of 417 microseconds. Delay should be 10ms. Every time the station gets turn, it shows message.
- 2) Write a program that identifies the bluetooth devices in the wireless range.
- 3) Write a program that prints the signal strength of WiFi connection of the given computer.
- 4) Prepare a wireless ad hoc network and show its working.
- 5) Write a program to find hamming distance. For example Hamming distance $d(v_1, v_2)=3$ if $v_1=011011, v_2=110001$.
- 6) Write a program to perform infrared communication.
- 7) Write a program to perform Bluetooth file transfer.

- 8) Develop an android app which displays “Hello, welcome to Android Lab” message.
- 9) Develop an android app which displays a form to get following information from user.
 - Username
 - Password
 - Email Address
 - Phone Number
 - Country
 - State
 - State
 - Gender
 - Interests
 - Birth Date
 - Birth Time

Form should be followed by a Button with label “Submit”. When user clicks the button, a message should be displayed to user describing the information entered.

Utilize suitable UI controls (i.e. widgets). [When user enters country in AutoCompleteTextView, list of states should be displayed in Spinner automatically.]

- 10) Using Android, Create a login Activity. It asks “username” and “password” from user. If username and password are valid, it displays Welcome message using new activity.
- 11) Develop calculator Android Application.

Design based Problems (DP)/Open Ended Problem:

- 1) **Radio connectivity is inherently poor. How to ensure data delivery without retransmission?**
- 2) **Resource manager might have allocated resources to applications. How to revoke those resources? How to utilize available resources optimally?**

Major Equipment:

Computer, Laptop

List of Open Source Software/learning website:

<http://www.wirelessdevnet.com/>
<http://www.protocols.com/>
www.tutorialspoint.com/mobile_computing

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.