

D. Syllabus Detailing and Learning objectives

Module	Chapter	Detailed Content	Syllabus Detailing	Learning Objectives
Module 1	CH 1 Fundamentals of wireless communication (8-Hours)	Fundamentals of Wireless Communication Advantages, Limitations and Applications Wireless Media, Infrared Modulation Techniques, DSSS And FHSS, Multiple access technique: TDMA, CDMA, FDMA, CSMA, OFDMA [fundamentals], Frequency Spectrum, Radio and Infrared Frequency Spectrum	Purpose: To make students understand the basic concepts related to wireless communication and also to make them aware of the recent and past trends in the domain along with its advantages and disadvantages.	1. To describe the fundamentals and technological aspects of wireless technology and communication (R) 2. To explain the fundamentals of wireless communication and Multiple access technique such as TDMA, CDMA, FDMA, CSMA, OFDMA (U) 3. To Differentiate between various multiple access techniques (A) 4. To identify different types of modulation techniques. (AN)
			Scope – 1. Academic Aspects- Understanding concepts of wireless technologies, its limitations and various techniques involved in it. 2. Technology Aspect- Implementation of DSSS/FHSS in spread spectrum system. 3. Application Aspect- Application of wireless techniques for spread spectrum etc to be used in real life world. Students Evaluation – 1. Theory Questions to be asked on multiple access techniques and FHSS , DSSS. 2. Case study to be given to differentiate between different multiple access techniques.	
Module 2	CH 2 Introduction to wireless technology (10-Hours)	The cellular concepts: Frequency Reuse, Channel assignment strategies, Handoff strategies Interference and System Capacity [Design problems] Evolution of cellular networks 1G,	Purpose – The focus of this module is to understand the essential principles of cellular communication and the formation of regular hexagonal cellular structures with multiple clusters. The most serious concern due to frequency reuse is co channel interference which may degrade the performance of a cellular system operation. This module will also give a detailed description of Global System for Mobile communication (GSM) which includes architectures, interfaces, channel types and its frame structure.	1. To categorize various cellular network systems. [AN] 2. Draw and explain the GSM and CDMA architecture. [R] 3. To solve and evaluate numerical on frequency reuse, system capacity and interference. (E)

		2G,3G,4G,GSM: System Architecture, Radio Subsystem, Channel Types, GSM frame structure, CDMA: Architecture, Frequency and channel specifications, forward and Reverse CDMA Channels.	Scope – 1. Academic Aspects- Learning the insights of wireless technologies and cellular concepts. 2. Technology Aspect- Implement frequency reuse in GSM and CDMA. 3. Application Aspect- Application of number of techniques and strategies of channel assignment and handoffs. Students Evaluation 1. Questions on frequency reuse, channel assignment, interference, system capacity can be asked. 2. Implementation of numerical problems on system capacity. 3. Students can apply A5 algorithm for security in GSM.	4. To describe various handoff strategies(R) 5. To explain and solve frequency reuse algorithm. (A) 6. Compare various cellular network generations. [U]
Module 3	Chapter 3 Wireless in local loop (WLL) and Chapter 4 wireless local area network (WLAN) (Hours -12)	User requirements of WLL systems, WLL system loop (WLL) architecture, MMDS, LMDS, WLL subscriber terminal, WLL interface to the PSTN. Introduction, WLAN Equipment, WLAN	Purpose- the student should be able to understand the requirements and basic involved in wireless local loop and wireless local area networks. Scope – 1. Academic Aspects- Understanding the architecture and requirements of WLL and WLAN. 2. Technology Aspect- Implementation of WLL interface to PSTN. 3. Application Aspect- Students should understand how WLL and WLAN can be used in various wireless systems	1. Draw the WLL architecture and identify the components in it. (R) 2. List the WLAN topologies, technologies and explain their significance. (U) 3. Draw the WLAN architecture and describe . (R) 4. Illustrate MMDS , LMDS. (AN)

		topologies and Technologies, IEEE 802.11 WLAN : Architecture, Physical Layer, Data Link Layer, MAC Layer, Security Latest developments of IEEE 802.11 standards	Students Evaluation – 1. Theory Questions to be asked on WLAN , WLL architecture and local loop techniques . 2. Lab experiments for design of wireless network using Netsim. 3. Corresponding viva questions can be asked for security in latest developments of 802.11 , MMDS,LMDS.	5. Explain MMDS and LMDS working in WLL based technology (U)
Module 4	Chapter 5 Wireless personal area network (WPAN) (Hours -08)	Introduction ,WPAN technologies and Protocols, Bluetooth (802.15.1)[Protocol stack and network connection establishment, security aspects] HR –WPAN (UWB) (IEEE 802.15.3) LR-WPAN (IEEE 802.15.4) Zigbee [Stack architecture, components , Network Topologies , Applications] Wireless Sensor networks [Network model and protocol stack , routing algorithms, Applications]	Purpose- the student should be able to understand wireless personal area network its technologies and protocols used in it along with Bluetooth protocol stack.	1. Name WPAN technologies and describe . (R)
			Scope - 1. Academic Aspects- Understanding the WPAN technologies and protocols. 2. Technology Aspect- To study the design requirements of IEEE 802.15.1 protocol architecture & its design. 3. Application Aspect- Students should understand how Bluetooth , zigbee ,UWB are used in real life.	2. Investigate the protocols and show their usage in computer. (A) 3. Draw the protocol stack and determine the role of each layer. (AN) 4. Describe HR-WPAN. (U) 5. Design security aspects in Bluetooth. (C)
			Students Evaluation – 1. Theory Questions to be asked on WPAN, Bluetooth, zigbee, piconet , scatternet. 2. Lab experiments for implementation wireless sensor network routing algorithm. 3. Corresponding viva questions can be asked for WPAN, Bluetooth, zigbee, piconet , scatternet.	6. Compare different WPAN technologies and summarize their performance. (AN)

Module 5	Chapter 6 - Wireless metropolitan area network (Hours -4)	IEEE 802.16 [Protocol Architecture], IEEE 802.16a [Wimax] networks Wimax and LTE /3GPP comparison	Purpose – To make students understand basics wireless metropolitan area network and Wimax, LTE and 3GPP. Scope – 1. Academic Aspects- Understanding wireless metropolitan area network and Wimax, LTE and 3GPP. 2. Technology Aspect- Understanding of wireless metropolitan area network and Wimax, LTE and 3GPP. 3. Application Aspect- Understand basics of IEEE 802.16 protocol and its real life applications. Student Evaluation - 1. Theory Questions to be asked on IEEE 802.16 standard, MAC layer, comparison between WiMAX and LTE 2. Explaining protocol architecture of IEEE 802.16	1. To describe the fundamentals and technological aspects of IEEE 802.16. (R) 2. To draw and explain IEEE 802.16 protocol architecture. (R) 4. Compare Wimax and LTE/3GPP techniques and summarize their performance. [AN] 5. Discuss the need for IEEE 802.16 (a). (U)
	Chapter 7- Security issues in wireless systems Chapter 8- Economics of wireless network (Hours -6)	The need, attacks , security services, wired equivalent privacy protocol(WEP), Mobile IP, VPN [PPTP, L2TP, IPSec], Economic Benefits, Economics of Wireless industry, Wireless data forecast, charging issues	Purpose – To make students understand the attacks, needs, security aspects, WEP , economic benefits along with economics of wireless industry and wireless data forecast with charging issues. Scope – 1. Academic Aspects- Understanding of the security issues involved in the implementation of wireless technology. 2. Technology Aspect- Study the design issues on “Economics of wireless communication standards”. 3. Application Aspect- Students will be able to understand need for security, security attacks and different security services in wireless system.	1. To describe and identify various security issues in wireless systems. (AN) 2. Describe various security services and summarize their functionality. (AN) 3. List the various attacks on wireless systems. (R) 4. Explain economic benefits of wireless communication. [U] 5. Define charging issues and identify them. (AN)



			Student Evaluation - 1. Theory Questions to be asked on WEP, economic benefits of wireless networks, various methods of charging 2. Explain different role played by a mobile carrier to remain competitive in the market.	
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