National University

WCM 604 Course Outline

Class	WCM604– Dec. 2011 Term
Course	WCM604 - Coding and Modulation for Wireless Communication
Instructor	Name:Nazila Safavi Email: nazila_safavi@yahoo.com Phone: 949-295-2709 Office Hours: 1) Any time email – leave message (preferred) 2) Call – leave message
Course Description	This course describes the coding and modulation techniques, and comparative studies of different coding and decoding schemes including Trellis and Turbo coding. Studies of different modulation formats and their effects on wireless channels, analysis of different modulation schemes applied to the current wireless standards.
Learning Outcomes	Upon successful completion of this course, the student will be able to: 1) Understand modern digital wireless communications systems 2) Gain knowledge of current wireless communications networks and standards deployed around the world 3) Recognize physical limitations that affect the performance of the wireless communications channel 4) Model the mobile radio propagation channel and understand the parameters that affect its performance 5) Analyze the different techniques and tradeoffs used to increase the wireless networks quality and overall capacity Material covered in this course also supports the following Program Learning Outcomes: • Evaluate and apply wireless networking, protocols, architectures, and standards to the development and design of wireless communication systems. • Evaluate and choose the most appropriate kinds of coding and decoding schemes for constructing, detecting and filtering wireless communications signals. • Employ strategic analysis software and tools to rapidly, but thoroughly, develop wireless, networks and service plans. • Develop simulation models of the radio component of wireless systems using MATLAB, SIMULINK and its communication tools • Analyze and synthesize wireless communications concepts through projects, assignments
Textbook	For the correct edition of the textbook assigned to a specific class, go to: http://www.nutextdirect.com **1. In Print:** T. Oberg, "Modulation, Detection & Coding," John Wiley & Sons, 2002. ISBN: 978-0471497660 **Other readings:** 1. A. Burr, "Modulation and Coding for Wireless Communications," Prentice Hall, 2001. 2. J. Proakis, "Digital Communication," McGraw-Hill, 2008, Boston, 2001. 2. J. Boccuzzi, "Signal Processing for Wireless Communications," McGraw-Hill, 2008, New York. ISBN: 978-0071489058 (Online from NU Library) 3. M. Parker, "Digital Signal Processing 101," Newnes, 2010, Oxford.

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Course Requirements Students are expected to attend all class sessions, participate in all class activities, complete quizzes and exams as scheduled, make presentation(s) if applicable, and turn in all assignments on time. Failure to do so may result in the loss of points.

Course Schedule

Date	Subject	Activities
Week 1	What is Signal?	In class activity/lab
	What is Modulation?	Assignment 1
	Introduction, Communication Definition & Model	
Week 2	Modem System	
	Modulation	
	Filters	Assignment 2
	Receiver	**Midterm Exam**
Week 3	Block Coding	
	Convolutional Coding	Assignment 3
	Turbo Coding	
Week 4	CDMA & Spread Spectrum	
		Final Paper
	OFDM	**Final Exam**

Course Grading

		A	96-<100	A -	90 -<96
B +	87 -<90	B	84 -<87	B -	80 - <84
C +	77 - <80	C	74 -<77	C -	70 - <74
D +	67 - <70	D	64 -<67	D -	60 - <64

Definition of Grades:

A Outstanding Achievement
B Commendable Achievement
C Marginal Achievement
D Unsatisfactory
F Failing

Point Distribution

Items	Percentage
Class Discussion, Participation, Attendance	15 %
Weekly Assignments	10 %
Project	25 %
Midterm Exam	20 %
Final Exam	30 %
Total	100 %

***** With approval of the instructor, any student may earn up to 5% of their grade through an internship or Curricular Practical Training with a company or organization approved by the Lead Faculty.

Assignments:

Weekly assignments will be posted to the course site.
Each week you will be required to complete and submit an assignment that could be graded. The assignment will be due on the Sunday of the week and maybe emailed to the instructor.

Final Project:

Class Project – Students will work individually, or pair up to work on hands-on project of their own. The project topic needs to be submitted by the end of week one. Each team will earn extra points by presenting early. 1$^{s/2ndt}$ week will earn 25% + 15 points. Third week presentation will earn 25% + 10. Final week, day one presentation will earn 25% + 5. Final week day two, three will only be graded based on the 25% marks.
Suggested Topics :
Channel coding
Various Modulation Techniques
Turbo Coding

Midterm & Final:

The Midterm & Final exams will be a combination of multiple, true/false, essay and computational problems, covering the course material to the date of the exam. The final will be a comprehensive final test covering all material. Open book, notes.

Policies and Procedures:

Students are encouraged to review the National University's Policies and Procedures http://www.nu.edu/Academics/StudentServices/AcademicPoliciesandP.html

Conflicting opinions among members of a class are to be respected and responded to in a professional manner. Side conversations or other distracting behaviors are not to be engaged in during lectures, class discussions or presentations. There are to be no offensive comments, language, or gestures

Diversity:
Learning to work with and value diversity is essential in every class. Students are expected to exhibit an appreciation for multinational and gender diversity in the classroom.

Civility & Ethics:
As a diverse community of learners, students must strive to work together in a setting of civility, tolerance, and respect for each other and for the instructor. Ethical behavior in the classroom is required of every student.

Plagiarism:
Plagiarism is the presentation of someone else's ideas or work as one's own. Students must give credit for any information that is not either the result of original research or common knowledge. If a student borrows ideas or information from another author, he/she must acknowledge the author in the body of the text and on the reference page. Students found plagiarizing are subject to the penalties outlined in the Policies and Procedures section of the University Catalog, which may include a failing grade for the work in question or for the entire course. The following is one of many websites that provide helpful information concerning plagiarism for both students and faculty: http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml

Writing Across the Curriculum:
Students are expected to demonstrate writing skills in describing, analyzing and evaluating ideas and experiences. Written reports and research papers must follow specific standards regarding citations of an author's work within the text and references at the end of the paper. Students are encouraged to use the services of the University's Writing Center when preparing materials.

The following website provides information on APA, MLA, and other writing and citation styles that may be required for term papers and the like:
http://www.nu.edu/LIBRARY/ReferenceTools/citations.html

Library Electronic Resources:
The NU Library System (NULS) purchases access to several databases of full text articles from scholarly journals. Go to http://www.nu.edu/library and click on "Electronic Resources".