

**Klipsch School of Electrical and Computer Engineering
College of Engineering
New Mexico State University**

**EE 595: Multirate Filter Banks & Wavelets, 3.0 Credits
Fall 2008**

Class Schedule: MWF 3:30-4:20 PM

Class Location: Thomas & Brown Hall, room 307

Instructor:

Dr. Charles (Chuck) Creusere

Room 160D Goddard Annex

Phone: 646-3919

email: cCreuser@nmsu.edu

Office hours: Friday 9-10AM, by apt.

Course Description:

Advanced course in digital signal processing dealing with multirate systems, filter banks, and wavelets

Prerequisites: EE395, EE545, or equivalent.

Textbook:

P.P. Vaidyanathan, Multirate Systems and Filter Banks, Prentice Hall, 1993, ISBN: 0-13-605718-7.

Other Useful References (not required):

M. Vetterli and J. Kovacevic, Wavelets and Subband Coding, Prentice Hall, 1995, ISBN: 0-13-097080-8.

Oppenheim, A.V., Shafer, R.W., and Buck, J.R., *Discrete-Time Signal Processing*, Prentice Hall, 2nd Edition (1999); ISBN: 0137549202.

S.K. Mitra, *Digital Signal Processing: A Computer-Based Approach*, 2nd Edition, McGraw-Hill, August 2000, ISBN: 0-07-232105

Software:

MATLAB v6.x, (available in T&B Labs). Purchase of MATLAB is optional.

Online Resources: WebCT

Course Objectives:

After completing this course, the student should be comfortable with multirate DSP theory and should understand the basics of filter banks and wavelet implementations. Topics covered include:

- Fundamentals of multirate systems
- Maximally decimated filter banks
- Paraunitary filter banks
- Biorthogonal filter banks & wavelets
- Lifted wavelet implementations
- Cosine modulated filter banks
- Connection between filter banks & wavelets
- Applications of wavelets and filter banks

Grading:

Homeworks: There will be weekly homework assignments consisting of textbook problems and/or computer simulation projects. Worth 20% of the final grade. Late assignments will not be accepted. If the program does not generate the results given in the hardcopy, no points will be awarded for the entire homework assignment. Homework will be reviewed in class on the day it is due and selected problems will be presented/demonstrated by the students

Project: There will be a projects worth a total of 30% of the final grade. Both a written report (20%) and an oral presentation (10%) of the project results will be required.

Lectures: Each student will give two lectures during the course of the semester on material assigned by the instructor. If a student is unable to give a lecture, he or she will instead be required to submit a paper summarizing and discussing their reading assignment. 10% of the course grade will result from each of the lectures (the total being 20% for both).

Final: A final, comprehensive examination take home examination will be given in this class. It is worth 30% of the final grade.

Re-grading: If a student feels that the grading on any assignment or exam is in error, they must bring the problem to the instructors attention within 1 week of receiving the graded assignment back from the instructor.

Policies:

I highly encourage you to discuss homeworks and projects with either myself or your peers. This discussion could include among other things, various approaches to a homework problem, algorithms for a software project, programming tips, and various theoretical insights. Be aware, however, that all submitted solutions to homeworks and projects must be written or coded (in the case of software) by the individual. There is to be no "sharing" of solutions. Any plagiarism or cheating will result in an automatic F in the course.

Rescheduled Classes:

There may be rescheduled classes. Classes will be made up either in the evenings or on weekends.

Students with Disabilities:

Feel free to call Jerry Nevarez, Director of Institutional Equity, at 505-646-3635 with any questions you may have about NMSU's Non-Discrimination Policy and complaints of discrimination, including sexual harassment.

Feel free to call Michael Armendariz, Coordinator of Services for Students with Disabilities, at 505-646-6840 with any questions you may have on student issues related to the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act of 1973. All medical information will be treated confidentially.

Prepared by: C. Creusere, 08/14/08