

Branch Name:	Signal Processing and Communication
Program Code:	ET214
Course Name:	ADVANCED WIRELESS COMMUNICATION
Course Code:	2ET2140107T
Pre-requisite Subject	Digital communication

Course Objective:

1. To study the advance topics in communication. OFDM, MIMO and SDR communication concepts are required to be studied by the students which are incorporated in the course.
2. To study the related simulations and experimentation for students to validate the theory studied.
3. To study the working principles advanced efficient communication techniques which uncovers many research are as in wireless communication

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40		-	-	-	100

Subject Contents

Sr. No	Topic	Total Hours	Weight (%)
1	Fundamental of Wireless Communication : Introduction, Existing, Technologies, Evolution in Wireless Systems, Bandwidth Concept, Types of Signals, Signal Space, Digital Communication over the channels	2	5
2	Source and Channel Coding Techniques : General Diagram of Source Coding Stage, Quantization Techniques, Pulse Code Modulation, Delta Modulation, Fundamental of Channel Coding and Decoding, Channel Coding Schemes	4	10
3	Spread Spectrum Techniques (Single Carrier Modulation) : Spread Spectrum Modulation (SSM) Concept, Concept of SSM Bandwidth from Shannon's Theorem and SNR, Operations Related to PN Code, Direct Sequences (DS) Fundamentals, Block Diagram of DSSS Transmitter and Receiver, PN Signal Characteristics, Spectral Density, Bandwidth, and Processing Gain, Rake Receiver, Frequency Hopping Spread Spectrum Transmitter and Receiver, Hybrid Spread Spectrum Systems, Chirp Spread Spectrum	8	20
4	OFDM (Multicarrier Modulation) : Basic principles of Orthogonality, Single Vs Multi carrier Systems, OFDM Block Diagram and its Explanation, Selection Parameters for Modulation, Pulse Shaping in OFDM Signal and Spectral Efficiency, Windowing in OFDM Signal and Spectral Efficiency, Synchronization in OFDM, Pilot insertion in OFDM Transmission and channel Estimation, CDMA vs OFDM, Hybrid OFDM	9	25
5	MIMO Systems : Introduction, Space Diversity and Systems Based on Space Diversity, Smart Antenna Systems and MIMO, MIMO-Based System Architecture, MIMO Exploits Multi-path, Space-Time Processing, Antenna Considerations for MIMO, MIMO-OFDM	8	20

6	Wireless Communication Systems and Software Defined Radio: Direct To Home (DTH), GSM Systems, COMA-Based Digital Cellular Standards IS-95 to CDMA-2000, Wireless Local Loop (WLL), Bluetooth, Wi-Fi Standards, WiMAX Standards, Ultra-Wideband (UWB) Technology, IEEE 802.20 and Beyond, Software Define Radio, Need for Software Radio, General Structure of the Transceiver for SDR, Cognitive Radio	8	20
Total		39	100

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the time table) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same.

Recommended sites for journal papers are (1) dl.acm.org (2) springer.com (3) sciencedirect.com (4) elsevier.com (5) ieeexplore.ieee.org (6) scholar.google.co.in (7) scopus.com or others of same repute.

List of Text Book:

1. "Wireless Communication", Upena Dalal, Oxford University

List of Reference Books:

1. "Wireless Communications: Principles and Practice", Theodore S. Rappaport, Second Edition, Pearson Education
2. "Modern Wireless Communications", Simon Haykin, Michale Moher, Pearson.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To understand various bandwidth efficient and power efficient wireless communication techniques.	1 Remembering 2 Understanding
CLO2	To understand detail knowledge of basics and working principles advanced efficient communication techniques which uncovers many research areas in wireless communication.	2 Understanding
CLO3	To understand the OFDM (Multicarrier Modulation): Basic principles of Orthogonality, Single Vs Multi carrier Systems, OFDM Block Diagram and its Explanation, Selection Parameters for Modulation	2 Understanding
CLO4	To understand Pilot insertion in OFDM Transmission and channel Estimation, CDMA vs. OFDM, Hybrid OFDM	2 Understanding 3 Applying
CLO5	To understand MIMO Systems : Introduction, Space Diversity and Systems Based on Space Diversity	2 Understanding 4 Analyze
CLO6	To understand Wireless Communication Systems and Software Defined Radio: Direct To Home (DTH), GSM Systems, COMA-Based Digital Cellular Standards IS-95 to	2 Understanding 6 Create

	CDMA-2000	
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Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1					L	M						H	H	M	L	
CLO2		H	M	M	L					L		H		M	L	
CLO3		M	H		L									H		L
CLO4		M	H		L			L					L		M	H
CLO5	H	M	H		L				L			H	L		M	H
CLO6	H	M	H		L							M	L		M	H

H:High, M:Medium, L:Low