**Date**

Fall 2014

## Contact

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office hours: Mon 4:30–5:30pm and by appointment

## 1. Credits and Hours

3 credit hours

Lecture: Mon and Wed, 3:05–4:25pm in Couch 102

## 2. Course Description and Objectives

Introduction to the software-based analysis of digital music signals. This course covers the basic approaches for musical content analysis and teaches students to approach this class of problems and think algorithmically. Topics include pitch tracking, beat tracking, audio feature extraction, and genre classification. The classes focus is on the audio signal processing aspects of Music Information Retrieval (MIR).

**2.1 Learning Outcomes**

After successful completion of this class, the students will demonstrate:

1. an understanding of typical analytic approaches for audio and music signals
2. the ability to use this understanding to design MIR systems for music analysis, and
3. the aability to implement such designs in a programming language such as Matlab.

## 3. Prerequisites

Prerequisite with concurrency is MUSI 2526 Introduction to Audio Technology II. Prior coursework or experience in signal processing and machine learning and familiarity with Matlab will be helpful.

## 4. Procedures

Class will meet two times weekly, see Sect. 1. Attendance is expected but not factored into your grade.

## 5. Course Materials

### 5.1. Text Book

The class will be based on the following text book:

Alexander Lerch (2012), *An Introduction to Audio Content Analysis: Applications in Signal Processing and Music Informatics*, Jon Wiley & Sons, Hoboken.

It is available electronically here (access to this site may be restricted from off-campus):

ieeexplore.ieee.org/servlet/opac?bknumber=6266785

### 5.2 Recommended Reading

• Li, T., Ogihara, M. and Tzanetakis, G. (Eds.) (2012), *Music Data Mining*. CRC Press.

• Klapuri, A. and Davy, M. (Eds.) (2006), *Signal Processing Methods for Music Transcription*. Springer.

• Mueller, M. (2007), *Information Retrieval for Music and Motion*. Springer.

### 5.3 Software

The assignments and project work will be done in Matlab. 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.

## 6. Undergraduate vs. Graduate Students

Both undergraduate and graduate students will be attending this class. In addition to having the same workload as undergraduate students, graduate students will:

• Submit a final paper, and

• Receive an additional question on each assignment.

## 7. Method of Evaluation

The final project is a team effort. Group size will be two or three students. The grades for paper and final presentations will be per group. The assignments and tests will be done and graded individually. The overall grade consists of:

• Assignments: 20%

• Quizzes and Exams: 30%

• Presentations: 15%

• Term Project: 35%

All assignments, papers, presentations 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 above. 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.

All project-related grades are **per group**. Students are encouraged to support each other with both the assignments and project work, but each submission has to be clearly executed by the individual/group being graded. More specifically, two or more individuals/groups handing in the same code/answers will be reported for academic misconduct.

## 8. Grading Policies

Homework assignments and the final project paper are due **ON THE DUE DATE**. The due date will be announced per assignment, but will usually be the following Monday on 3:05pm. A penalty of **ten points per day** will be applied to all late assignments and late project papers. Documented illnesses and family emergencies are excepted, of course. Quizzes and exams cannot be made up unless you have a valid, documented excuse.

## 9. Course Outline

There will be six assignments, posted every two weeks. There will be one mid term presentation and a final presentation of the project. Tests will be held weekly.

The topics for the project have to be approved by the instructor. The second half of the semester will focus on the listening tests for the projects rather than assignments.

• Week 1: Introduction

• Week 2: Fundamentals (Convolution, Correlation, Fourier Analysis)

• Week 3: Instantaneous Features, Feature Selection

• Week 4: Peak and Loudness Features

• Week 5: Pitch Tracking

• Week 6: Key Detection, Chord Detection

• Week 7: Onset Detection

• Week 8: Tempo and Downbeat Detection

• Week 9: Mid-term Project Presentation

• Week 10: Genre and Mood Classificaton

• Week 11: Audio Alignment

• Week 12: Audio Fingerprinting

• Week 13: Structural Segmentation

• Week 14: Music Performance Analysis

• Week 15: Project Presentation

• Week 16: Project Presentation

• Week 17: Final Exam

## 10. 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:

• Possessing, using, or exchanging improperly acquired written or oral information in the preparation of a paper or for an exam.

• Substitution of material that is wholly or substantially identical to that created or published by another individual or individuals.

• 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: [www.deanofstudents.gatech.edu/integrity/policies/honor\_code.html](http://www.deanofstudents.gatech.edu/integrity/policies/honor_code.html).

## 11. 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:

[www.adapts.gatech.edu/faculty\_guide/sturespon.htm](http://www.adapts.gatech.edu/faculty_guide/sturespon.htm).