EC-312D	SPREAD SPECTRUM COMMUNICATIONS (ELECTIVE - II)	L	T	P	C
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COURSE OBJECTIVES:

1. To know the fundamental concepts of spread spectrum.
2. To know the tracking and synchronization methods of wideband signals.
3. To know the principles and detection methods of code division multiple aceess.
4. To find the performance of spread spectrum systems in jamming environment.
5. To know the fundamental concepts of software defined radio.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand the various methods of spreading the spectrum and generation of codes.
2. understand the working of loops to track codes and synchronization techniques.
3. understand the CDMA principles and various schemes for multi-user detection.
4. calculate the performance of spread spectrum systems in jamming environment with forward error correction.
5. understand the principles and architecture of software defined radio.

UNIT I *Text Book - 1* **(10)**

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.

UNIT II *Text Book - 1* **(10)**

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.

UNIT III *Text Book - 2* **(10)**

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.

UNIT IV *Text Book - 1* **(10)**

Performance of spread spectrum systems in jamming environments : Spread Spectrum Communication system model, Performance of spread spectrum systems without coding,

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.

UNIT V *Text Book - 3* **(10)**

Software Defined Radio : Introduction to SDR: SDR concepts and history, Characteristics and Benefits of SDR, SDR Forum, Design principles of Soft ware Radio, Ideal SDR architecture, SDR Based End-to-End Communication.

LEARNING RESOURCES:

TEXT BOOK(s):

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. A Modern Approach to Radio Engineering - Software Radio - Jeffrey H. Reed, Prentice Hall PTR, May 2002

REFERENCE BOOK(s):

1. Modern Communication and Spread Spectrum - George R. Cooper, Clare D. Mc Gillem, McGraw Hill, 1986.
2. CDMA; Principles of Spread Spectrum Communication - Andrew J. Viterbi, Pearson Education, 1st Edition, 1995.
3. Wireless Digital Communications - Kamilo Feher, PHI, 2009.
4. WCDMA Design Handbook -Andrew Richardson, Cambridge University Press, 2005.
5. Software Defined Radio, Architectures, Systems and Functions - Dillinger, Madani, Alonistioti(Eds.), Wiley, 2003.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/