Date

Fall 2016

Course Number and Title:

MUSI 2525 Introduction to Audio Technology I

Credits and Hours

3 credit hours: lecture

Lecture: Tuesday and Thursday from 1:35 – 2:55 pm in Couch 102

Procedures:

Class will meet two times weekly from 1:35 – 2:55 pm for lecture and activities. Attendance for all lectures is strongly urged. The instructors are under no obligation to make up material presented in class unless the student can provide a reasonable and, if appropriate, documented excuse.

Required Prerequisite:

MATH1502 Calculus II

Instructor (office hours upon request)

Dr. Alexander Lerch

* Couch Music Building – 840 McMillan Street – Room 203A – (404) 894-8943
* Office Hours: M/W 1:00 – 2:00 pm.

Course Description

This course will review acoustic fundamentals and introduce the basic principles of analog audio technology, including audio recording and processing equipment (microphones, mixing consoles, audio effects) and models for sound synthesis (additive, subtractive, physical modeling, etc.).

Course Objectives and Learning Outcomes

Students will gain critical understanding of, and hands-on experience with the fundamentals of analog audio technology. Student learning outcome will include deep understanding and practical familiarity with concepts such as signals and systems, electro-acoustics, sound effects, synthesis and music protocols. Upon completion of the course, students will demonstrate:

1. critical understanding of audio signals and systems,
2. knowledge and critical understanding of the fundamentals of analog audio technology, electro-acoustics, audio effects, and music protocols,
3. the ability to understand the signal flow in typical equipment for audio processing,
4. the ability to use this knowledge to create a technological artifact for audio processing.

Course Material

* Richard Boulanger and Victor Lazzarini (eds.), *The Audio Programing Book*, MIT Press, 2010.
* Curtis Roads, *The Computer Music Tutorial*, MIT Press, 1996.

Software

The assignments and project work will be done in Matlab. This will include implementation of functions for signal synthesis, system analysis (transfer functions), and signal processing (audio effects). Please note the following license information: [www.matlab.gatech.edu](http://www.matlab.gatech.edu). Other tools and programming languages can be used if approved by the instructor.

Method of Evaluation:

The following evaluative tools will be utilized in measuring progress towards obtaining the class objectives:

Homework 30%

Quizzes 30%

Midterm Exam 15%

Final Project 25%

TOTAL 100%

All assignments, quizzes, and tests will be graded by points. The final grade for the course will be determined by dividing the total points earned by the number of points possible for each of the categories listed in Method of Evaluation. These numbers will be converted into a grade according to the following scale: A=100-90%, B=89-80%, C=79-70%, D= 69-60%, F= 59% and below.

Grading Policies

Homework assignments are due *by the beginning of class* ON THE DUE DATE. A penalty of one letter grade per day will be applied to all late assignments. Documented illnesses and family emergencies are excepted, of course. Quizzes and exams cannot be made up unless you have a valid, documented excuse.

Academic Integrity

Students must do their own work on assignments, projects, and tests unless collaboration is previously specified and approved by the instructor. Students caught cheating will receive zero credit for that assignment/quiz/test and may be subject to further sanctions through the Office of Student Integrity. Students are expected to abide by the Georgia Tech Honor Code and avoid any instances of academic misconduct, including but not limited to:

1. Possessing, using, or exchanging improperly acquired written or oral information in the preparation of a paper or for an exam.
2. Substitution of material that is wholly or substantially identical to that created or published by another individual or individuals.
3. False claims of performance or work that has been submitted by the student.

Please refer to the published Georgia Institute of Technology Academic Honor Code for further information: osi.gatech.edu/plugins/content/index.php?id=46

Statement Regarding Students With Disabilities:

In accordance with the Americans with Disabilities Act, students with bona fide disabilities will be afforded reasonable accommodation. The ADAPTS Office will certify a disability and advise faculty members of reasonable accommodations. The web site for a student requesting accommodation is:

<http://www.adapts.gatech.edu/plugins/content/index.php?id=12>

Course Outline

Week 1: Introduction to Sound – Mechanical and Cognitive Perspectives

Week 2: Fundamentals of Signals and Systems – Discrete and Continuous-time Signals, Linear Systems

Week 3: Advanced Signals and Systems – Modulation, Multiplexing

Week 4: The Fourier Transform

Week 5: Microphones and Speakers – Types, Characteristics, Pick-up Patterns, Speaker Power Ratings

Week 6: Mixing and Processing ­– Audio Signal Flow, Mixing Consoles, Pitch and Time Shifting

Week 7: Midterm Exam

Week 8: Modulation Effects – LFO, Chorus, Flangers, Phasers, Tremolo

Week 9: Time Based Effects - Delay Lines, Reverb

Week 10: Additive Synthesis – Harmonic Form, Time Dependent Amplitudes, Inharmonic Forms, Time Dependent Frequencies

Week 11: Subtractive Synthesis – Filter Types, Filter Theory, Vocoders

Week 12: Modulation Synthesis – Ring Modulation, Amplitude Modulation, Frequency Modulation Synthesis

Week 13: Physical Modeling – Computational Methods, Motion, Conservations Laws, Oscillating Systems and Resonance

Week 14: Music Protocols – Musical Instrument Digital Interface (MIDI), Open Sound Control (OSC)

Week 15: Final Project Presentation and Critique