

PHYS 144: The Physics of Music and Sound



Instructor: Frank Toffoletto, Physics and Astronomy (toffo@rice.edu)

Time: Fall 2012, Tues./Thursday: 10:50-12:05

Location: SS 106 (subject to change)

Website: Owlspace

Distribution 3 credit

This course is designed to develop a scientific understanding of the relationship between music and sound, by exploring the properties of sound and its relation to musical instruments. We will examine the production of sound by a variety of musical instruments, how the resulting sound is propagated, and how it can be measured and analyzed. Additional topics to be covered include an analysis of musical scales, resonance, architectural acoustics, the physics and physiology of hearing, and the technology of sound reproduction and recording. **This course is designed for non-science and non-engineering majors.**

The goal here is to acquire an intuitive understanding of the science behind sound and music. The use of formulas will be kept to a minimum, but there will be some quantitative aspect to the class which will entail some calculations. Be sure to bring a calculator or equivalent to class.

Textbook

“Measured Tones: The Interplay between Physics and Music”, by Ian Johnson, 3rd edition, CRC press. The book is highly recommended, but is not required.

There is an electronic edition: <http://store.vitalsource.com/show/9781439889572>



Topics to be covered include (not in this order):

1. Harmonies in a mechanical universe: properties, generation and propagation of waves and sound.
2. Overtones of enlightenment: Harmonic analysis, complex tones, overtones, and timbre Music of the spheres: The scientific method, tones and the perception of pitch, harmonious intervals and the development of musical scales.
3. Good vibrations: The physics and psychophysics of hearing.

4. Brave new world: The role of electronics and the information age.

Throughout the semester we will examine the physical properties of various musical instruments; on occasion students will be encouraged to bring their own instruments and/or favorite music to class for discussion and demonstrations.

Assessment

The course assessment will consist of the following:

	% of Grade	Comments
2 take-home tests	30	One test in early October, another at the end of the semester. Each will be closed book, closed notes and 1 hour in length.
Homework and in class assignments	35	
Project 	30	Exact details TBA, will entail a group project and two in-class presentations.
Class participation	5	

I will **not** use a curve to assign a grade, a 60 and higher is a pass, D = 60-69, C=70-79, B=80-89, A=90+. +/- grades will be given to numerical grades that fall at the borders between letter grades. (e.g., 89 =B+, 90=A-). The exact fine tuning will be decided at the end of the semester.

Late Policy

Unless there are mitigating circumstances, assignments will be due at specified dates. Any work handed in late will have the grade reduced by 10% for each part of a day late, up to 50% off.

Students with Disabilities

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Students with disabilities will need to also contact Disability Support Services in the Ley Student Center.