

UTA EE6367 Advanced Wireless Communications — Fall 2014

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Lecture: TTh 11:00pm-12:20pm, NH105

Office Hours: TTh: 1:00pm-2:00pm

Course Webpage: <http://www.uta.edu/faculty/liang/EE6367/>

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TA Office Hours: TTh 9:30am-11:00am and 1:00pm-2:30pm

Pre-req: EE5368

Other Requirements: Basic programming skills in MATLAB

Grading (On-Campus Students):

- 5% Homework
- 15% Quizzes
- 30% Midterm Exam I
- 30% Midterm Exam II
- 20% Final Project

Grading (ETV Students):

- 5% Homework
- 35% Midterm Exam I
- 35% Midterm Exam II
- 25% Final Project

Exam Dates:

Midterm Exam I: Thursday, October 2, 2014, 11:00pm-12:20pm, NH105

Midterm Exam II: Thursday, November 20, 2014, 11:00am-12:20pm, NH105

Course Objective

Students will be able to keep up-to-date with the new technology development of wireless communications: MIMO, space-time communications, turbo codes, ultra-wideband (UWB) communication, sensor networks, WiFi, WiMAX, WCDMA, CDMA2000, LTE, etc.

Final Project or Term Paper (Due: December 8, 2014).

It's a team project (or term paper) for up to 3 graduate students per team (i.e., 1, 2, or 3 students per team). Each team has a choice to choose a course project or term paper. The course project will be either designing an UWB communication system (physical layer reference system) or MIMO physical layer communication system (CHOOSE ONE). Regarding the term paper, students are free to choose any topic in the areas of sensor networks, UWB communications, MIMO, FH/TH CDMA, space-time communications, turbo codes, WiFi, WiMAX, etc. More details on the project and term paper will be announced.

Grading Policies:

- **Final grades** will be assigned by a combination of student score distribution (histogram) and the discretion of the instructor.
- **Homework** will not be graded, but checked.
- **Late Homework** will not be accepted.
- **Make-up Exams:** No make-up exams will be given. If you can't make the above exam dates, you must drop the class.
- **Academic Integrity Policy:** As per university rules and guidelines.

Textbook

No required textbook.

Reference Books:

1. Hamid Jafarkhani, *Space-Time Coding: Theory and Practice*, ISBN: 0521842913, Cambridge University Press, 2005.
2. Shu Lin and Daniel Costello, *Error Control Coding*, 2nd Ed, ISBN: 0130426725, Prentice Hall, 2004.
3. David Tse and Pramod Viswanath, *Fundamentals of Wireless Communication*, ISBN 0521845270, Cambridge University Press, 2005.
4. Andrea Goldsmith, *Wireless Communications*, ISBN: 0521837162, Cambridge University Press, 2005.
5. Di Benedetto & Giancola, *Understanding Ultra Wide Band Radio Fundamentals* (Prentice Hall Communications Engineering and Emerging Techno), ISBN: 0131480030, Prentice Hall 2004.

Course Material:

1. Overview of the development of wireless communications
2. Multiple Antennas and Space-Time Communications
 - Parallel decomposition of the MIMO model
 - MIMO diversity gain and Multiplexing gain
 - Space-time modulation and coding
 - Space-Time Coding Design Criteria
 - Space-Time Block Codes
 - Space-Time Trellis Codes
3. Convolutional Codes
 - Encoder
 - Viterbi decoder
 - Puncturing and Interleaver
4. Turbo Codes
 - Soft decision decoding
 - Concatenated codes
 - Turbo codes
5. Ultra Wideband (UWB) communications
 - Introduction to UWB
 - DS-UWB and TH-UWB
 - Channel modeling for UWB
 - Transmitter and receiver system-level design for UWB radio
 - Interferences and performance analysis in UWB
6. Sensor Networks
 - Virtual MIMO-based Sensor Networks, Fading Relay Channels in Sensor Networks, UWB-based Sensor Networks
7. Other Selected Topics
 - WiFi and WiMAX, CDMA2000 and WCDMA, LTE.Others

Academic Dishonesty

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

“Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22).