

EC417: Spread Spectrum Communication

Details of course:-

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Spread Spectrum Communication	3	1	0	Signals and Systems, Communication Systems, Probability Theory

Course Objective:

1. Explain the differences, in design, implementation, and operation, between code/frequency/time division access and code/frequency/time division multiplexing
2. Generate orthogonal codes and pseudorandom noise sequences using both shift registers and generator function representations
3. Implement the tracking and synchronization methods of wideband signals.
4. To explain the principles and detection methods of code division multiple access.
5. Use pseudorandom sequences for purposes of error correction.

Course Outcomes:

- CO 1. Describe the various methods of spreading the spectrum and generation of codes.
- CO 2. Explain the working of loops to track codes and synchronization techniques.
- CO 3. Understand the CDMA principles and various schemes for multi-user detection.
- CO 4. Calculate the performance of spread spectrum systems in jamming environment.
- CO 5. Evaluate the performance of spread spectrum systems with forward error correction.

S. No.	Content	Contact Hours
Unit 1	Introduction to spread spectrum system : Fundamental concepts of spread spectrum systems, Pseudo noise sequences, direct sequence spread spectrum, frequency hop spread spectrum, Hybrid direct sequence frequency hop spread spectrum, code division multiple access Binary shift register sequences for spread spectrum systems : Introduction, Definitions, Mathematical back ground and sequence generator fundamentals, maximal length sequences, Gold codes.	10
Unit 2	Code tracking Loops : Introduction, Optimum tracking of wideband signals, Base band delay-lock tracking loop, Tau-dither non-coherent tracking loop, Double dither non-coherent tracking loop. Initial synchronization of the receiver spreading code : Introduction, Problem definition and the optimum synchronizer, serial search synchronization techniques, synchronization using matched filter, synchronization by estimated the received spreading code.	8
Unit 3	Cellular code division multiple access CDMA Principles: Introduction, Wide band mobile channel, The cellular CDMA System, Single user receiver in a multi user channel, CDMA System capacity. Multi-User detection in CDMA Cellular radio: Optimal multi-user detection, linear suboptimal detectors, Interference combat detection schemes, Interference Cancellation techniques.	8
Unit 4	Performance of spread spectrum systems in jamming environments: Spread Spectrum Communication system model, Performance of spread spectrum systems without coding,	8
Unit 5	Performance of spread spectrum systems with forward error correction: Elementary block coding concepts, Optimum decoding rule, Calculation of error probability. Elementary convolution coding concepts, viterbi algorithm, Decoding and bit-error rate. Global Positioning System Spread Spectrum Receivers.	8
Total		42

Books:-

S. No	Name of Books/Authors/Publisher
1	Introduction to spread spectrum communication - Rodger Eziemer, Roger L. Peterson and David E Borth - Pearson, 1st Edition, 1995
2	Introduction to CDMA wireless Communications - Mosa Ali Abu, Rgheff, Elsevier Publications, 2008.
3	Glisic, S., & Vucetic, B.(1997). Spread spectrum CDMA systems for Wireless Communications (1st ed.). Boston, MA: Artech House.
4	Modern Communication and Spread Spectrum - George R. Cooper, Clare D. Mc Gillem, McGraw Hill, 1986.
5	CDMA; Principles of Spread Spectrum Communication - Andrew J. Viterbi, Pearson Education, 1st Edition, 1995.
6	Wireless Digital Communications - Kamilo Feher, PHI, 2009.
7	WCDMA Design Handbook -Andrew Richardson, Cambridge University Press, 2005.