PH 331 Syllabus
Winter 2015

Instructor: Tom Giebultowicz  Office: Weniger 424  Phone: 737-1707  email: giebultt@onid.orst.edu
Office Hours: MW 10:30-12:00; T 11.00 – 12:30;  R 12:15-11:30, WNGR 300

Class meeting hours: TR 13:00 – 13:50 am
Labs meet in Wngr 204. There are four lab sections:
T 14:00-15:50; T 16:00-17:50; R 14:00-15:50; R 16:00-17:50
Lab TA: Subin Sahu (sahus@onid.oregonstate.edu)

Website: http://www.science.oregonstate.edu/~tgiebult/COURSES/ph331/

FINAL EXAM: Tuesday, March 17th, 2015 from 18:00 to 19:50 – venue TBA
Website: http://www.physics.oregonstate.edu/~tgiebult/COURSES/ph331/
Labs meet in Wngr 204.

Principal Objectives

The PH332 “Light, Vision and Colors” is one of the Oregon State University’s Baccalaureate Core (Bacc Core) Courses. Their principal objective is to instill in students the abilities to:

1. Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
2. Analyze the role of science and technology in shaping diverse fields of study over time.
3. Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.

Specific aims in the Ph332 Course are given below in the Section “Specific aims”.

SPECIFIC AIMS AND GENERAL INFORMATION FOR PH 332

Baccalaureate Core:
This course is part of the baccalaureate core and fulfills the synthesis requirement for study related to science, technology and society. This course will require students to analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines, analyze the role of science and technology in
shaping diverse fields of study over time, and articulate in writing a critical perspective on issues involving science,
technology, and society using evidence as support.

**Student learning outcomes:**
After completing the course, the students will be able to define sound, hearing, music, velocity or speed, mass, force,
pressure, density, periodic motion, simple harmonic motion (SHM), linear restoring force, amplitude, period, frequency,
phase angle, resonance, damping, the speed of sound in air, The Principle of Superposition, constructive and destructive
interference, diffraction, refraction, reflection, beats, The Doppler Effect, ultrasound, infrasound, Mersenne's Laws, standing
waves on strings and in air columns, nodes and anti-nodes, fundamental frequency, harmonics, bowing, action, edge tones,
reed tones, register key, Fourier Theorem, Fourier Analysis, waveforms, spectrum, timbre, envelopes, inharmonics,
formants, Faraday's Law of Induction, Lorentz Force, analog vs. digital, microphones, transducers, analog and
digital storage, numbering systems, bits, sampling rate, Nyquist Theorem, resolution, speakers, frequency range of hearing,
frequency just noticeable difference (JND), limit of frequency discrimination (LFD), sound intensity, sound intensity level,
change in sound intensity level, thresholds, loudness level, Fletcher-Munson Curves, reverberation time, focusing and
dispersal, absorption, absorption coefficient, Pythagoras, Pythagorean Theorem, diatonic scale, Music of the Spheres,
Pythagorean Intervals, open vs. closed temperaments, Pythagorean temperament (open) and equal temperament (closed);
solve numerical and symbolic problems which involve frequency and period; speed, frequency and wavelength; amplitude;
sine, square and triangle waves; average frequency and beat frequency; length, linear mass density, tension, fundamental and
harmonics of stringed instruments; fundamental and harmonics of wind instruments; graphical superposition of two waves;
waveform and spectral analysis; converting numbers from base ten to base two and vice versa; sampling rate and the Nyquist
Theorem; digital resolution; sound intensity, sound intensity level and change in sound intensity level; reverberation time,
total absorption and absorption coefficients; Pythagorean and equal temperaments.

**Prerequisites:** None. However, a basic understanding of algebra, logarithms, exponents and trigonometry is necessary.

**Required Texts:** *The Physics of Sound* (3rd edition) by Berg and Stork (Prentice-Hall, 2005) and *Physics 331 Laboratory
Manual*.

**Laboratory:** Original work is required. **Read the lab instructions before coming to lab.** Lab reports are due by the end of
lab, unless the lab TA indicates otherwise.

**Help Room:** Physics TAs will hold their office hours in the Help Room, Weniger 145. A schedule is posted on the door of
the room. You are also welcome to stop by the instructors office at any time.

**Exams:** There will be a midterm and a final. The final will be comprehensive, i.e. it will cover the entire course. The midterm
will be given at the date and time shown in the course outline. The final will be given at the date and time shown in the
Schedule of Classes for winter term. Exams are closed book and closed notes. A formula sheet will be provided by the
instructor for each exam, so you do not need to memorize any formulas. **Please arrive to the exam room five to ten
minutes early and bring a calculator that has trigonometric (sine, cosine and tangent), logarithm and exponential
function keys.**

**Term Paper:** You will write a three-to-five page paper (typed, double-spaced) on one of the following topics (or a different
one approved by the instructor): *Music of the Spheres, Sound Recording, Sound Reproduction, Architectural Acoustics,
Whispering Rooms, Noise Pollution, Synthesized Music, Acoustics in Medicine, Echolocation, Cavitation,
Sonoluminescence, Seismic Waves, Midi Technology, Digital Distortion, Theremin, Pythagorean Scale.* You will
submit a rough draft two weeks before the final draft is due. The instructor will read it and provide useful feedback. It's
important for you to submit a rough draft for feedback before writing the final version of your paper.

**Academic Integrity:** All students are expected to uphold the highest standards of honesty and integrity in their academic
work. **All graded work is to be done on an individual basis.** Any incidence of academic dishonesty will be dealt with in
accordance with OSU policies.

**Students with Disabilities:** Students with **documented** disabilities who need special accommodations should make an
appointment with the instructor as soon as possible to discuss the accommodations.

**Final Grades:** Your final grade will be computed as follows: Midterm 20%, Final 40%, Term Paper 20% and Lab Reports
20%.

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<td>Ch. 12 and 13</td>
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