PY 231
THE PHYSICS IN MUSIC
Professor B. Lee Roberts
Spring 2016
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http://physics.bu.edu/py231/

Prof. Roberts’ Office: PRB 373, (3 Cummington Street)
Office phone number: 617-353-2187  The PY231 Lab in PRB is room 156.

Office Hours: By appointment. I am willing to answer brief questions just after class. You are welcome to phone 617-353-2187, or send email (preferred) to see if I am available at some other time if just after class doesn’t work. More detailed discussions can be scheduled by appointment. During the course of the term, you will have at least two, and probably three conferences with Prof. Roberts to discuss your project.

Teaching Fellows: None


Grade Your grade will be determined from the three tests (total 40%), the homework/discussion (15%), the final exam (20%) and the project (25%).

Tests and the Exam There will be three tests during the term, February ?, March ?, April?. The final examination is scheduled on May ?, at the time that the Registrar assigns to the Tuesday-Thursday 9:30 – 11:00 time slot. pm. The project is due by 5:00 pm on at the end of reading period, May 2nd, and can be submitted electronically.

Goal of the Course: This course is for students who are musicians and want to learn about the physics that is involved in producing musical sounds. We will also study some of the psychophysical phenomena associated with the perception of musical sound. Room acoustics will also be discussed.

No previous knowledge of physics is assumed, but a working knowledge of musical terms will be assumed. In addition to the three hours of lecture and demonstrations, we have a 50 minute discussion section on Thursday. Discussion will be devoted to the homework, and to a broader discussion of the material presented in lecture.

We will try to discuss much of the material in Hall’s book, so please keep up in the reading. You are expected to read all the “Exercises and Projects” at the end of each chapter. You will be asked to hand in some of these. You should think about all of them.

Reserve Books: A number of books will be on reserve for this course (venue to be determined).
In addition to tests and a final exam, each student is required to do a project on some aspect of musical acoustics. This project should be on a topic of special interest to you and should help you to focus all the course material onto one area and give you deeper insight into musical acoustics.

We have a MacIntosh-based analysis programs (Electroacoustics Toolbox, Audacity) at our disposal, as well as a number of other standard laboratory instruments. We can measure the resonant frequencies of wind instruments, analyze sounds in the laboratory, or we can analyze music (wav) files which you have recorded elsewhere.

Some project topics from previous years have been: “A Research and Analysis of the Clarinet’s Harmonics,” “The Acoustics of Melodic Percussion Instruments,” “The Effect of Striking Point on the Partials Produced by a String,” “Trombones: Red Brass vs. Yellow Brass,” “Just Noticeable Difference for Frequency Change,” “The Spectrum of French Horn Tones,” “Measurement of Critical Band and Limit of Discrimination,” “The Harmonica”. The projects combine acoustical measurements with a paper. The point is to make acoustical measurements with the intent to explain or discover some effect, e.g. the difference in tone produced by a trombone of red brass with one of yellow brass, etc. It is crucial that your results are carefully presented. You should first define the problem or issue to be studied, tell what measurements were done, giving any background on what has been done before. Your results should then be presented along with a discussion of how they agree/disagree with any measurements in the literature, and then you should summarize your conclusions.

Needless to say, standard rules of term paper writing apply to the write-up. It should include an introduction which motivates what is to follow and which states the underlying thesis, a central body and a conclusion. Sources must be properly referenced with footnotes and/or a bibliography at the end. It is assumed that in addition to the lab work that the topic will be carefully researched.