

Department of Electrical Engineering, IIT Madras

ESB-350, E-Slot

Jan. to Apr.,2011

EE 6003: Multi-Antenna Digital Communications

Instructors: Dr. Kiran Kuchi, CEWiT, IITM Research Park & Dr. K. Giridhar, IIT Madras

Part-1 Estimation & Equalization:

- 1a) Introduction to Estimation Theory, MMSE estimator and it's properties
- 1b) Pulse shaping for band-limited channels, Nyquist criterion,
- 1c) ISI channel model, FIR MMSE equalization
- 1d) Over-Sampling, Matched filter bounds
- 1e) D-domain representation of IIR MMSE and MMSE-DFE equalizers
- 1f) Co-channel and adjacent channel interference suppression using excess BW
- 1g) Performance in frequency selective fading channel

Part-2 Introduction to OFDM: Why and what is OFDM? Generalised multi-carrier modulation, synchronization, channel estimation, and symbol detection in OFDM

Part-3 Co-channel Interference Suppression: Maximum ratio combining, MMSE based interference rejection combining, Bit error rate (BER) bounds

Part-4 MIMO Wireless Communications:

- a) MIMO channel capacity, capacity achieving techniques
- b) Information theoretic treatment of simple transmit diversity modes such as delay diversity, phase-offset diversity, transmit antenna switching, Performance in flat and frequency selective fading channels
- c) Performance analysis of spatial multiplexing, MMSE and MLD receivers
- d) Introduction to MU MIMO in OFDM systems
- e) Deriving Log-Likelihood Ratios (LLRs) for various MIMO modes

Assessment Method:

This course will have 2 quizzes (for 20 marks each), and several computer simulation/design assignments which have to be turned in for assessment (for about 20 marks in total). The end-sem will be for 40 marks. There will be 2 or 3 TAs for this course. Contact kkuchi@cewit.org.in or giri@tenet.res.in, or at ESB-334B, x4420 for more details. Soft-copies of additional material will be made available at www.ee.iitm.ac.in/~giri & on moodle.