

UIUC Physics 406: Acoustical Physics of Music

Course Syllabus

Professor Steven Errede, 435 Loomis Laboratory, serrede@illinois.edu, 333-0074/4452

Introduction to Course, Course Structure, Organization:

- This course meets 3×/week, 4 credit hours.
 - * Lecture/demos Tues & Thurs 12:30-1:50 pm in 6105 ESB, and:
 - * 3 hr Lab Friday, either: Lab1: 11am-2pm, or Lab2: 2:00-5:00 pm in 6105 ESB
- Lecture/demo/lab/hands-on interactive/investigative-type format
- 1 HW assignment/week, lecture related.
- Take-Home Midterm & Final Exams.
- Lecturer: Steve Errede 435 Loomis, email: serrede@illinois.edu
Phone(s): 333-0074 (office); 333-4225 (lab), 333-4452 (HEP sec'y)
- 2 TAs: Matt Ziemann mrziema2@illinois.edu, Andrew Ferrante aferran2@illinois.edu
- UG Lab Teaching Specialist: Jack Boparai 6101 ESB, email: jboparai@illinois.edu
- Course Project - of own choice (must be relevant to course), can be wide-ranging
 - * Brief oral presentation on project @ midterm
 - * Final oral presentation & final written report @ end of semester, substantive effort.
 - * Final written report will be posted on P406POM Student Reports web page.
- Web page for course, URL: <http://courses.physics.illinois.edu/phys406/>
- Final grade: mix of HW, midterm, final exams, active participation in class & labs, project midterm & final oral presentation(s) and final report(s) on project(s).

Course Content:

- Essentially acoustical physics, with emphasis on music and musical instruments.
- What is music? For humans? For other animals?
- Why does music exist? Why is it important? For humans? For other animals?
- Why/how did music evolve? History of music/musical instruments.
- Human music, music associated with other living creatures...
- Importance of music today in our societies. In future? Evolution of music?
- Music in Nature/Music of the Cosmos... earth, sun, other planets, universe...
- Scientific study of music/musical instruments (history):
 - * Ancient Greeks - Pythagoras (~ 500 BC) at least. Earlier endeavors?
 - * Since then: Aristotle, Ptolemy. Huygens, Euler, Ohm, Young, Helmholtz
- How is music made?
 - * (Collective) vibrations of atoms of matter
 - * Matter vibrations coupling to air - collective vibrations of air molecules
 - * Propagation of sound waves in air, other media, fluids & solids.
- How/why is music heard/perceived? Human & animal hearing/sound perception
 - * Evolution - why is it beneficial to perceive sound?
 - * Psychoacoustics - study of human hearing
 - * How human ear(s) + brain work
 - * Hearing in other animals
- Simple Vibrating Systems
 - * Simple harmonic motion - e.g. mass on a spring, tuning fork
 - + Frequency, period, wavelength, amplitude, phase, energy, energy loss/damping/dissipation, power