Course code (4041) : Modern Digital Communication

Programme: B.Tech. (ECE) Year: 2014/2015 Semester : Even
Course : Core/Program/Open/HSS/Science/Math Program Elective Credits : 04
Hours : 0-0-3

Course Context and Overview (100 words):

The course will impart advanced techniques used in modern digital communication such as channel modelling, modulation, channel estimation, channel equalization, MIMO techniques and spread spectrum systems.With the understanding of the above concepts the students will be better equipped to appreciate, analyse and design current mobile and wireless communication systems

Prerequisites Courses:

Digital Communication (course Code)

Course outcomes(COs):

On completion of this course, the students will have the ability to:
CO1 To analyze and design wireless and mobile communication systems
C02 To be able to simulate wireless communication systems including fading channel
C03 To be able to design and implement channel estimators and equalizers
C04 To design and implement MIMO based systems using space-time code
C05 To analyse, design of a CDMA system and be able to determine its capacity

Course Topics:

Topics	Lecture Hours	
UNIT - I **1. Topic: Communication Channel Model**		
1.1 Path-loss model, Effect of shadowing, shadowed fading		
1.2 Small scale fading: Rayleigh, Rician, Nakagami, log-normal fading, generalized channel model, Doppler spectrum		
1.3 Wideband channel, frequency selective channel, Channel simulation		

UNIT – II Capacity of Wireless networks **2. Topic:**		
2.1 Shannon Capacity formula, Capacity bound, ergodic capacity, Capacity outage		
2.2 Channel capacity in SISO, MISO and MIMO systems		
2.3 Capacity for MIMO –OFDM system		
UNIT - III **3. Topic: Advanced Modulation Techniques**		
3.1 Review of QAM/DQPSK/TCM		
3.2 OFDM, OFDM in WLAN 802.11a, OFDM frame, Cyclic prefix, PAPR and its mitigation		
3.3 MIMO –OFDM,, OFDM channel estimation		
3.4 MIMO- Space Time Codes		
UNIT - IV **4. Topic: Synchronization Techniques**		
4.1 Carrier synchronization, Phase-lock loop, Costas Loop, Loop SNR, Effect of Synch error on BER		
4.2 Bit Synchronization, DTTL, Early-late gate Synchronizer, Loop Analysis		
UNIT-V **5. Topic: Spread Spectrum Systems and CDMA**		
5.1 DSSS, m-sequence and properties, Delay Lock Ttracking Loop		
5.2 Jamming Margin, Performance of SSSS in presence of Jamming		
5.3 CDMA, Rake receiver, MUD		

Textbook references (IEEE format):
Text Book:
1) Andrea Goldsmith, Wireless Commuication, Cambridge University Press
Reference books:
2) Introduction to Spread Spectrum Communication, R.L.Peterson et al, Pearson
3) Digital Communication, J.G.Prokais and Masoud Salehi, 5th Edition, McGraw Hill
4) Modern Wireless Communication, Simon Haykin and Michael Moher, Pearson

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):

Evaluation Methods:

Evaluation criteria will be shared by the concerned course instructor.

Prepared By:
Last Update: __13/4/2015_____