

**B. E. 2018 Scheme Eighth Semester Syllabus (EC)**  
**Choice Based Credit System (CBCS) and Outcome Based Education (OBE)**

**SEMESTER – VIII**

**WIRELESS and CELLULAR COMMUNICATION**

Course Code	: 18EC81	CIE Marks	: 40
Lecture Hours/Week	: 03	SEE Marks	: 60
Total Number of Lecture Hours	: 40 (08 Hrs / Module)	Exam Hours	: 03
CREDITS – 03			

**Course Learning Objectives:** This course will enable students to:

- Understand the concepts of propagation over wireless channels from a physics standpoint
- Application of Communication theory both Physical and networking to understand GSM systems that handle mobile telephony
- Application of Communication theory both Physical and networking to understand CDMA systems that handle mobile telephony.
- Application of Communication theory both Physical and networking to understand LTE-4G systems.

**Module-1**

**Mobile Radio Propagation –**

Large Scale Path Loss - Free Space Propagation Model, Relating Power to Electric Field, Three Basic Propagation Mechanisms – Reflection (Ground Reflection) , Diffraction, Scattering, Practical Link Budget,

**(Text 1 - 2.2 and Ref1 - Chapter 4)**

**Fading and Multipath** – Broadband wireless channel, Delay Spread and Coherence Bandwidth, Doppler Spread and Coherence Time, Angular spread and Coherence Distance **(Text 1 – 2.4)**

Statistical Channel Model of a Broadband Fading Channel

**(Text 1 – 2.5.1)**

**The Cellular Concept** – Cellular Concept , Analysis of Cellular Systems, Sectoring

**(Text 1- 2.3)**

**L1, L2**

**Module-2**

**GSM and TDMA Technology**

**GSM System overview** – Introduction, GSM Network and System Architecture, GSM Channel Concept.

**GSM System Operations** – GSM Identities, System Operations –Traffic cases, GSM Infrastructure Communications (Um Interface)  
(Text 2, Part1 and Part 2 of Chapter 5) **L1,L2,L3**

### **Module-3**

#### **CDMA Technology**

**CDMA System Overview** – Introduction, CDMA Network and System Architecture

**CDMA Basics**– CDMA Channel Concepts, CDMA System (Layer 3) operations, 3G CDMA

(Text 2-Part 1, Part2 and Part 3 of Chapter 6) **L1,L2,L3**

### **Module-4**

#### **LTE –4G**

**Key Enablers for LTE 4G** – OFDM, SC-FDE, SC-FDMA, Channel Dependant Multiuser Resource Scheduling, Multi-Antenna Techniques, Flat IP Architecture, LTE Network Architecture. (Text 1, Sec 1.4)

**Multi-Carrier Modulation** – Multicarrier concepts, OFDM Basics, OFDM in LTE, Timing and Frequency Synchronization, Peak to Average Ration, SC-Frequency Domain Equalization, Computational Complexity Advantage of OFDM and SC-FDE.

(Text 1, Sec 3.1 – 3.7) **L1,L2,L3**

### **Module-5**

#### **LTE - 4G**

**OFDMA and SC-FDMA** – Multiple Access for OFDM Systems, OFDMA, SCFDMA, Multiuser Diversity and Opportunistic Scheduling, OFDMA and SC-FDMA in LTE, OFDMA system Design Considerations.

(Text 1, Sec 4.1 – 4.6)

**The LTE Standard** – Introduction to LTE and Hierarchical Channel Structure of LTE, Downlink OFDMA Radio Resources, Uplink SC-FDMA Radio Resources.

(Text 1, Sec 6.1 – 6.4) **L1, L2,L3**

**Course Outcomes:** After studying this course, students will be able to:

1. Understand the Communication theory both Physical and network-ing associated with GSM, CDMA & LTE 4G systems.
2. Explain concepts of propagation mechanisms like Reflection, Dif-fraction, Scattering in wireless channels.
3. Develop a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network.

4. Develop a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network.
5. Understand the Basic operations of Air interface in a LTE 4G system.

**Question paper pattern:**

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

**Text Books:**

1. “Fundamentals of LTE” Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed, Pearson education (Formerly Prentice Hall, Communications Engg and Emerging Technologies), ISBN-13: 978-0-13-703311-9.
2. “Introduction to Wireless Telecommunications Systems and Networks”, Gary Mullet, First Edition, Cengage Learning India Pvt Ltd., 2006, ISBN -13: 978-81-315-0559-5.

**Reference Books:**

1. “Wireless Communications: Principles and Practice” Theodore Rappaport, 2<sup>nd</sup> Edition, Prentice Hall Communications Engineering and Emerging Technologies Series, 2002, ISBN 0-13-042232-0.
2. LTE for UMTS Evolution to LTE-Advanced’ Harri Holma and Antti Toskala, Second Edition - 2011, John Wiley & Sons, Ltd. Print ISBN: 9780470660003. 2