

Sound and Music

V85.0010

Tuesday, Thursday 12:30-1:45, Meyer Room 121

Fall 2009

Prof. H.H. Stroke
Meyer 631
henry.stroke@nyu.edu
Office hours: to be arranged

TA/Grader James Beacham
Meyer 621
Phone: (212) 998-1308
jbb334@nyu.edu
Homepage: <http://physics.nyu.edu/~jbb334/>

Text: none assigned

Very diverse (often quite negative) reactions have been expressed by students in the past to the selected textbooks (marked by an * in the reference list). Some of these will be put on reserve at Bobst. In 2008 we tried not to assign any text, and relied heavily on the Web site listed at the end of the references. About 3/4 of the class found this to be quite satisfactory, so we continue. The **Web site** marked with a ** is particularly useful for this course: it allows you to go into many details that may not be covered in class.

Classroom demonstrations

Lectures will be supplemented by demonstrations. **Questions relating to them will appear on the quizzes.**

Homework

Although minimal mathematics is assumed (and some will be reviewed), **this is a serious physics course!** Quantitative problems will be assigned. Homework is due in the Physics Office (Mr. Le Page) by 4:30 PM on the Thursday following the week in which the problems are assigned. No late homework will be accepted without a medical or the course instructor's excuse.

Optional term paper (based on Cornell system)

Title-due date 29 October

One-page proposal, including 5-10 sources, due date 12 November

Final paper: sent to henry.stroke@nyu.edu in PDF or Word format, **no later than 8 December**

References: books, articles, Web information, cite author, journal, volume, date; for books, also title, publisher, place, year, pages.

Oral presentations of 10 minutes maximum will be scheduled on 10 and 15 December.

Extra credit will be received for satisfactory *and timely* papers.

Examinations and grades

There are two scheduled quizzes (25% each) and a cumulative final (35%). Homework (15%).

FINAL EXAMINATION: Thursday 17 December, 12-1:50, Room Meyer 121.

Quizzes will contain material from discussed subjects, classroom demonstrations, and homework problems.

There will be no make-up exams. A medical, or instructor, excuse is required for missed exams.

A sheet containing formulae will be provided for the exams.

Questions, Help

Please ask questions during lectures! Do not hesitate to ask for help, either from me, or the TA. Do not be timid: if there is something that you don't understand, chances are that many other students have the same problem. *If there is some aspect of the pace, content, structure of the course that you don't like, or any other feedback, please let me know as soon as possible. The end-of-semester evaluations benefit future students, not you!*

2009 Tentative schedule - may vary according to classroom work

Week	Dates	Subjects
1	Tues 8 Sept	Physics of music-basics of motion needed to understand sound waves and tones made by musical instruments. Equations, graphs. Time and place, how fast we go and direction. Force, mass, pressure. Energy, power
	Thurs 10 Sept	Vibrating systems-Periodic (simple harmonic) motion. Amplitude, period, frequency, phase. Springs, pendulums
2	Tues 15 Sept Thurs 17 Sept	Waves and wave properties. Longitudinal, transverse waves. Wavelength. Reflection, echo, interference, diffraction. Speed of sound. Doppler effect Continuation
3	Tues 22 Sept Thurs 24 Sept	Resonance. Swinging and falling bridges. Standing waves (to be applied later in discussion of musical instruments) Continuation
4	Tues 29 Sept Thurs 1 Oct	Hearing. Ear. Powers of numbers, logarithms, decibels. How much sound do we get for the extra spending? Sound pressure, intensity, loudness levels, equal loudness curves (phons); loudness (sones). We don't hear 100 violins 100 times the loudness of one!
5	Tues 6 Oct Thurs 8 Oct	Continuation QUIZ 1
6	Tues 13 Oct Thurs 15 Oct	Pitch, discrimination, place theory, neural processing, timber Combination tones, beats, consonance, harmony. Some funny things about what we hear. Critical bands
7	Tues 20 Oct Thurs 22 Oct	Musical scales, intervals, temperament, cent scale. Sounds we like to hear Fourier analysis, harmonic content, synthesis
8	Tues 27 Oct Thurs 29 Oct	String instruments: finally some real applications! Vibrato, tremolo (compare to FM and AM radio). Resonances, bowing, plucking. Wolf tones Brass (trumpet), woodwind (clarinet, recorder, flute), percussion (tympani, xylophone, celeste), modes of vibration; reeds, edge tones, organ
9	Tues 3 Nov Thurs 5 Nov	Continuation keyboard instruments: piano, piano tuning; harpsichord
10	Tues 10 Nov Thurs 12 Nov	QUIZ 2 Voice, singing, effect of medium
11	Tues 17 Nov Thurs 19 Nov	Basics of electricity and magnetism - some new concepts Filters, amplifiers, distortion, oscillators; Theremin
12	Tues 24 Nov	Transducers. Microphones, loudspeakers; impedance matching
13	Tues 1 Dec Thurs 3 Dec	Digital and analogue recording: phonograph (old), CD, tape. Binary system of numbers. Reproduction Sound systems, hi-fi, equalization
14	Tues 8 Dec Thurs 10 Dec	Auditorium acoustics, reverberation, dispersion, absorption. Some recent designs Noise and environment. Sound proofing. Presentations I
15	Tues 15 Dec	Presentations II. Review
END	Thurs 17 Dec	FINAL EXAMINATION, 12:00-1:50, ROOM 121 MEYER