National University
School of Engineering and Technology

WCM606 – CDMA Wireless Standards and Applications

Instructor: Nazila Safavi, PhD **email:** nazila@globaltechnologies.biz
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Course Prerequisites: WCM602,

Required Text: Vijay K. Garg, "Wireless Network Evolution: 2G to 3G", 2002, Prentice Hall, ISBN: 0130280771

Course Description:

Analysis of CDMA (code division multiple access) concepts, models and techniques. An overview of second- and third-generation (3G) air interfaces. Direct-sequence spread spectrum (DSSS); physical and logical channels; CDMA IS-95 call processing, diversity, combining and antennas; access and paging channel capacity; planning of a CDMA system.

Learning Outcomes:

Upon successful completion of this course, the student will be able to:

- Illustrate the basics of spread spectrum technology.
- Select effective code acquisition and tracking techniques based on given requirements.
- Justify and design CDMA overlays.
- Apply sound CDMA system design philosophies to design CDMA receivers and systems.
- Illustrate on emerging third-generation CDMA-based mobile radio systems.
- Contrast the existing CDMA standards.
- Defend why CDMA has taken the mobile wireless world by storm and has become a major Second Generation (2G) technology and the dominant technology choice for Third Generation (3G) systems
- Identify about pseudo-random codes, their role in CDMA systems, and how they offer enhanced privacy, security, call quality, and coverage in comparison to other cellular technologies
- Understand how CDMA offers increased capacity and improved performance

Course Requirements:

Students are expected to attend all class sessions, participate in all class activities, complete exams as scheduled, complete and present course project and turn in all assignments on time. Failure to do so may result in the loss of points or the lowering of one's grade.

Regular Session

Days & Times	Room	Instructor	Meeting Dates
MoWe 5:30PM - 10:00PM	Kearny Mesa Learning Center	Nazila Safavi	08/06/2012 - 09/01/2012
Sa 1:00PM - 5:00PM	Kearny Mesa Learning Center	Nazila Safavi	09/01/2012 - 09/01/2012

Objective of 1st lecture

- Review of course outline, syllabus, project and requirements
- Review the mobile telephone system architecture.
- Video – The men who made Radio
- Read related material on chapter 1 of the text book

Objective of 2nd lecture

- Review multiple access techniques.
- Define requirements for spread spectrum wireless systems.
- Derive the capacity equation for a CDMA system.
- Read related material on chapter 3 of the text book

Objectives of 3rd lecture

- Define Cross Correlation and Auto-Correlation
- Define Orthogonal Codes
- Define PN codes
- Describe Properties of Orthogonal and PN Codes
- Read related material on chapter 4 of the text book
- Hand out first assignment

Objectives of 4th lecture

- Forward Traffic Channel Generation
- Pilot Channel Generation
- Sync Channel Generation
- Paging Channel Generation
- Demodulation of the Forward CDMA Channel

Objectives of 5th lecture

- Reverse Traffic Channel Generation
- Access Channel
- Read related material on chapter 5 of the text book
- First assignment due Monday
- Presentation proposal due on Tuesday

Objectives of 6th lecture

- Discuss Power Control in CDMA
- Midterm Exam
- Hand out 2nd assignment

Objectives of 7th lecture

- Describe the synchronization process in IS-95 systems

- Discuss the structure of paging channel
- Describe the structure of access channel
- Discuss important signaling in Traffic mode
- Read related material on chapter 9 of the text book – cont.
- Second assignment due Monday

Objectives of 8th lecture

- Presentation of Projects
- Discuss the Registration Process in IS-95 Systems
- Discuss the Handoff Processes in IS-95 Systems
- Discuss the Improvements Made to Handoff Process in IS-95B Systems
- Discuss Handoff Messages and Parameters
- Read related material on chapter 8 of the text book

Objectives of 9th lecture – Thursday March 27th

- Presentation cont.
- Lecture and Demo with Spectrum Analyzer/PN scanner

Objectives of 10th lecture – Friday March 28th

- Discuss Future of CDMA
- Final Exam

(Note that this syllabus is subject to change)

Course Project:

The term project will be a research oriented project related to any topic in the CDMA area. The project MUST be accompanied by a presentation.

Some suggested topics are listed below, but you are by no means limited to these topics. The project can be a literature survey, analysis, and/or simulation. **Ideally**, the project should include some original research. However, re deriving a known result from scratch, repeating a simulation experiment or a literature survey of existing papers is also one. The project should follow APA style.

Details and deadline: A one paragraph project proposal is due by seminar 5 (email to nazila@globaltechnologies.biz or hard copy is fine too).

The project proposal should include few lines describing what you plan to do.

Do not propose an overly ambitious project that cannot be completed by the end of the semester. The project should be accompanied by 15 - 20 minutes of presentation and is due by session 10. You may either hand me the hard copy or email it to me in a readable format.

Some suggested topics:

- Coding/spreading trades in CDMA systems
- Future CDMA
- Interference in CDMA systems
- Future of 4G
- CDMA Market, Economical issues, Vendors, Design, Impact, Future

Course Grading:

Course requirements include the following major independent measures of learner competency.

Learning Activity Weights and Scoring Guides	
Activity	**Weight**
1. Class Participation	**10%** = 10 Points
2. Unit Assignments	**10%** = 10 Points
3. Course Project and Presentation	**30%** = 30 Points
4. Midterm Exam	**20%** = 20 Points
4. Final Exam	**20%** = 20 Points
5. Quizzes	**10%** = 10 Points
Total:	**100%** = 100 Points

Final Course Grade:

Your final course letter grade is determined by a cumulative percentage, a total of the graded percentages you receive for each weighted activity above.

Grades/Points:

A	4.0 = 95 – 100	C	2.0 = 74 - 76
A-	3.7 = 89 – 94	C-	1.7 =70 - 73
B+	3.3 = 86 – 88	D+	1.3 = 67 - 69
B	3.0 = 83 – 85	D	1.0 = 64 - 66
B-	2.7 = 79 – 82	D-	0.7 = 60 - 63

C+ 2.3 = 77 – 78 F 0.0 = 00 – 59

National University Statements on:

Diversity:

Learning to work with and value diversity is essential in every program. Students are required to act respectfully toward other students and the instructor throughout the course. Students are also expected to exhibit an appreciation for multinational and gender diversity in the classroom and develop management skills and judgment appropriate to such diversity in the workplace.

Ethics:

Ethical behavior in the classroom is required of every student. Students are also expected to identify ethical policies and practices relevant to course topics.

Communication Skills:

Both written and oral communications are required in the classroom of every student.

Technology:

Computer Lab, DVD

Writing Across the Curriculum:
http://www3.nu.edu/schools/SOET/writing.html

Student Discipline and Plagiarism:
http://www3.nu.edu/schools/SOET/plagiarism.html

Attendance Procedures:
http://www3.nu.edu/schools/SOET/attendance.html

Library Resources:
http://www3.nu.edu/schools/SOET/library.html
National University Library supports academic rigor and student academic success by providing access to scholarly books and journals both electronically and in hard copy. Print materials may be accessed at the Library in San Diego or through document delivery for online and regional students. Librarians are available to provide training, reference assistance, and mentoring at the San Diego Library and virtually for online or regional students. Please take advantage of Library resources:
URL: www.nu.edu/library
Contact the Library:
RefDesk@nu.edu
(858) 541-7900 (direct line)
1-866-NU ACCESS x7900 (toll free)
Use the Library Training Tools (on the Library Homepage) for additional hel
Recorded class presentations
Tutorials & Guides (APA/MLA, Peer-Review, and more)

APA Reference Guide:
http://www.apastyle.org/pubmanual.html

References:

Spread Spectrum Communications, Scholtz, Bary K.levit, 1995.

Multiuser Detection, Sergio Verdu, Cambridge Univ.Press, 1998.

CDMA systems Engineering Handbook, J S Lee and L E Miller, Artech House, 1998

CDMA Principles of Spread Spectrum Communications, Andrew J Viterbi, Addison Wesley, 1995

Wireless News and events:

http://www.wirelessdevnet.com/

www.sdtelecom.org

http://www.computerworld.com/

http://www.instat.com/

http://www.itconversations.com/

http://www.instat.com/MarkAlrt/insightw.asp

http://www.wired.com/news/wireless/

http://www.livenewswires.com/wimax/WIMAX-news

http://www.3gnewsroom.com/3g_news/index.shtml

Note: This syllabus is tentative and is subject to change.