NIU Course Syllabus for Physics 180

ACOUSTICS, MUSIC AND HEARING
CTP

Spring Semester, 2016, Tuesdays and Thursdays, 9:30 pm-10:45 pm

Course Description:

Elementary study of acoustics designed especially for students with an interest in music, speech and hearing, the theatre, or sound recording. Topics include the waves and vibrations, perception and measurement of sound, acoustics of musical instruments, speech and singing, and the acoustics of rooms. No pre- or co-requisites required. Credit hours: 3 credits. Contact hours: 3.0. Lecture hours: 3.0.(There are 3 lab activities, 1 hour 15 minutes each, as a part of engagement components). Method of delivery: Hybrid of traditional and non-traditional.

Course Transformation Project (CTP): *This section is a Course Transformation Project (CTP) course intended to promote higher-level learning with increased levels of student engagement. A major component of this course is experiential learning where you will be leading the learning and the professor serves as a facilitator.*

As part of the CTP course experience, you have to be present in-class to do the experiential activities. We cover a great deal of information in each module, and I use the class lectures to emphasize key areas that you should study. You may notice that within the schedule, there are some days you will not be required to come to class. *YOU MUST ALWAYS COME TO CLASS UNLESS THE SYLLABUS OR CALENDAR SAYS OTHERWISE OR YOU RECEIVE INSTRUCTIONS OTHERWISE.*

Course Goals:

1. Develop logical, objective, and critical thinking with scientific method using physical science topics.
2. Develop the awareness of relationship between physics and everyday life.
3. Develop basic quantitative analysis skills and methods.

Student Learning Outcomes: Upon successful completion of the course, students will be able to explain, analyze and/or predict:

- A basic, working knowledge of the physics of force, velocity, energy, vibration, elasticity and simple harmonic motion and how they apply to the properties of sound waves.
- The mechanics of various types of sound waves - what they look like, how they are produced by instruments, interact with other sound waves, and propagate through various materials. The physics of waves - interference, refraction, diffraction, dispersion, standing waves, frequency spectrum
- How sound is detected and perceived by the human ear and brain beginning with pressure variations
- The basics of sound making and detection equipment and room acoustics.

Remarks: ***PHYS 181 Lab course is not required to pass this PHYS 180 course even though it is closely related.*** It is independent to this course in terms of credits. However, some programs/departments may elect PHYS 181 as required. Please check with your own department. And, PHYS 181 requires this PHYS 180 to register.

The *most* ***Essential*** in this class is ***COMMUNICATION & PARTICIPATION!***

Class room: La Tourette Hall 200, 6 classes will be held in Faraday Hall 105 lab.

Instructor: Yasuo Ito. La Tourette 218
Tel: 815-753-6397, -8027
e-mail: yito@niu.edu (*Preferred method of communication*)
UG assistant: Elaina Zintl (z1698425@students.niu.edu)
Office Hours: Tuesdays and Thursdays 2:00 - 3:00pm; Other hours by an appointment.

Textbook/Materials: ***ESSENTIALS***

- ***Why You Hear What You Hear,*** Eric J. Heller, Princeton

Please read your textbook before coming to the class!!

Small group session: ***The small group session*** *is either held in a lab or in the classroom. The group* ***will be assigned with a contract with each members*** *in the second week of the course.* ***This is your group, and we would like to keep this group until the end of the semester.*** *For the classroom session, you will be assign a topic or problem, which requires preliminary reading of textbook, webpages, and/or some excercises. Each group member will be assigned some role in the group. Your particiaption to the group will be self-evaluated by your group member, and become a part of your grade.*

Recommended textbooks:

"***The Science of Sound****, 3rd edition*", by T. Rossing, F.R. Moore & P.A. Wheeler (Addison-Wesley2002).

Other helpful reference textbooks:

"Physics in the Arts", 2nd edition P.U.P.A. Gilbert, W. Haeberli

"*Introduction to Sound, acoustics for the Hearing and Speech Sciences, 3rd edition*" by C.E. Speaks.

Comments: "Physics in the Arts" is very concise textbook while "Science of Sound" is very informative and can be used as a reference book. I used both of these textbook in my past classes. Information of many lecture slides is mostly coming from these textbooks.

Blackboard web course: The lecture viewgraphs (Power Point files), homework assignments and their solutions will be posted on the Blackboard web course. Therefore, it is essential for you to familiarize with the Blackboard web course.

Tests and Grading (tentative)**:**

5% Attendance. Attendance is ***MANDATORY***. Since this is a CTP course, it is ***critical*** for you to attend ***all of*** the ***small group*** activity classes. Your absence is directly impacting the effectiveness of learning of your team member.

Students must attend at least 85% of required classes (except for the small group sessions). *Attendance will be taken in a form of attendance sheets at the first 20 minutes of each class and/or conceptual quizzes.*

A student will receive attendance points if the student attends more than or equal to 85% of the course (25 out of 30 classes), according to the attendance rate. *Perfect attendance will receive extra credit points.* Students will not receive attendance points if he/she misses 6 - 9 classes. Students will receive ***Negative*** attendance points ***if he/she misses small group session*** or ***classes more than 9 classes*** (-1/class). **This rule will be only applied to "Unexcused absences" except for the small group sessions.**

Exception: Attendance of the first week will not be counted.

If you know your absence prior to the class, please let me know at that point. Otherwise, please email me within 2 days from your absent day(s). In case of medical absence, it is the best for you to present me a doctor's note when you contact me even though it is required.

15 % Small group activity assignments ***CRITICAL***

40% Homework ***ESSENTIAL!!*** Assigned problems, essays, and other forms of assignments. I expect you to submit all of the given assignments.

20% Midterm Exams February 25th and March 31st during the class hour.

20% Final Exam (comprehensive) **May 12th, 10 – 11:50 am**.

To pass this course, you must score at least **50%** on the homework **AND** at least **50%** overall.

Grading scale:

A ($90 \leq x$), A- ($85 \leq x < 90$), B+ ($80 \leq x < 85$), B ($75 \leq x < 80$), B- ($70 \leq x < 75$), C+ ($65 \leq x < 70$), C ($55 \leq x < 65$), D ($50 \leq x < 55$), F ($x < 50$).

Grade points (assigned by University):

A (4.00), A- (3.67), B+ (3.33), B (3.00), B- (2.67), C+ (2.33), C (2.00), D (1.00), F (0.00).

There will be makeup tests available if you have a time conflict on the above exam schedule. Please obtain written approval (email is fine) from me ***1 week prior to the exam***. If you cannot take tests due to your medical conditions/illness, please a note from Health Services or your physician (doctor). If you cannot take tests due to unexpected incidents, please send me a note to explain the situation.

COMMUNICATION IS ESSENTIAL!!!

Extra credits:

Part of points for the correct answers of the above conceptual quizzes may be added as extra credits. Other form of extra credit assignments may also be given such as essays, problem solving etc.. *These Extra credit points are directly added to the raw scores of the final grading points described above.*

YOU MAY BE ASKED TO SHOW YOUR NIU PHOTO ID WHEN YOU TAKE EACH TEST. IF YOU DO NOT HAVE YOUR ID WITH YOU YOUR TEST WILL NOT BE GRADED

COURSE NOTEBOOK: Students are strongly encouraged to keep a Course Notebook of key materials that is brought to all lecture and recitation sessions. Materials include (must be current): Syllabus, lecture notes (printed from Blackboard with room to take notes), student's class notes, tests, class exercises.

WHAT TO BRING TO CLASS: Notebook, textbook, assignments, ***USB drive***, and calculator. Everyone ***must*** bring your own USB drive for the ***small group lab session***. At the end of the session, each group member must store the data you took during the class. Don't rely on your group members. I do not accept the excuse for not having data because of your group members.

COURSE POLICIES INCLUDE:

1. Be respectful of each other (this applies to Instructors, TA's and students). Some specifics include:
    a. No cell phone/ electronic device usage in class (except clickers, calculators). Cell/ smart phones must be turned off or silenced and placed in backpacks, etc. (not in pockets or on desks). Violators may be required to turn in their devices to the Instructor for the remainder of the class period.
    b. Read your newspapers before or after class
    c. No talking during class unless you are instructed to discuss.
    d. If you need to leave class early, let your Instructor know

2. Laptops/ notebooks may be used for lecture materials and taking notes only.

3. Be aware of the policies and procedures regarding your rights as well as responsibilities that are published in the NIU Student Code of Conduct. It is available on line at http://www.niu.edu/communitystandards/Student_Code_of_Conduct/NIUSCC_FINAL.pdf.

4. If you feel there was an error in the grading of a Test, submit a written request within 48 hours to the Instructor's mailbox in La Tourette 202. Your entire test will be re-graded and returned to you.

Accessibility Statement

If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.
Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let us know your needs, the sooner we can assist you in achieving your learning goals in this course.

(Tentative schedule: Currently tuning the details)

Week	Tuesdays	Thursdays
1	**1/19 Introduction**	**1/21 Meet Sir Isaac Newton!**
2	**1/26 What is sound? (Ch1)**	**1/28 Small Group session: What is wave?** (Ch. 2) (Group A and B)
3	**2/2 Wave Phenomena**	**2/4** Ch.1 **See the sound wave lab [Group 1 only]** – Read ch.6
4	**2/9 Application of acoustics to Forensic science (Dr. Coutrakon)**	**2/11 See the sound wave lab [Group 2 only]** – Read ch.6
5	**2/16 Harmonic motion and Sound** (Ch.3)	**2/18 Stretched string** (Ch. 8) (ch 15 2D modes)
6	**2/23 Review I**	**2/25** ***1st Midterm test***
7	**3/1 Spectrum and Fourier**	**3/3 Analyze the sound lab [Group 1 only]** [ch.3]
8	**3/8 Resonance** (Ch. 9, **10,** 13)	**3/10 Analyze the sound lab [Group 2 only]** [ch.3]
9	**3/15 Spring break!**	**3/17 Spring break!**
10	**3/22 String Instruments** (Ch. 18)	**3/24 Small group session: Musical Instruments and their performance**
11	**3/29 Review II**	**3/31** ***2nd Midterm test***
12	**4/5 Wind Instruments** (ch16), **(voice** (ch17))	**4/7 Small group session: Musical Instruments and their performance**
13	**4/12 Ear: Origin of Perception** (Ch.21, 22, 23, 24)	**4/14 Vegitable instrument? lab [Group 1 only]**
14	**4/19 Loudness** (Ch22)	**4/21 Vegitable instrument? lab [Grop 2 only]**
15	**4/26 Pitch Perception** (Ch.23)	**4/28 Timbre** (Ch.24)
16	**5/3 TBA**	**5/5 Review III** [All]
17	*No class (Finals week)*	**5/12** ***Final Exam*** (10 am – 11:50 am)