

MOHAMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN							
Department of Electronics and Communication Engineering							
Name of the Subject	Wireless communication			Name of the handling Faculty	S.ANUSUYA		
Subject Code	EC8652			Year / Sem	III/VI		
Acad Year	2021-2022			Batch	2020-2023		
Course Objective							
1)Know the characteristic of wireless channel							
2) Learn the various cellular architectures							
3) Understand the concepts behind various digital signaling schemes for fading channels							
4) Be familiar the various multipath mitigation techniques							
5) Understand the various multiple antenna systems							
Course Outcome							
CO1:Enumerate the types of wireless channels							
CO2:Interpret the concepts in various Multiple access techniques							
CO3:Design a cellular system							
CO4:Apply the concepts behind various digital signalling schemes,Compare multipath mitigation techniques and analyze their performance							
CO5:Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance							
Lesson Plan							
Sl. No.	Topic(s)	T / R*	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO
		Book					
UNIT I-WIRELESS CHANNELS							
1	Introduction of wireless Communication Systems	T1	1	BB	L1	CO1	PO1, PO2,
2	Large scale Fading and Free Space	T1,T2	1	BB	L2	CO1	PO1, PO2,PO3, PO6
3	Two Ray Ground Reflection Model	T1,T2	1	BB	L2	CO1	PO1,PO2
4	Link Budget design using Path loss models	T1,T2	1	BB	L3	CO1	PO1,PO2,PO3
5	Small scale fading- Factors,	T1,T2	1	BB	L1	CO1	PO1,PO2,PO3
6	Time dispersion parameters – Power delay profile, rms delay spread, excess delay, mean excess delay	T1,T2	1	BB	L2	CO1	PO1,PO2,PO3,PO5
7	Parameters of mobile multipath channels, Coherence bandwidth – Doppler spread & Coherence time,	T1,T2	1	BB	L2	CO1	PO1,PO2
8	Fading due to Multipath time delay spread – flat fading – frequency selective fading	T1,T2	1	BB	L2	CO1	PO1,PO2,,PO4,PO12
9	Fading due to Doppler spread – fast fading – slow fading.	T1	1	BB	L2	CO1	PO1,PO2,PO5,PO12
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any						: ASSIGNMENT	
Tutorial							
Evaluation method :MARKS WILL BE GIVEN FOR THEIR SOLUTION							
UNIT II-CELLULAR ARCHITECTURE							
10	Multiple Access techniques	T1	1	BB	L2	CO2	PO1,PO2
11	FDMA and TDMA	T1	1	BB	L2	CO2	PO1,PO2
12	CDMA	T1	1	BB	L4	CO2	PO1,PO2,PO5

13	Cellular concept- Frequency reuse	T1,T2	1	BB	L2	CO3	PO1,PO2,PO4,PO12
14	Channel assignment	T1,T2	1	BB	L2	CO3	PO1,PO2
15	hand off- interference	T1,T2	1	BB	L2	CO3	PO1,PO2,PO3,PO6
16	Capacity calculations	T1,T2	1	BB	L3	CO3	PO1,PO2,PO3
17	system capacity- trunking & grade of service	T1,T2	1	BB	L3	CO3	PO1,PO2,PO3
18	Coverage and capacity improvement.	T1	1	BB	L2	CO3	PO1,PO2,PO3

Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any
Survey Type projects: Compare multiuser detection schemes for CDMA communications. Evaluate whether they are appropriate for mobile, wireless communications

Evaluation method :MARKS WILL BE GIVEN FOR THEIR REPORT

UNIT III-DIGITAL SIGNALING FOR FADING CHANNELS

19	Introduction about modulation and Fading Channels	T1	1	BB	L2	CO4	PO1,PO2
20	Structure of a wireless communication link- Transceiver block structure and simplified models	T1,T2	1	BB	L1	CO4	PO1,PO2
21	Principles of $\pi/4$ Quadrature Phase Shift Keying	T1,T2	1	BB	L2	CO4	PO1,PO2,PO4
22	Principles of offset Quadrature Phase Shift Keying	T1,T2	1	BB	L2	CO4	PO1,PO2,PO4
23	Minimum Shift Keying and Gaussian Minimum Shift Keying)	T1,T2	1	BB	L2	CO4	PO1,PO2,PO4
24	Error performance in fading channels- Average BER- classical computation method, alternative method	T1,T2	1	BB	L3	CO4	PO1,PO2,PO3,PO4
25	Principle of Orthogonal Frequency Division Multiplexing, Implementation of Transceivers, MC-CDMA system	T1,T2	1	BB	L3	CO4	PO1,PO2,PO3,PO4,PO5,PO12
26	Cyclic Prefix and Windowing	T1	1	BB	L2	CO4	PO1,PO2,PO3
27	PAPR- origin of PAPR and PAPR reduction techniques	T1,R2	1	BB	L2	CO4	PO1,PO2

Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any
QUIZ

Evaluation method :GOOGLE FORM

UNIT IV-MULTIPATH MITIGATION TECHNIQUES

28	Introduction to Equalisation- Adaptive equalization-	T1,T2	1	BB	L2	CO4	PO1
29	Zero forcing and LMS algorithms and RLS Algorithm	T1,T2	1	BB	L2	CO4	PO1,PO2,PO3,PO4
30	Linear Equalization	T1,T2	1	BB	L2	CO4	PO1,PO2,PO3
31	Nonlinear equalization- Decision feedback and MLSE equalisation	T1,T2	1	BB	L4	CO4	PO1,PO2,PO3,PO5
32	Diversity- Microdiversity- Spatial, temporal, frequency, angle and polarisation diversity	T1,T2	1	BB	L2	CO4	PO1,PO2
33	Macrodiversity	T1,T2	1	BB	L2	CO4	PO1,PO2
34	Diversity combining techniques- Selection, switched maximal ratio combining diversity	T1,T2	1	BB	L2	CO4	PO1,PO2

35	Error probability in fading channels with diversity reception- Error probability in flat fading channels and SER in frequency	T1,T2	1	BB	L3	CO4	PO1,PO2,PO3,PO6			
36	RAKE receiver	T1,T2	1	BB	L2	CO4	PO1,,PO12			
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any Mini project:Simulate various adaptive equalization schemes.										
Evaluation method :Bsed on the simulation output and report.										
UNIT V-MULTIPLE ANTENNA TECHNIQUES										
37	Introduction to MIMO systems	T1,T2	1	BB	L2	CO5	PO1			
38	Spatial Multiplexing and system model	T1,T2	1	BB	L2	CO5	PO1,PO2			
39	Precoding	T1,T2	1	BB	L1	CO5	PO1			
40	Beam forming	T1,T2	1	BB	L1	CO5	PO1			
41	Transmitter diversity	T1,T2	1	BB	L2	CO5	PO1,PO2			
42	Receiver diversity- Channel state information	T1,T2	1	BB	L2	CO5	PO1,PO2,PO3,PO4,,PO6			
43	Capacity of flat fading channels	T1,T2	1	BB	L2	CO5	PO1,PO2,PO4,PO5			
44	Capacity of non-fading channels	T1,T2	1	BB	L2	CO5	PO1,PO2,PO6			
45	Comparison of beam forming, receiver diversity and transmitter diversity	T2,R2,R3	1	BB	L4	CO5	PO1,PO2,PO3,PO12			
Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any Case study about MIMO techniques										
Evaluation method :BASED THE CONTENT SUBMISSION, MARKS WILL BE AWARDED.										
Content Beyond the Syllabus Planned										
1	Recent trends in Wireless communication									
2	Technology Comparision about generation of wireless communication									
Text Books										
1	Rappaport,T.S., “Wireless communications”, Second Edition, Pearson Education, 2010.									
2	Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006.									
Reference Books										
1	David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.									
2	Upena Dalal, “ Wireless Communication”, Oxford University Press, 2009.									
3	Van Nee, R. and Ramji Prasad, “OFDM for wireless multimedia communications”, Artech House, 2000									
Website / URL References										
1	https://www.youtube.com/watch?v=kxLcwIMYmr0									
2	https://nptel.ac.in/courses/117/102/117102062/									
3	https://freevideolectures.com/course/2329/wireless-communication/32									
Blooms Level										
Level 1 (L1) : Remembering		Lower Order Thinking	Fixed Hour Exams	Level 4 (L4) : Analysing				Higher Order Thinking	Projects / Mini Projects	
Level 2 (L2) : Understanding				Level 5 (L5) : Evaluating						
Level 3 (L3) : Applying				Level 6 (L6) : Creating						
Mapping syllabus with Bloom’s Taxonomy LOT and HOT										
Unit No	Unit Name	L1	L2	L3	L4	L5	L6	LOT	HOT	Total
Unit 1	WIRELESS CHANNELS	2	6	1	0	0	0	9	0	9
Unit 2	CELLULAR ARCHITECTURE	0	6	2	1	0	0	8	1	9
Unit 3	DIGITAL SIGNALLING FOR FADING CHANNELS	1	6	2	0	0	0	9	0	9

Unit 4		MULTIPATH MITIGATION TECHNIQUES				0	7	1	1	0	0	8	1	9
Unit 5		MUTIPLE ANTENNA TECHNIQUES				2	6	0	1	0	0	8	1	9
Total						5	31	6	3	0	0	42	3	45
Total Percentage						11.1111	68.8889	13.3333	6.66667	0	0	93.3333	6.66667	100
CO PO Mapping														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	0	0	0	0	0	1	1	0
CO2	3	2	2	1	1	1	0	0	0	0	0	1	1	0
CO3	3	2	2	1	1	1	0	0	0	0	0	1	1	0
CO4	3	2	2	1	1	1	0	0	0	0	0	1	1	0
CO5	3	2	2	1	1	1	0	0	0	0	0	1	1	0
Avg	3	2	2	1	1	1	0	0	0	0	0	1	1	0
Justification for CO-PO mapping														
CO1	PO1(3) Graduates will learn the basic knowledge of Wireless channels,PO2(3) Graduates will able to analyze the problems in the field of AM systems,PO12(1),Graduates will be able to upgrades their knowledge in types of wireless channeel by life long learning													
CO2	PO1(3) Graduates will be able to understand the basic knowledge of cellular systems,PO2(2) Graduates will able to compare the different multiple access tehcniques													
CO3	PO2(2) Graduates will learn the different signalling schemes in wireless communication systems. PO6(1) Graduates will able to slightly gain the contextual knowledge abot OFDM..PO4(1) Graduates will be able to discuss about error performance of all signalling schemes..PO5(1) Graduates will be able to use recent tools in these signalling schemes in wireless communication systems.													
CO4	PO2(2) Graduates will be able investigate at research level about equalization in wireless communication systems.PO4(1) Graduates will be able to understand the error probability of fading channels.													
CO5	PO2(2) Graduates will be able analyse the diversity schems in wireless communication systems. PO3(2) Graduates will able to compare the capacity of fading and non fading channels.													
3		High level			2		Moderate level			1		Low level		
Name & Sign of Faculty Incharge :														
Name & Sign of Subject Expert :														
Head of the Department :														