MANIPAL UNIVERSITY JAIPUR

School of Electronics and Electrical Engineering

Department of Electronics and Communication Engineering

Course Hand-out

Spread Spectrum Communications| EC 1757 | 3 Credits

Session: Jul- Dec 2014 | Faculty: Dr. Dinesh Yadav

Course Outcomes: At the end of the course, students will be able to

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[1757.1]. Develop understanding in Digital Modulation Techniques, radio technologies based on frequency hopping and spread spectrum communication principles. [Comprehension]

[1757.2]. Enhance knowledge and develop skills in frequency and spectral characteristics, generation of codes and pseudo random sequences, auto correlation properties to develop employment skills in these specific domains through software simulation tools for design and analysis of such systems. [Design/synthesis/evaluation]

[1757.3]. Understand the Direct Sequence Spread Spectrum system with time domain and spectral analysis, error probability, DS/QPSK systems and evaluate performance of these advance systems.

[1757.4]. Study the FHSS and effects of hop rates on performance , spectral analysis , error probability etc in the design and fielding of such networks in current and future spectral environments. [Design].

[1757.5]. Evaluate applications of SS communications for anti-jamming and LPI in CDMA and other systems with code tracking and synchronisation in radio links/systems for undertaking entrepreneurship and other start up projects subsequently.[Evaluation]

A. SYLLABUS

Review of basic digital modulation techniques: Review of basic digital modulation, bandwidth considerations, Principle of spread spectrum communication, direct sequence and frequency hopping principles. PN sequences, maximal length sequences, properties, spectral characteristics, auto correlation properties, Generation of PN sequences, Gold sequences, Barker codes, Walsh-Hadmard Codes, Kasami codes, Non Linear Code Generators; **Direct sequence spread spectrum system**: DS/BPSK system, time domain analysis, spectral characteristics, processing gain and jamming margin, probability of error, performance evaluation, DS/QPSK system and other advanced schemes. MSK-Spread Spectrum, Hybrid Spread Spectrum; **frequency hopping spread spectrum system**: Slow and fast hopping systems, BFSK-FH system, time domain analysis, spectral characteristics, processing gain and jamming margin, probability of error, performance evaluation; **Code tracking and synchronization**: Code acquisition and synchronization; **Applications of spread spectrum communication**: Anti-jamming, Low probability detection, Multi-path rejection, Code division multiple Access(CDMA), CDMA in digital mobile systems.

B. TEXT BOOKS

References:

1. R.L. Peterson and R.E. Ziemer, "*Introduction to Spread Spectrum Communication*" Pearson Education, Asia
2. R. George & C.D Cooper, "*Modern Communications and Spread Spectrum*", McGraw Hill, 2nd Edition.
3. J. Dixon, "*Spread Spectrum Communication*", John Wiley and Sons
4. B. Sklar, "*Digital Communication Fundamentals and Applications*", Pearson Education, Asia