Music 175: Psychoacoustics
Spring 2019
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[Department of Music]
[University of California, San Diego (UCSD)]
May 7, 2019

Course Information
Teaching Assistant
• Nicholas Solem, nsolem@ucsd.edu

Meeting Time and Place
Meeting Dates: 2017/4/2 - 2017/6/6

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>Th: 12:30PM - 1:30PM</td>
<td>CPMC 387</td>
</tr>
<tr>
<td>Office hours:</td>
<td>Th: 11:00-12:00PM (before class)</td>
<td>CPMC 243</td>
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<tr>
<td>Office hours:</td>
<td>Th: 2:00-3:00PM (or by appointment)</td>
<td>CPMC 233</td>
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<tr>
<td>Final project/paper presentations</td>
<td>M 11:30AM-2:30PM (6/11/2018)</td>
<td>CPMC 387</td>
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Course Description
Formerly Music 160B. Study of psychoacoustical phenomena, theories of hearing, and their relation to musical perception and cognition. Techniques of psychoacoustical experimentation.

Prerequisites
Music 170 or 171 (or permission by instructor).

— Reading: Cook, Chapter 4.

• Week 2:
  — Hearing
    • [Timbre] pressure, power, intensity, dB scale
    • [Ear Physiology] The ear and how it works
  — Pd patches: [pitchFreq.pd] [FrequencyAndLoudness.pd] [max.pd]
  — Reading: Cook, Chapter 1 and 6.

• Week 3:
  — Hearing in Time and Space
    • [Time and Space] “cocktail party”, binaural masking, precedence effect, reverberation, localization.
  — Reading: Cook, Chapter 8.

• Week 4:
  — Hearing in Time and Space (cont.)
    • Field trip: Audio Spatialization Lab (Spat Lab), Calit2 (April 23, 2019)
    • Exams:
      • Test 1: April 25, 2019 (Thursday, last 45 mins of class)
      • Test 2: May 16, 2019
      • Test 3: June 6, 2019
  — Student paper presentation(s) Hearing in Time and Space (Thursday)
  — Student paper presentation(s) Hearing in Time and Space (Tuesday)
    • Mason Davis: “Comparative Study of European Concert Halls”.
    • Erik Garcia: “Synchronization in Performed Ensemble Music.”
    • Andrew Loun: “The CIPIC HRTF Database.”
  — Cognitive Psychology and Music
    • [Principles of perception] unconscious inference vs. direct perception (Gibson), size and loudness constancy, perceptual completion, gestalt grouping principles.
  — Reading: Cook, chapter 3

• Week 6:
  — 3 tests (15% each) 45%
  — 1 assigned paper presentation: 15%
  — occasional assignments/experiments: 15%
  — Final project/paper and presentation 20%
  — participation (attendance) 5%

Required Textbooks
• Brian Moore. An Introduction to the Psychology of Hearing (available EBOOK).
• Music 175 on-line notes.

Important Dates
• Thursday, April 25, 2019. Test 1.
• Thursday, May 16, 2019. Test 2.
• Thursday, June 6, 2019. Test 3.
• Monday June 10, 11:30AM-2:30PM. Final project presentations (10-15 minutes each).

Schedule and Online Lecture Notes (subject to change)

• Week 1:
  — Introduction to Music 175
  — Sound:
    • [Spectrum] what is sound? acoustics vs. psychoacoustics.
    • [Frame] time representation of sound, sinusoids, partials/overtones, harmonics.
    • [Pitch] frequency representation of sound, fourier analysis, spectrograms, periodicity
  — Pd patches: [audioacoustics.pd] [pitchFreq.pd] [pitchFreq2.pd]

• Week 2:
  — Timbre
    • [Pitch Perception] average spectral shape, formants, missing harmonics, time variation.
  — Reading: Cook chapter 7.
  — Student paper presentations Timbre
    • JP Eikam: “Multidimensional Perceptual Scaling of Musical Timbres.”

• Week 3:
  — Ambiguity in Music
    • [Timbre] ambiguity, common fate, separation with apparent motion, Sheperd tones, tritone paradox
  — Reading: Cook chapter 10.
  — Student paper presentations Illusion
    • Camden Greenwood “Hearing Lips and Seeing Voices.”
    • Ting Yu Moore, “A General Model for Spatial Processing of Sounds.”

• Week 4:
  — Pitch
    • [Pitch Perception] place theory of pitch, repetition pitch, pitch paradox, jad, mad scale
    • Reading: Cook, chapter 5
  — Student paper presentations Pitch Perception
    • Hugh Shin: “Octave Generalization and Tune Recognition.”

• Week 5:
  — Student paper presentations Timbre

• Week 6:
  — Student paper presentations Psychoacoustics/Animal Perception
Assignments are to be submitted on TED by 12:15PM (before class) on the day they are due.

- Week 1:
  - Due Tuesday April 9, 2019.
    - Download `message1.wav` and `harmonicity.pd` here.
    - Play example 1 and try to transcribe the text of the two spoken messages.
    - Play example 2 and see if it’s easy to transcribe, correcting your transcriptions where necessary.
    - Submit your final transcriptions of both texts.
  - Reading: Cook, chapter 4.

- Week 2:
  - Due Tuesday April 16, 2019.
    - Download `harmonicity.pd` and answer the following questions.
      1. Play a square and then triangle wave. Describe (qualitatively) the difference you hear between the tones. The difference is the timbre (pronounce: TAM-BRRR).
      2. For both square and triangle waves, change the frequency of the 3rd harmonic until you no longer perceive the sound as having a clearly defined pitch (you can do this while the note plays continuously or by turning it on and off). Note the change in frequency. Is it different for each of the waveforms?
      3. Reset the frequencies and select a SQUARE wave. Change the 7th harmonic until you no longer perceive a pitch. Note the change in frequency. Is it the same, more, or less than for the 3rd harmonic for the square wave in the previous step?
      4. Reset frequencies and change the amplitude of the 5th harmonic until you hear a change in the timbre (tone quality of the sound). Note the amplitude (in terms of the quotient number).
      5. Lower the amplitude of the fundamental by raising the quotient number until increasing no longer makes a difference in the perceived sound. Do you still hear the same pitch?
    - Reading: Cook, chapter 1 and 6.

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  - Reading: Cook, chapter 8.

- Week 4:
  - Reading: Cook, chapter 3.

- Week 5:
  - Reading: Cook, chapter 7.

- Week 6:
  - Final project proposal: write a 1-2 paragraph proposal describing your project and submit on TritonEd. Once you get approval you may begin working on your project!

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Selected Papers:


2. Mirjam Kurnschild et all. “Bat echolocation calls facilitate social communication”, available [here](#).

3. (Hearing in moths) Hannah M. Moir, Joseph C. Jackson and James F. C. Windmill. “Extremely high frequency sensitivity in a ‘simple’ ear”, available [here](#).


Final project presentation

- Presentations will be during the final exam period.
- Papers should be constrained to 5-10 pages.
- The paper’s grade will be based on both its style, i.e. that it consistently follows a standard research style (e.g. MLA, APA, Chicago, etc), and its content, i.e. it is well written and clear, the information is correct and accurate etc.
- Proposals: Each student must submit a list of 2 proposed topics, each with a brief description (and possibly a drawing if appropriate), ranked in order of preference.

Exams

Exams will be based on lectures, assigned readings, and student presentations.

Project

The project may consist of:

- “pure” research
- pd listening experiment + paper
- music analysis/create (yours or another) illustration of an auditory effect + paper
- other