

EC2401 WIRELESS COMMUNICATION
SUBJECT DESCRIPTION AND OBJECTIVES

AIM

- To introduce the concepts of wireless / mobile communication using cellular environment.
- To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be introduced.

OBJECTIVES

- It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.
- It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measure and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.
- It provides idea about analog and digital modulation techniques used in wireless communication.
- It also deals with the different types of equalization techniques and diversity concepts. It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques.
- It deals with advanced transceiver schemes and second generation and third generation wireless networks.

DESCRIPTION

Wireless communication is among technology's biggest contributions to mankind. Wireless communication involves the transmission of information over a distance without help of wires, cables or any other forms of electrical conductors. The transmitted distance can be anywhere between a few meters (for example, a television's remote control) and thousands of kilometres (for example, radio communication).

Advantages

Wireless communication has the following advantages:

- i. Communication has enhanced to convey the information quickly to the consumers.
- ii. Working professionals can work and access Internet anywhere and anytime without carrying cables or wires wherever they go. This also helps to complete the work anywhere on time and improves the productivity.
- iii. Wireless networks are cheaper to install and maintain.

Disadvantages

Wireless network has led to many security threats to mankind. It is very easy for the hackers to grab the wireless signals that are spread in the air. It is very important to secure the wireless network so that the information cannot be exploited by the unauthorized users. This also increases the risk to lose information. Strong security protocols must be created to secure the wireless signals like WPA and WPA2. Another way to secure the wireless network is to have wireless intrusion prevention system.

Some of the devices used for wireless communication are cordless telephones, mobiles, GPS units, wireless computer parts, and satellite television.

EC2401 WIRELESS COMMUNICATION L T P C

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UNIT I SERVICES AND TECHNICAL CHALLENGES 9

Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.

UNIT II WIRELESS PROPAGATION CHANNELS 9

Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models.

UNIT III WIRELESS TRANSCEIVERS 9

Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying, $\pi/4$ -Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels.

UNIT IV SIGNAL PROCESSING IN WIRELESS SYSTEMS 9

Principle of Diversity, Macro diversity, Micro diversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques.

UNIT V ADVANCED TRANSCEIVER SCHEMES 9

Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, Second Generation(GSM, IS-95) and Third Generation Wireless Networks and Standards

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, “Modern Wireless Communications”, Pearson Education, 2007.

REFERENCES:

1. Rappaport. T.S., “Wireless communications”, Pearson Education, 2003.
2. Gordon L. Stuber, “Principles of Mobile Communication”, Springer International Ltd., 2001.
3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

MICRO LESSON PLAN

WEEK	HOURS	LECTURE TOPIC	READING
UNIT I SERVICES AND TECHNICAL CHALLENGES			
I	1	Types of Services (A/V Class)	T1
	2	Requirements for the services	
	3	Multipath propagation	
	4	Spectrum Limitations	
	5	Noise limited systems	
II	6,7	Interference limited systems	
	8	Principles of Cellular networks (A/V Class)	
	9,10	Multiple Access Schemes	
UNIT II WIRELESS PROPAGATION CHANNELS			
III	11,12	Propagation Mechanisms (Qualitative treatment)	T1
	13	Propagation Effects with Mobile Radio (A/V Class)	
	14,15	Channel Classification	T2
IV	16,17	Link Calculations	T1
	18,19	Narrowband Models	
	20	Wideband Models (A/V Class)	
UNIT III WIRELESS TRANSCEIVERS			
V	21	Structure of a wireless communication link (A/V Class)	T1
	22,23	Modulation and demodulation – Quadrature Phase Shift Keying	
	24	$\pi/4$ -Differential Quadrature Phase Shift Keying	
	25	Offset-Quadrature Phase Shift Keying	
VI	26	Binary Frequency Shift Keying	T1
	27	Minimum Shift Keying	
	28	Gaussian Minimum Shift Keying (A/V Class)	
	29,30	Power spectrum and Error performance in fading channels	

UNIT IV SIGNAL PROCESSING IN WIRELESS SYSTEMS				
VII	31	Principle of Diversity	T1	
	32	Macro diversity		
	33	Micro diversity		
	34	Signal Combining Techniques (A/V Class)		
	35	Transmit diversity		
VIII	36,37	Equalisers- Linear Equalisers (A/V Class)		
	38	Decision Feedback Equalisers		
	39,40	Review of Channel coding and Speech coding techniques		
UNIT V ADVANCED TRANSCEIVER SCHEMES				
IX	41	Spread Spectrum Systems	T1	
	42	Cellular Code Division Multiple Access Systems – Principle		
	43	Power control		
	44	Effects of multipath propagation on Code Division Multiple Access		
	45	Orthogonal Frequency Division Multiplexing – Principle		
X	46	Cyclic Prefix		T3
	47	Transceiver implementation		
	48	Second Generation - GSM (A/V Class)		
	49	IS-95		
	50	Third Generation Wireless Networks and Standards (A/V Class)		

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