Course Information

Meeting Time and Place

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>CPMC 145</td>
<td>Smyth</td>
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<tr>
<td>Office Hour</td>
<td>CPMC 145</td>
<td>Kevin, Johannes, Smyth</td>
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<tr>
<td>Thursday, Oct. 5, 2017</td>
<td>3:30PM—4:50PM</td>
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<tr>
<td>Tuesday, Nov. 28, 2017</td>
<td>5:00PM—6:00PM</td>
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<tr>
<td>Final Exam</td>
<td>CPMC 233</td>
<td>Smyth</td>
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<tr>
<td>Wednesday, Dec. 13, 2017</td>
<td>3:30PM—4:50PM</td>
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Course Description

An introduction to the acoustics of music with some exposure to contemporary digital techniques for understanding and manipulating sound. Prerequisites: Music 1A, 2A, or 4. Offered Fall Quarter Only.

Prerequisites

Music 1A, 2A, or 4 or permission from Instructor.

Important Dates

- November 2, 2017: Project/Paper proposals due.

Schedule and Online Lecture Notes (subject to change)

- Week 0:
  - Lecture 0a: Sound
  - Lecture 0b: Waves
  - Lecture 0c: Decibels

- Week 1:
  - Lecture 1a: Quantifying Sound
  - Lecture 1b: Periodic Waves
  - Lecture 1c: Amplitude Envelopes

- Week 2:
  - Lecture 2a: Digital Audio
  - Lecture 2b: Spectral Analysis

- Week 3:
  - Lecture 3a: Digital Audio
  - Lecture 3b: Practical Review of A2 in class

Grading

- 3 exams (25% each, top 2 of 3 (student MUST write all three): 30%)
- 7 weekly assignments (5% each, top 6 of 7): 30%
- Final paper/project: 20%

Required Textbooks

- Music 170 on-line notes.

Reference

- A Digital Signal Processing Primer, Ken Steiglitz, Addison Wesley, 1996, 97808985316981

Paper/Project

There is a choice between a paper or a project.

- PAPER:
  - This is NOT a research paper in the traditional sense.
  - The paper should be an approximately 1-5 page (double spaced) summary of 2 related academic journal articles on a particular acoustic musical instrument or phenomenon of the student’s choosing.
  - **Proposal Requirement**: state the chosen acoustic instrument/phenomenon AND include bibliographic entries for 4 journal articles (TAs will help you refine/reduce to 2). Include journal articles (in PDF) with proposal.
  - **Grade will be based on:**
    1. process of selecting topic and 4 initial papers (proposal stage).
    2. student’s ability to read, understand, and translate a technical/academic paper into his/her own words, conveying salient ideas even if omitting mathematical detail.
    3. style, quality of writing, clarity, accuracy.

- PROJECT:
  - If you elect to do a project (strongly encouraged!), you will also be expected to briefly present/demonstrate your project during the final exam time slot. You

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1. must also submit an accompanying short paper (approx. 1-2 pages) documenting your project.
2. A suitable project would be to design and build your own acoustic musical instrument (or hybrid electro-acoustic), and “play” a short piece during the final presentation. Your instrument should be capable of producing different pitches and should demonstrate that you know about vibration and projection of sound.
3. Projects may be done in pairs: partnering up is encouraged, though you should be clear in your proposal (see below) with whom you will be working and what each student will contribute.

**Proposal Requirement**: Each student must submit 2 proposed topics, each with a brief (1-2 paragraph) description (and possibly a drawing if appropriate), ranked in order of preference (the second is an alternative to the first, in case the first is out of scope or otherwise not appropriate). If you will work in a pair, the proposal should state very clearly with whom you will be working, and the role of each contributor.

Each student submits a proposal. Due Thursday, Oct. 27, 2015.

- Week 1:
  - Lecture 1a: Quantifying Sound
  - Lecture 1b: Periodic Waves
  - Lecture 1c: Amplitude Envelopes

- Week 2:
  - Lecture 2a: Digital Audio
  - Lecture 2b: Spectral Analysis

- Week 3:
  - Lecture 3a: Digital Audio
  - Lecture 3b: Practical Review of A2 in class

- Week 4:
  - Lecture 4a: Digital Audio
  - Lecture 4b: Exam 1

- Week 5:
– Lecture 5a: Waves
  * principle of superposition
  * constructive and destructive interference
  * boundary reflections
  * standing waves (node and antinode patterns)
  * string and tube harmonics
– Lecture 5b: Strings
  * plucked string
  * simple Karplus-Strong plucked string (using Pd’s vdelay)
• Week 6:
  – Lecture 6a: Strings
    * bowed string
    * resonance
    * instrument bodies
  – Lecture 6b: Winds
• Week 7:
  – Lecture 7a: Winds
    * acoustic tubes
    * pressure-controlled valves
    * mouthpiece, valves and slides
    * tone holes
  – Lecture 7b: Exam 2
• Week 8:
  – Lecture 8a: Ear
    + human auditory system
    + spectral analysis and the basilar membrane
  – Lecture 8b: Thanksgiving—no class
• Week 9:
• Week 10:
  – Lecture 10a: Space
    * auditory localization
    * interaural time and intensity difference
    * cues for judging distance
    * reverberation
  – Lecture 10b: Exam 3

Assignments

Assignments will be available online every Thursday, and due Friday the following week. Late assignments will be accepted up to the following Tuesday (before class) but with a penalty of 10% a day. This ensures that graded assignments and/or solutions can be returned to students in a timely manner.

• Week 0:
  – Assignment 1 (due Friday, Oct. 6)
    – Download Pd and the Music 170 patch library provided by Miller Puckette from [here](#).
    – Follow instructions for putting library in Pd’s search path.
• Week 1:
  – Assignment 2 (due Friday, Oct. 13)
• Week 2:
  – Assignment 3 (due Friday, Oct. 20)
• Week 3:
  – Assignment 4 (due Friday, Oct. 27)
• Week 4:
  – Exam 1 (Tuesday, Oct. 24)

• Week 5:
  – Project proposals due (Thursday, Nov. 2):
    – Assignment 5 (due Friday, Nov. 10)
• Week 6:
  – Assignment 6 (due Friday, Nov 17)
• Week 7:
  – Exam 2 (Tuesday, Nov. 14)
• Week 8:
  – Assignment 7 (due Friday, Dec. 1)
  – Thanksgiving (Thursday, Nov. 23)
• Week 9:
• Week 10:
  – Exam 3 (Thursday, Dec. 7)