

<b>Devi Ahilya University, Indore, India Institute of Engineering &amp; Technology</b>				<b>III Year B.E. (Electronics and Telecommunication)</b>			
<b>Subject Code &amp; Name</b>	<b>Instructions Hours per Week</b>			<b>Credits</b>			
<b>ETR6C2 MOBILE AND WIRELESS COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
	<b>Duration of Theory Paper: 3 Hours</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>

**Learning Objectives:** The course contents are aimed to provide:

- Evolution of mobile communication system from 1G to 5G.
- Understanding of various transmission and reception techniques used in different mobile communication systems.
- To know the importance of communication channel in performance of mobile communication system.

**Prerequisites:** Knowledge of analog and digital communication systems.

## **COURSE CONTENTS**

### **Unit – I**

**Introduction to Wireless Communication:** Classification of different wireless communication networks, Transceiver techniques for Mobile wireless communication - Modulation, Channel Coding, Speech Coding, Spread spectrum Modulation, Multiple Access Techniques, Duplexing.

### **Unit – II**

**Channel Characterization:** Characterizing Mobile-Radio Propagation, Large-Scale Fading, Path loss models, Small-Scale Fading, Types of small scale fading, fading parameters – Coherence time, coherence BW, Delay spread, Doppler spread. Models for Fading channel- Rayleigh Fading and Rician distribution for fading channel, Fading mitigation techniques - Equalization Techniques, Diversity Techniques, RAKE Receiver, OFDM.

### **Unit – III**

**Introduction to Cellular Mobile System:** A basic cellular system, Performance criteria, Concept of frequency reuse channels, C/I ratio, cell splitting, sectoring, types of non co-channel interference, co-channel interference: measurement & reduction factor, Frequency management, Channel Assignment, Handoffs, Dropped call rate.

### **Unit – IV**

**GSM:** System architecture, Air interfaces, Multiple access, Channel organization and framing structure, Call set-up procedure, Protocols and signaling, Authentication and security.

**CDMA:** CDMA Evolution, CDMA IS-95 systems - its forward and reverse links, PN sequence related to IS-95, Power control, Trans receiver techniques used in CDMA, call processing steps, Hand-off process.

### **Unit – V**

**Advanced Mobile Networks:** Wireless Networks GPRS, EDGE, 3G-UMTS, Wi-max, WLAN, their architecture and working. Overview of IP and Mobile IP, Introduction to 4G & 5G systems.

### **Learning Outcomes:**

Upon Completing the Course, Student will able to learn

- (1) Various processes and their types involved in mobile communication system.
- (2) Current and future Mobile communication standards and techniques used in standards.

### **BOOKS RECOMMENDED:**

- [1].S Misra, “Wireless Communications and Networks” 3G and Beyond, Second Edition, Mc Graw Hill, 2013.
- [2].A F Molisch, Wireless communication, Second Edition, Wiley Publication, 2014.
- [3].A Biswas, M Chaudhary, Wireless Communication, Theory and Applications, Cambridge University Press, First Edition, 2017.
- [4].T.S.Rappaport, “Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
- [5].W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.

### **List of Practical Assignments:**

**Note: Assignments has to be performed using MATLAB.**

**Assignment I :** Performance evaluation of Mobile communication system in presence of various digital modulation techniques.

- (a) To evaluate the performance of MPSK for  $M=2,4,8,16$  and their comparison study.
- (b) To evaluate the performance of MFSK for  $M=2,4,8,16$  and comparison study.
- (c) Compare the performance of MSK & QPSK techniques.
- (d) How will select a particular modulation technique for a particular application.

**Assignment II :** Performance evaluation of mobile communication system in presence of various error correcting codes .

- (a) To evaluate the performance of Hamming code.
- (b) To evaluate the performance of Convolution code.
- (c) Performance comparison of these two codes.
- (d) How will select a particular channel code for a particular application.

**Assignment III :** Performance evaluation of mobile communication system in presence of various communication channels.

- (a) To evaluate the performance of AWGN channel.
- (b) To evaluate the performance of Rayleigh channel.
- (c) To evaluate the performance of Rician channel
- (d) Performance comparison of different communication channels.
- (e) What will be the impact of a communication channel on the performance of digital communication system.

**Assignment IV :** Performance evaluation of digital communication system in presence of various equalizers using.

- (a) To evaluate the performance of linear equalizers.
- (b) To evaluate the performance of adaptive equalizers.
- (c) Performance comparison of different equalizers.
- (d) What will be the impact of an equalizer on the performance of digital communication system.

**Assignment V :** Simulate a mobile communication system and evaluate its various performance measures.