SPREAD SPECTRUM COMMUNICATIONS AND JAMMING

PROF. DEBARATI SEN
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IIT Kharagpur

TYPE OF COURSE : Rerun | Elective | UG/PG
COURSE DURATION : 12 weeks (24 Jan' 22 - 15 Apr' 22)
EXAM DATE : 24 Apr 2022

PRE-REQUISITES : Digital Communication, Fundamentals of Wireless Communications

INTENDED AUDIENCE : Practicing engineers, Technical and Non-technical managers of telecomm companies, Students preparing for competitive exams with Signals and Systems subject

INDUSTRIES APPLICABLE TO : Spread Spectrum Communications is the core technology for secured Defence Communication Systems. It is also applied to several modern commercial communication systems e.g. CDMA in 3G, and upcoming Millimeter Wave Communications. Hence all Defence R&D labs under Ministry of Defence will be in need of the course.

COURSE OUTLINE :

The present course introduces basic principle of spread spectrum techniques, key concept of code designing supported by Galois field mathematics, understanding Jamming environment and interference handling mechanisms. The theoretical principles are tempered with their practical significance to cope up with the interest to both researchers and system designers. Learning is facilitated by streamlined derivations, tutorials, and assignments. Several systems examples help students understand the concept and tutorials offer quick practice. After an in–depth exposure to spread spectrum techniques and wireless cellular environment the course takes a thorough tour of training on wireless multiuser system design with spread spectrum technique in MATLAB platform. The course ends with an expose to cdma2000 and WCDMA protocol structure and brief introduction to low probability of intercept methods.

ABOUT INSTRUCTOR :

Prof. Debarati Sen is presently an Assistant Professor at the G.S.S. School of Telecommunications, IIT Kharagpur since 2013. She, a National Doctoral Fellow, completed her PhD in Telecommunication Engineering from IIT, Kharagpur in 2010. During 2011-2012, she was a Postdoctoral Researcher with the Department of Signals and Systems, Chalmers University of Technology, Sweden. She was with Samsung Research, Bangalore, India, firstly as a Chief Engineer during 2009-2011 and then as a Senior Chief Engineer during 2012-2013.

COURSE PLAN :

Week 1**:** Types of Spread Spectrum Systems: Different Spreading Techniques will be addressed

Week 2**:** Spreading Sequences: Generation Mechanism of sequences and Waveforms

Week 3**:** Properties of Spreading Sequences: Code Properties and comparative studies

Week 4**:** Systems under Jamming: Performance Analysis

Week 5**:** Galois Field Mathematics: Concept of code generator polynomial and characteristic equation

Week 6**:** Interference Rejection Techniques

Week 7**:** Code Acquisition Mechanism

Week 8**:** Code Tracking Mechanism

Week 9**:** Concept of Fading Channels and Diversity

Week 10**:** CDMA Technology and Interference Handling Mechanisms

Week 11**:** MUD and Performance Analysis of CDMA Networks

Week 12**:** WCDMA; Low Probability of Intercept Methods