Marwadi University
Faculty of Diploma studies
Information and Communication Technology

Subject Code: 09CT0609
Subject Name: Wireless Technologies
Diploma Year – III (Semester VI)

Objective:

This course is to make students learn about fundamentals of wireless technologies and various wireless networking architectures. They will also go through significantly latest wireless technologies.

Credits Earned: 4 Credits

Course Outcomes: After learning this course, students should be able to,

1. Understand basic concepts of cellular communication systems.

2. Understand about basic principles behind radio resource management techniques such as power control, channel allocation and handoffs.

3. Evaluate different wireless communication systems and standards.

4. Compare different technologies used for wireless communication systems.

5. Explain the architecture, functioning, protocols, capabilities and application of various wireless communication systems.

Pre-requisite of course: Electromagnetic Theory.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

Contents:

Sr No	Course content	Total Hrs.
1	**Introduction to Cellular Communication** Cellular cell concepts: cell structure, frequency reuse, cell splitting, cell sectoring, Microcell zone concept, channel assignment, interference, capacity, power control, Evolution of cellular communication systems: overview and standards of 1G, 2G, 3G and 4G systems	08

2	**Global System for Mobile Communications (GSM) :** Services and Features, System Architecture, Radio sub systems, Channel types, Example of a GSM call, Frame Structure, Signal Processing, Protocols, Hand off, GPRS: Architecture, Protocols and Channels, security	**09**
3	**CDMA:** Architecture of IS-95 CDMA system, CDMA forward channels, CDMA reverse channels, Soft handoff, CDMA features, Power control in CDMA, Performance of CDMA System, RAKE Receiver, CDMA2000 cellular technology	**09**
4	Wireless Personal Area Networks: Bluetooth Specifications, Protocols Stack, Security Issues, Advantages and Disadvantages, Application, UWB, Zigbee, wireless local area networks: IEEE 802.11, network architecture, medium access methods, WLAN standards, wireless metropolitan area networks: Wimax	**08**
5	GPS, wireless local loop, cordless phone, paging systems, RFID, Home RF, NFC, Software Defined Radio, Wireless Sensor Networks, Security issues and challenges in wireless networks	**08**
	Total	42 hrs.

References:

1. Theodore S. Rappaport, Wireless Communications: Principles and Practices, Pearson
2. William Stallings, Wireless Communication and Networks, Pearson
3. Sanjay Kumar, Wireless Communication: the fundamental and advanced concepts, River Publishers
4. Andrea Goldsmith, "Wireless Communications", Cambridge University Press
5. Raj Pandya, Mobile and Personal Communication Systems and Services, IEEE Press

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

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

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
40%	40%	10%	10%	0%	0%

Suggested List of Experiments:
1. To perform various AT commands using GSM SIGMA Trainer Kit.
2. To Interface GSM module with micro-controller 8051 for message transmission and reception to control any device.
3. Write a MATLAB program to simulate hard and soft handoff.
4. Write a MATLAB program to simulate multipath fading channels defined for GSM, CDMA and WiMAX standards.
5. Write a MATLAB program to parameterize and generate GSM uplink and downlink frames.
6. Write a MATLAB program to parameterize and generate GSM multi-frame structure and simulate power control and propagation loss effects.
7. Write a MATLAB program to plot spectrum of forward and reverse cdma2000 waveform.
8. Write a MATLAB program to plot BER for various fading channels.
9. Study full duplex Bluetooth communication using Simulink.
10. Write a MATLAB program to generate MAC frames for IEEE 802.15.4 standard (Zigbee).
11. Write a MATLAB program to model communication between two NFC devices.

Reference Materials:

- https://nptel.ac.in/courses/117/102/117102062/

- https://nptel.ac.in/courses/106/106/106106167/

- https://www.coursera.org/learn/wireless-communications