Prerequisite: Graduate student or undergraduate with engineering standing and completed EE422G or equivalent.

Expected Student Outcomes:
A student who has successfully completed this course should be able to:
1. Characterize digital audio systems with difference equations and transfer functions.
2. Characterize digital audio signals with correlation functions and power spectra.
3. Design systems for processing audio data in applications such as filtering, audio effects, and signal classification.
4. Know the fundamental principles of acoustic energy generation and propagation.
5. Program to implement and evaluate designs.
6. Work as a team to solve multi-component problems.

Optional Text:

Class Email List: To receive relevant communications and homework assignments for this class you must register for the list at the following web site: http://lists.engr.uky.edu/mailman/listinfo/ee513

Materials: Matlab will be use extensively and is on all university computers. A student edition of Matlab is also available see http://www.mathworks.com/academia/student_version/index.html for more information.

Grading Undergraduate:
Final Exam (1) 32%
Quizzes (4) 16%
Studio Assignments (4) 40%
Homework (6) 12%

Grading scale: For undergraduates 100-90% = A, 90-80% = B, 80-70% =C, 70-60% = D, and 60-0% E.

Grading Graduate:
Final Exam (1) 32%
Quizzes (4) 16%
Studio Assignments (4) 40%
Paper/literature Review (1) 12%

Grading scale: For graduates 100-90% = A, 90-80% = B, 80-70% =C, 70-0% E.

Final Exam: The final exam will be comprehensive and similar in complexity to in-class quiz problems, homework problems, and components of the studio assignments. The final exam primarily assesses course outcomes 1 through 4.

Quizzes: Quizzes will be given throughout the semester to test recently acquired skills / knowledge. In-class quizzes will typically involve problems that can be solved without the help of specialized computer software. Take-home quizzes will require the use of specialized software and the solutions are to be completed independently. The quizzes primarily assess course outcomes 1 through 4.

Studio Assignments: Studio assignments involve designing, implementing, and demonstrating a solution by students working in teams (typically 2 to 3). Time will be given in class (location will be in a lab with workstations) to work on the problems with instructor present for interactions. The assignment may extend over several class periods. Each student will hand in a report in the following format:

1. Problem Statement(s) (a restatement of the assigned problem as you understand it)
2. Salient Issues (Critical issues or sub problems important to the assigned problem solution)
3. Team Approach (Describe solution to overall problem that the team selected, use of flow charts and top-level diagrams recommended)
4. Individual Contributions (Describe your contributions to the team effort)

At the end of the assignment, all teams will present a short (10-20 minute) demonstration of their results and answer questions. The final grade will have a common component based on the demonstration to show the problem was indeed solved and efficiency/performance of the solution.), and an individual component based on the report. Individual reports should be clear and concise. The use of figures, tables, and equations is highly recommended. Commented code developed completely or partially by the individual should be submitted with the report in an appendix. The studio assignments assess course outcomes 5 and 6.

**Homework:** Homework primarily involves responding to problems posed in the lecture. Homework assignments focus on the assessment of outcomes 1 through 4.

**Paper Review:** For graduate students only, read a research paper (approved first by instructor) related to audio signals/systems and write a critical report on it. The report must accurately summarize what the authors claim to show, describe the methods used to make their point, and critically assess the degree to which they established their claims. The paper review primarily assesses outcomes 1 through 4.

**Unethical behavior:** The following activities are unethical:
- Using data you did not measure
- Recording values you did not observe
- Copying a portion of work belonging to someone else

Any of these will result in the consequences described in the university’s policy on academic dishonesty. (see [http://www.uky.edu/StudentAffairs/Code/Section%20VI.pdf](http://www.uky.edu/StudentAffairs/Code/Section%20VI.pdf)).
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<td>1-9,11,14</td>
<td>HW1 (due 1-18) History/Introduction to Matlab’s sound functions</td>
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<td>2</td>
<td>1-16,18,23</td>
<td>HW2 (due 1-28) DSP general models (Z-transforms and difference equations)</td>
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<td>Studio Assignment 1: Digital oscillator for a complex tone Digital oscillators, Complex tones (Quiz 1)</td>
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<td>HW3: (due 2-18) Digital filters (graduate students: select paper by 2-8)</td>
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<td>HW3: (due 2-18) PSD, Spectrograms, and correlation functions, Filter design, Optimal filtering (Quiz 2)</td>
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<td>HW 6: (Due 4-10) Classifiers: MAP, Linear Discriminant</td>
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<td>Studio Assignment 4: Design, build, and test a classifier for speech (graduate students: Hand in paper review) (Quiz 5)</td>
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<td>5-1 (Wednesday)</td>
<td>Final Exam (1:00PM to 3:00PM)</td>
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**Spring Break!**