WIRELESS COMMUNICATION (EC735)- VII SEM ECE

By

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Course Learning Objectives:

The student should be able to:

- Understand the basics of wireless communication used for mobile telephony
- Apply the basic methodologies of cellular system designing.
- Describe the 3G network architecture and cellular network
- Understand GSM and TDMA technologies and GSM Call establishment, Cal handoff and Roaming
- Distinguish between CDMA technology, wireless LAN and PAN technologies

Unit No.	Syllabus Contents	No. of Hours	Blooms Taxonomy level
1	Introduction to wireless telecommunication systems and Networks, History and Evolution of wireless radio system, Development of modern telecommunication infrastructure, overview of existing Network infrastructure, Wireless Network applications, Future Wireless Network. Different generations of wireless cellular networks 1G, 2G,2.5G ,3G and 4G Cellular system and beyond, Wireless standard organizations. TEXT 1	10	L1,L2,L3
2	Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components. Cellular component identification, Call establishment. TEXT 1	10	L1,L2,L3
3	Wireless network architecture and operation: The cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backhaul networks, Mobility management, Radio resources and power management, Wireless network security. TEXT1	11	L1,L2,L3

Unit No.	Syllabus Contents	No. of Hours	Blooms Taxonomy level
4	GSM and TDMA Technology: GSM system overview- introduction to GSM and TDMA,GSM Network and System Architecture, GSM channel concept, GSM system operations-GSM identities, GSM system operations (Traffic cases). TEXT1	11	L1,L2,L3
5	CDMA Technology: CDMA system overview, introduction to CDMA,CDMA network and system architecture CDMA basics: CDMA Channel concept, CDMA operations(Layer 3) 3g CDMA,IS95B,CDMA 2000 and WCDMA Wireless LANs/IEEE 802.11X: Introduction and Evolution of Wireless LANs, Design issues. Wireless PAN/IEEE 802.15x: Introduction, Wireless Pan application and Architecture TEXT1	11	L1,L2,L3

- **Note :**Each Unit will have Internal Choice

Course Outcomes:

After the completion of the Course the student should be able to :

- CO1 Understand and Identify the telecommunication system and networks system, 3G cellular system components; list the components of wireless cellular network and different frequency band used in GSM and CDMA
- CO2 Explain cellular systems, list the characteristics of 3G wireless mobile systems power management and network security, Wireless LAN and Wireless PAN
- CO3 Explain the architecture of 3G and network Systems and the operation needed for call setup and call release in GSM and TDMA system and concept of CDMA,
- CO4 Illustrate the cellular concept, cell sectoring and cell splitting mobility management, CDMA channel concept, GSM frame concept , GSM system operation registration, call setup, location
- CO5 Discuss design issues in GSM,TDMA,CDMA, Wireless LAN and PAN Networks

Text Books.

1. Garry J Mullet, “Introduction to Telecommunication Systems and Networks: , India Edition, Delmar Cengage Learning,2007

Reference Text Books.

1. T L Singal, “Wireless Communications”, Tata McGraw-Hill, Education, 2010

2. Vijay K Garg, “IS-95 CDMA and cdma2000: Cellular/PCS Systems Implementation”, Pearson Education, reprint 2006

Web Links.

1. http://www.nptel.ac.in /courses/117102062/

UNIT – 1

Introduction to wireless telecommunication systems and Networks

- History and Evolution of wireless radio system
- Development of modern telecommunication infrastructure
- overview of existing Network infrastructure
- Wireless Network applications, Future Wireless Network.
- Different generations of wireless cellular networks
- 1G, 2G,2.5G ,3G and 4G Cellular system and beyond
- Wireless standard organizations.

WHAT IS WIRELESS ?

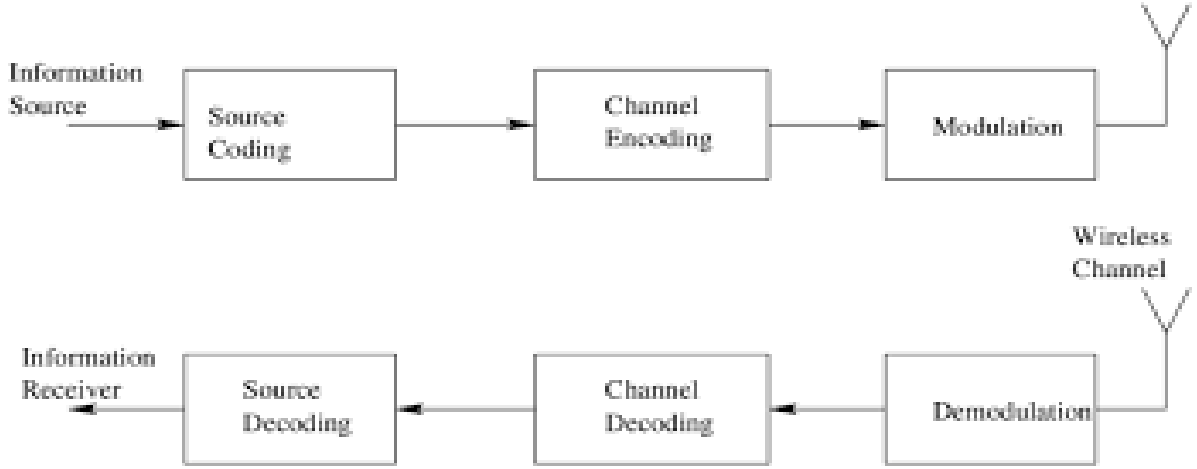
The word wireless is dictionary defined “having no wires ”

In networking terminology , wireless is the term used to describe any computer network where there is no physical wired connection between sender and receiver, but rather the network is connected by radio waves and or microwaves to maintain communications.

Wireless networking utilizes specific equipment such as NICs(Network Interface Controllers) and Routers in place of wires (copper or optical fiber).

Introduction to wireless Communication

- Wireless Communication is the process of transmitting voice and data using Electromagnetic waves in open space (atmosphere)
- Wireless means Transmitting signals over invisible radio waves instead of wires.



Wireless communication system BD

- WC – Limitations
  - Bandwidth
  - Frequency Spectrum
  - Power

- Advantages and Disadvantages
- Technologies in Digital WC
- Wireless modulation schemes
- Infrared modulation Schemes

Wireless Communication Channel Specifications

- Two steps
  - Duplexing method
  - Multiple access method

Important terms used to describe elements of wireless communication systems

Table 1.4 Wireless Communications System Definitions

Base Station	A fixed station in a mobile radio system used for radio communication with mobile stations. Base stations are located at the center or on the edge of a coverage region and consist of radio channels and transmitter and receiver antennas mounted on a tower.
Control Channel	Radio channel used for transmission of call setup, call request, call initiation, and other beacon or control purposes.
Forward Channel	Radio channel used for transmission of information from the base station to the mobile.
Full Duplex Systems	Communication systems which allow simultaneous two-way communication. Transmission and reception is typically on two different channels (FDD) although new cordless/PCS systems are using TDD.
Half Duplex Systems	Communication systems which allow two-way communication by using the same radio channel for both transmission and reception. At any given time, the user can only either transmit or receive information.
Handoff	The process of transferring a mobile station from one channel or base station to another.
Mobile Station	A station in the cellular radio service intended for use while in motion at unspecified locations. Mobile stations may be hand-held personal units (portables) or installed in vehicles (mobiles).
Mobile Switching Center	Switching center which coordinates the routing of calls in a large service area. In a cellular radio system, the MSC connects the cellular base stations and the mobiles to the PSTN. An MSC is also called a mobile telephone switching office (MTSO).
Page	A brief message which is broadcast over the entire service area, usually in a simulcast fashion by many base stations at the same time.
Reverse Channel	Radio channel used for transmission of information from the mobile to base station.
Roamer	A mobile station which operates in a service area (market) other than that from which service has been subscribed.
Simplex Systems	Communication systems which provide only one-way communication.
Subscriber	A user who pays subscription charges for using a mobile communications system.
Transceiver	A device capable of simultaneously transmitting and receiving radio signals.

Base station

Mobile Station

Mobile Station

- What is a mobile station?
  - A device able to access services in a GSM network via the Air interface.

Mobile switching centre

Basics of Wireless Networks

- Network – a collection of terminals, computers, servers and components which allows for the easy flow of data and use of resources among them.
- Wireless network
- Wireless network Architecture