



**K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**CO-PO Mapping**

<b>Course: WIRELESS AND CELLULAR COMMUNICATION</b>			
<b>Type: Core</b>		<b>Course Code: 18EC81</b>	
<b>No of Hours</b>			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
3	0	3	40
<b>Marks</b>			
Internal Assessment	Examination	Total	Credits
40	60	100	3
<b>Aim/Objectives of the Course:</b>			
<ol style="list-style-type: none"> <li>Understand the concepts of propagation over wireless channels from a physics standpoint.</li> <li>Application of Communication theory both Physical and networking to understand GSM systems that handle mobile telephony</li> <li>Application of Communication theory both Physical and networking to understand CDMA systems that handle mobile telephony.</li> <li>Application of Communication theory both Physical and networking to understand LTE-4G systems.</li> </ol>			
<b>Course Learning Outcomes</b>			
After completing the course, the students will be able to			
CO1	Explain concepts of propagation mechanisms like Reflection, Diffraction, Scattering in wireless channels.	Applying (K3)	
CO2	Develop a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network.	Applying (K3)	
CO3	Develop a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network.	Applying (K3)	
CO4	Understand develop the Basic operations of Air interface in a LTE 4G system.	Applying (K3)	
CO5	Explain concepts of OFDMA and SC-FDMA used in LTE and LTE Standards.	Applying (K3)	
<b>Syllabus Content</b>			
<b>Module-1</b> <b>Mobile Radio Propagation</b> – 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. <b>Fading and Multipath</b> – Broadband wireless channel, Delay Spread and Coherence Bandwidth, Doppler Spread and Coherence Time, Angular spread and Coherence Distance. Statistical Channel Model of a Broadband Fading Channel. <b>The Cellular Concept</b> – Cellular Concept, Analysis of Cellular Systems, Sectoring.			<b>CO1</b> 08 hrs PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PS01-3 PS02-2
<b>LO:</b> At the end of this session the student will be able to, <ol style="list-style-type: none"> <li>Explain Free space Propagation model.</li> <li>Explain Propagation Mechanisms.</li> <li>Path loss and derive the expression for path loss</li> <li>Analyze Cellular Systems, Sectoring</li> </ol>			
<b>Module-2</b> <b>GSM and TDMA Technology</b>			<b>CO2</b>

<p><b>GSM System overview</b> – Introduction, GSM Network and System Architecture, GSM Channel Concept.</p> <p><b>GSM System Operations</b> – GSM Identities, System Operations –Traffic cases, GSM Infrastructure Communications (Um Interface).</p> <p><b>LO:</b> At the end of this session the student will be able to,</p> <ol style="list-style-type: none"> <li>1. Explain GSM System operation, GSM Identities</li> <li>2. Explain GSM Network Architecture, Infrastructure Communications.</li> <li>3. Explain and solve problems on Channel Concept</li> </ol>	<p>08 hrs PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2</p>
<p><b>Module-3</b> <b>CDMA Technology</b> <b>CDMA System Overview</b> – Introduction, CDMA Network and System Architecture <b>CDMA Basics</b> – CDMA Channel Concepts, CDMA System (Layer 3) operations, 3G CDMA</p> <p><b>LO:</b> At the end of this session the student will be able to,</p> <ol style="list-style-type: none"> <li>1. Explain CDMA System operation, CDMA Basics</li> <li>2. Explain CDMA Network Architecture and Channel Concept</li> <li>3. Understand the concept of 3G CDMA</li> </ol>	<p><b>CO3</b> 08 hrs  PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2</p>
<p><b>Module-4</b> <b>LTE – 4G</b> <b>Key Enablers for LTE 4G</b> – OFDM, SC-FDE, SC-FDMA, Channel Dependant Multiuser Resource Scheduling, Multi-Antenna Techniques, Flat IP Architecture, LTE Network Architecture. <b>Multi-Carrier Modulation</b> – 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.</p> <p><b>LO:</b> At the end of this session the student will be able to,</p> <ol style="list-style-type: none"> <li>1. <b>Discuss</b> the key enabling technologies used in LTE design.</li> <li>2. <b>Explain</b> the OFDM concept and how it is used in LTE.</li> <li>3. Explain Channel Dependent Multiuser Resource Scheduling, Multi-Antenna Techniques.</li> <li>4. Explain LTE Network Architecture.</li> </ol>	<p><b>CO4</b> 08 hrs  PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2</p>
<p><b>Module-5</b> <b>LTE - 4G OFDMA and SC-FDMA</b> – Multiple Access for OFDM Systems, OFDMA, SCFDMA, Multiuser Diversity and Opportunistic Scheduling, OFDMA and SC-FDMA in LTE, OFDMA system Design Considerations. <b>The LTE Standard</b> – Introduction to LTE and Hierarchical Channel Structure of LTE, Downlink OFDMA Radio Resources, Uplink SC-FDMA Radio Resources.</p> <p><b>LO:</b> At the end of this session the student will be able to,</p> <ol style="list-style-type: none"> <li>1. Explain Multiple Access for OFDM Systems</li> <li>2. Explain OFDMA system Design Considerations</li> <li>3. Explain Hierarchical Channel Structure of LTE</li> <li>4. Explain Downlink OFDMA Radio Resources, Uplink SC-FDMA Radio Resources</li> </ol>	<p><b>CO5</b> 08 hrs  PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2</p>



**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, 2nd 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

**Useful Websites**

1. [https://www.tutorialspoint.com/wireless\\_communication/index.htm](https://www.tutorialspoint.com/wireless_communication/index.htm)
2. [https://onlinecourses.nptel.ac.in/noc21\\_ee66/preview](https://onlinecourses.nptel.ac.in/noc21_ee66/preview)
3. <https://www.coursera.org/learn/wireless-communications>
4. <https://www.coai.com/home>
5. <https://www.gsma.com/>

**Useful Journals**

1. IEEE transaction on Wireless communication:- [www.ieee.org/](http://www.ieee.org/)
2. <https://www.hindawi.com/journals/wcmc/>
3. <https://jwcn-urasipjournals.springeropen.com/>

**Teaching and Learning Methods**

1. Lecture class: 40 hours
2. Practical classes: 0 hours

**Assessment:**

**Type of test/examination:** Written examination

**Continuous Internal Evaluation(CIE) :** 40 marks (30 marks -Average of three tests + 10 marks Assignments)

**Semester End Exam (SEE):** 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

**Test duration:** 1 :30 hours

**Examination duration:** 3 hours

### CO to PO Mapping

<b>PO1:</b> Science and engineering Knowledge <b>PO2:</b> Problem Analysis <b>PO3:</b> Design & Development <b>PO4:</b> Investigations of Complex Problems <b>PO5:</b> Modern Tool Usage <b>PO6:</b> Engineer & Society	<b>PO7:</b> Environment and sustainability <b>PO8:</b> Ethics <b>PO9:</b> Individual & Team Work <b>PO10:</b> Communication <b>PO11:</b> Project Mngmt & Finance <b>PO12:</b> Lifelong Learning
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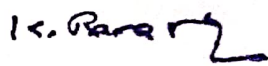
**PSO1:** Be able to acquire knowledge and apply concepts in the field of engineering and interdisciplinary subjects.

**PSO2:** Be able to identify the existing problems, effectively utilize tools to provide solution, and disseminate the information.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
18 EC36	K-level														
CO1	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO2	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO3	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO4	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO5	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2

  
Course In-charge

  
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