

		National Institute of Technology Meghalaya An Institute of National Importance												CURRICULUM					
Programme		Bachelor of Technology in Electronics and Communication Engineering										Year of Regulation				2018-19			
Department		Electronics and Communication Engineering										Semester				VII			
Course Code	Course Name	Credit Structure												Marks Distribution					
		L	T	P	C	INT	MID	END	Total										
EC 415	Wireless Communication	3	0	0	3	50	50	100	200										
Course Objectives	To provide students an understanding of the concepts related to wireless channel modelling.	Course Outcomes	CO1	Able to model the wireless channel in terms of large scale/small scale fading, delay spread, coherence time parameters and understand the basic concepts of Cellular System and the design requirements															
	To explore communication concepts and techniques for exploiting wireless channel characteristics and application of these concepts in a system context.		CO2	Able to gain insights into various mobile radio propagation models and the fading effects on the system performance															
	To familiarize students on how the diversity can be exploited to improve performance		CO3	Able to analyse the effectiveness of diversity techniques to mitigate the multichannel fading effects on received signals with insights on MIMO technology and spectral efficiency improvements through spatial multiplexing															
	To familiarize students with capacity analysis and multiple access techniques in 3G, 4G and 5G		CO4	Enabling the students to think in terms of innovative ideas to improve the existing technology in the field of wireless communication through improving capacity in cellular systems and allocating resources in multiuser scenarios															
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs					
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4		
1	CO1	3	2	2	1	-	-	-	-	2	-	-	-	3	2	3	-		
2	CO2	2	3	2	2	-	-	-	-	2	-	-	-	3	1	2	-		
3	CO3	1	2	3	2	2	-	-	-	-	-	-	1	2	2	3	-		
4	CO4	1	3	3	-	-	-	-	-	1	-	-	-	2	3	2	-		
SYLLABUS																			
No.	Content													Hours	COs				
I	Overview on wireless systems: Motivation and introduction for wireless communication, The cellular concept fundamentals: cell capacity and reuse, Introduction to 3G, 4G and 5G technologies.													04	CO1				
II	Wireless propagation models and fading: Large scale path loss - Free-space propagation model, propagation path loss, outdoor propagation models (Okumura model & Hata model), combined pathloss and shadowing. Small scale and multipath fading - AWGN Channel, multipath fading, flat and frequency selective fading, BER performance for various modulations, slow and fast fading, delay spread and coherence bandwidth, Rayleigh, Rician and Nakagami channel models.													09	CO2				
III	Diversity & Combining Techniques: Introduction to SIMO, MISO, MIMO, Realization of independent fading paths, Receiver diversity: selection combining (SC), threshold combining, maximum ratio combining (MRC), equal gain combining (EGC), Transmitter diversity: channel known at transmitter, channel unknown at the transmitter, the Alamouti scheme, BER performance of all above schemes, Spatial Multiplexing in MIMO, Singular Value Decomposition of Channel, Optimal Power Allocation, MIMO Zero-Forcing and MMSE Receivers.													09	CO3				
IV	Capacity of wireless channels: AWGN channel capacity, capacity of fading channels – slow fading channel, receive diversity, transmit diversity, time and frequency diversity, fast fading channel, transmitter side information, frequency selective fading channels													06	CO4				
V	Multiuser communication, multiple access techniques – Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Global System for Mobile (GSM) communication, Introduction to wide band communication systems - Code Division Multiple Access (CDMA), Orthogonal Frequency-Division Multiplexing (OFDM) and Orthogonal Frequency Division for Multiple Access (OFDMA), Single Carrier FDMA schemes, Introduction to MIMO-OFDM, Long Term Evolution (LTE)													08	CO3, CO4				
Total Hours												36							
Essential Readings																			
1. T.S. Rappaport, “Wireless Communications – Principles and Practice”, 2 nd edition, Pearson, 2010.																			
2. D. Tse and P. Vishwanath, “Fundamentals of Wireless Communications”, Cambridge Univ Press, 2005.																			
3. A. Molisch, “Wireless Communications”, Wiley, 2005.																			
Supplementary Readings																			
1. A. Goldsmith, “Wireless Communications”, Cambridge Univ Press, 2005																			
2. William C.Y. Lee, “Wireless and Cellular Telecommunications,” Third edition, Mc. Graw Hill, 2006																			
3. Aditya K. Jagannatham, “Principles of Modern Wireless Communications Systems” McGraw Hill Education, 1 st edition, 2015.																			
4. NPTEL Video Lectures on Advanced 3G and 4G Communication																			