ECEC 690-502 CAD for VLSI Design Fall 2005  
Dr. Baris Taskin

This course focuses on the electronic design automation problems in the physical design process of digital VLSI integrated circuits. These problems are discussed in theory and application. Algorithms, techniques and heuristics structuring contemporary VLSI CAD tools are presented. Within this context, common data structures used for computer manipulation of circuit design data are analyzed. Optimization, graph theory and boolean algebra topics are presented. Various physical design flow steps including synthesis, logic partitioning, floor-planning, routing and timing are analyzed in detail.

ECES 690-501 Psychoacoustics and Models for Sound Analysis/Synthesis Fall 2005  
Dr. Youngmoo Kim

This course will introduce the human auditory system and investigate established techniques for the computational modeling of sound. Signal processing issues, such as sampling, aliasing, and quantization will be thoroughly examined from the perspective of audio and music processing. This quarter will focus on such applications as sound synthesis, audio data compression (techniques and standards), and audio watermarking. The prerequisite for this course is ECES 631 (Deterministic Signal Processing) or equivalent.

Dr. Youngmoo Kim

The digital music revolution has led to unprecedented access to vast amounts of music. Advances in audio compression (such as mp3) and portable devices (such as the iPod) now provide the ability to carry "1000 songs in your pocket". The proliferation of digital music, however, has had unforeseen consequences. How do we organize our ever-growing music library? How do we find just the music we want to hear out of the millions of songs now available to us? Can we develop systems to do these things for us?

Computers, while great for storing and playing back music, thus far have been unable to tell us much about the music from the audio itself. In this class we will explore recent advances in analyzing and classifying music using audio (acoustic) data. Some examples of applications that will be covered are:

- Song identification: What song is that playing on the radio?
- Artist identification: What band is performing that song?
- Music similarity determination: Can I find other bands that sound like one that I like?
- Genre classification: Is this song pop? Jazz? Classical?
- Sound and instrument identification: What instrument is being played?
- Musical feature extraction: What's the key of the song? What's the tempo? Where are the beats?
- Sound source separation: Can we separate out individual sounds that have been mixed together?
- Structure analysis: Where's the chorus of the song? Where's the bridge?
The prerequisite for this quarter is ECES 631 (Deterministic Signal Processing) or equivalent. Note that the previously listed prerequisite of Psychoacoustics and Sound Modeling (ECES 690-501 Fall quarter) has been dropped.

ECES 690-502 Processing of the Human Voice  
Dr. Youngmoo Kim  
Spring 2006  
This course will focus on the human voice, both speech and singing. Topics to be covered include voice analysis/synthesis, compression and coding, speaker/singer identification, and speech recognition. Prerequisites are ECES 631 and 632 (Deterministic and Stochastic Signal Processing) or equivalent.

ECES 817 Non-Linear Control Systems  
Dr. Allon Guez  
Winter 2006  
The course provides a graduate level introduction to nonlinear and time varying dynamic systems. The major techniques of modeling, simulation, computation, model solution, transient, steady states and stability analysis will be reviewed. Students will prepare topics for class presentation. The prerequisites for this course are ECE-S511 and ECE-S512.

ECES 699-001 Bioinformatics Seminar  
Dr. Oleh Tretiak  
Winter 2006  
Modern biomedical research poses many interesting and novel problems that benefit from a probabilistic formulation. The seminar will cover theories and algorithms that arise in this field. Some of the topics are: construction of genetic trees, genome reconstruction, gene methods in forensic studies, microarray methodologies and tasks, flow cytometry systems and methods, mass-spectroscopy methods in proteomics. Meeting times will be scheduled for the convenience of the participants. Presentations will be given by guests and by participants. Students wishing to take the seminar for credit should register for the ECE-S699 and will be required to give a presentation and to write a paper. A background in probability and statistics is desirable. It is possible to participate in this seminar without taking it for credit.