MUS421A Overview: Administrative Info

Center for Computer Research in Music and Acoustics (CCRMA)  
Department of Music | Stanford University  
Stanford, California 94305  
Spring Quarter, 2018-2019

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Music 421A
Spectral Audio Signal Processing

1 Course Description

Music 421A (EE 367B): Time-Frequency Audio Signal Processing

Music 421A covers typical spectrum analysis and processing arising in digital audio research. The main topics addressed are practical time-frequency analysis using Fast Fourier Transforms (FFT), spectral foundations for Music Information Retrieval (MIR) and Audio Machine Learning, sound synthesis by means of spectral models, and FFT-based signal processing.

1.1 Prerequisites

The only prerequisite for Music 421 is Music 320[^1] or equivalent (prior exposure to complex numbers, sinusoids, Fourier theory, linear systems theory, digital filters, and z-transform analysis). In Electrical Engineering (EE), more than adequate coverage of Fourier theory is provided by EE 261[^2] (Fourier Transform and its Applications). The EE Digital Filtering course, EE 264[^3], covers prerequisite background pertaining to sampling and digital filtering, and there is some overlap of topics. Matlab[^4] or Octave[^5] is required for homework assignments, and is recommended for programming project work.

1.2 When, Where, Who

**Term:** Spring Quarter
**Location:** Main CCRMA Classroom (Knoll 217)
**Time:** Tuesdays and Thursdays, 3:30-4:45 PM
**Instructor:** Julius Smith (jos@ccrma.stanford.edu)
**TA:** Orchi (orchi@ccrma.stanford.edu)
**TA Office Hours:** Wednesdays 5:30-7:30
**JOS Office Hours:** after class on Tu, Th afternoons, up to half-hour appointments typical
**Website:** [https://ccrma.stanford.edu/courses/421/](https://ccrma.stanford.edu/courses/421/)

2 Administrative Information

2.1 Announcements

Class announcements are often made via email. For this we are presently using Piazza:

https://piazza.com/stanford/spring2019/music421a/home

You should have received an invitation from Piazza to join the class after you signed up for it in axess (using the email address known to axess). Otherwise, please join by visiting the above URL and entering your preferred email address.

2.2 Weekly Homework

There will typically be weekly to bi-weekly assignments consisting of reading, working theory problems, and carrying out lab exercises. The lab portions typically require programming in matlab.

The theory and lab assignments are normally assigned together on Thursdays. The theory part is due eight days later on Friday at 9 am in the 421A mailbox (located in the Knoll Ballroom with the other mailboxes). The lab part is due on the same day at midnight.

For lab assignments, we will be using the Canvas website. To sign up, go to the Canvas website and find Music421a. Once you are enrolled in the class, you can upload your matlab files in the “drop box” on the left menu.

See §2.5 below regarding obtaining help with theory and lab assignments.

Regarding late homeworks, 7 free late days are allowed (with hours rounded up to the nearest day). Late homeworks beyond this will be penalized at 5% per day. When using late days, write the number of late days used at the top of the assignment (date and time).

Students are encouraged to discuss the homework assignments with each other. It is fine to learn from a classmate how to solve any of the homework problems, but each student is responsible for carrying out and writing up the assignments individually. It is an honor code violation to copy the work of others.

2.3 Exams

The final examination will be held in the CCRMA Classroom (Knoll 217) on the University-assigned date, also listed for convenience in the class schedule (§4 on page 4).

2.4 Grading

Grades are based on the homeworks/labs (40%), class attendance and participation (20%), and the final examination (40%). There are bonus points available for going beyond the assigned work. The weightings may be changed as we see fit.

2.5 Office Hours and Getting Help

We will be using Piazza for sharing answers to posted questions with the whole class. To sign up, see the 421A Piazza site. It is free and allows you to view past questions from other students, and

https://canvas.stanford.edu
https://www.piazza.com
https://piazza.com/stanford/spring2019/music421a/home
discuss questions together. Try it first for any homework questions you may have. You are also welcome, of course, to catch us whenever you see us at CCRMA, such as during office hours, etc.

TA weekly office hours are TBA in the TBA. Meetings with JOS are arranged via email for half-hour slots after class, or other times when necessary.

### 2.6 Computer Usage

Lab exercises will be computer based. All students may obtain a computer account at CCRMA in order to use the computer facilities. It is also possible to work entirely on your own computer, as long as you have the necessary software. However, note that some course materials are restricted to on-campus access, so you should have at least one Stanford computer account from which you access those.

Here is how to obtain a CCRMA computer account:

[https://cm-knoll.stanford.edu/usersignup](https://cm-knoll.stanford.edu/usersignup)

*Note:* This link *only works at CCRMA.*

Once you have your account, please log in at CCRMA and take a look at the User’s guides¹ tab in the left-frame menu of the [main CCRMA website](http://ccrma.stanford.edu/guides/) to learn more about computer usage and other facilities at CCRMA.

### 2.7 Units

You may sign up for 3 or 4 units. Three units involves only in-class time, assigned reading, any assigned videos, and homework/lab problems, and final exam. A fourth unit adds an independent project and report, which can be based on reading and/or lab work.

### 2.8 Final Project (Optional 4th Unit)

The purpose of the final project is to go beyond the content of the lectures and assigned reading in the direction most interesting to you. Your project can be on any topic related to lectures and assignments. A *one-page project specification/proposal is due by the 4th class meeting*, and the final written report is due by the end of finals week. You are also invited to present your project results during the last class. There are two primary project types:

- Outside reading and report
- Programming project and report

Your project can consist of any combination of the above components. A research-oriented project typically consists of the following main phases:

- Phase I: Outside reading (explore the topic)
- Phase II: Software project (implement your best ideas from Phase I)
- Phase III: Write-up

It is normal to iterate the above phases to some extent, rather than to perform them entirely sequentially.

2.9 Required Software

Laboratory assignments in this course will require programming in the matlab language, which is available on CCRMA desktop machines. For personal computers, the student version of MATLAB is priced well below other versions, and you can get by fine with Octave, a free-software version of basic matlab.

2.10 Important Pointers

The course schedule and outline in §4 on page 4 (also reachable from the class home page) lists the following information:

- Assignments!
- Schedule of lectures
- Pointers to all lecture overheads and the online text.

The class home page further contains pointers to sound examples and related items of interest online.

3 Reading

The text for this course is Spectral Audio Signal Processing by JOS. It is available online in HTML format, and the printed book can be ordered if desired. All reading assignments will be specified in the course schedule and outline.

4 Schedule and Assignments

TBA