

Preliminary Course Outline
ECE 708: Technologies for Long Term Evolution (LTE) Communication

Course Instructor: G. E. Atkin
Textbook: See footnote* **Prerequisite:** ECE 513 or instructor's consent
Schedule: 09/30 - 10/01; 10/07 - 08; 2011 **Tentative hours:** 9:00 AM – 5:00 PM

Introduction (1st day)

- Multiple-Input Multiple-Output (MIMO) System Model
- MIMO System Capacity
- Combining
- Capacity of MIMO in Fading Channels
- Effect of System Parameters and Antenna Correlation on the MIMO Channel Capacity.
- Performance Limits of MIMO Communication Systems

Introduction to OFDM (2nd day)

- Characteristics of Multipath Fading Channels
- Principles and History of MCM/OFDM
- OFDM Characteristics
- Coded OFDM Scheme to Gain Frequency Diversity Effect

Space-Time Coding (STC) Performance Analysis and Code Design (3rd day)

- Diversity and Diversity Combining Methods
- Space-Time Coded Systems
- Performance Analysis of Space-Time Codes
- Space-Time Code Design Criteria

Space-Time Block Codes (STBC) (3rd day)

- Alamouti Space-Time Encoding
- STBC for Real and Complex Signal Constellations
- Decoding of STBC
- Performance of STBC
- Effect of Antenna Correlation on Performance

Space-Time Trellis Codes (STTC) (4th day)

- Encoder Structure for STTC
- Design of Space-Time Trellis Codes on Slow and Fast Fading Channels
- Performance Evaluation

Space-Time Coding for Wideband Systems (4th day)

- Performance of Space-Time Coding on Frequency and Non-Frequency Selective Fading Channels
- STC in Wideband Orthogonal Frequency Division Multiplexing (OFDM) Systems
- Capacity of STC-OFDM Systems
- Performance of STC-OFDM Systems

Grading: Homework, quizzes, projects and a final exam will be assigned to students.

* Check: <http://www.ece.iit.edu/~atkin>