NIU Course Syllabus for Physics 180

ACOUSTICS, MUSIC AND HEARING

CTP

Fall Semester, 2013, Tuesday 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. 3 credits.

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 Objectives: Develop an understanding of:
• 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, a part of the class will be held in Faraday 105.

Instructor: Yasuo Ito. La Tourette 218 and/or 101 (Electron Microscopy Lab)
Tel: 815-753-6397, -8027
e-mail: yito@niu.edu

Office Hours: Tuesdays, Thursdays and Fridays 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 before the second week of the course. This will be your 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 exercises. Each group member will be assigned some role in the group. Your participation to the group will be self-evaluated by your group member, and become a part of your grade.

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.

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 (Tuesday classes and small group activity classes). Attendance may be checked as a form of attendance sheets and/or conceptual quizzes. 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 October 3rd and October 31st during the class hour. 20% Final Exam (comprehensive) December 12th, 10 – 11:50 am.

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

• Grading scales:
  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 I 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).

COMMUNICATION IS ESSENTIAL.

Extra credits:
Part of points for the correct answers of the above conceptual quizzes will be added as extra credits. Other form of extra credit assignments will also be given.

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, and calculator
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 online 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.

For disabled students:
“NIU abides by Section 504 of the Rehabilitation Act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate in providing accommodations you may need. If you have not already done so, you will need to register with the Center for Access-Ability Resources (CAAR), the designated office on campus to provide services and administer exams with accommodations for students with disabilities. The CAAR office is located on the 4th floor of the University Health Services building (815-753-1303). I look forward to talking with you soon to learn how I may be helpful in enhancing your academic success in this course.”
# Tentative Schedule

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<tr>
<th>Week</th>
<th>Tuesdays</th>
<th>Thursdays</th>
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<tr>
<td>1</td>
<td>8/27 Introduction</td>
<td>8/29 Meet Sir Issac Newton! [Group 1 and 2]</td>
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<tr>
<td>2</td>
<td>9/3 What is sound? (Ch1)</td>
<td>9/5 What is wave? (Ch. 2 ) (Group 1 and 2)</td>
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<td>3</td>
<td>9/10 Harmonic motion and Sound (Ch.3)</td>
<td>9/12 Ch.1 See the sound wave lab [Group 1 only] – Read ch.6</td>
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<td>4</td>
<td>9/17 Stretched string (Ch. 8) (ch 15 2D modes)</td>
<td>9/19 See the sound wave lab [Group 2 only] – Read ch.6</td>
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<td>5</td>
<td>9/24 Resonance (Ch. 9, 10, 13)</td>
<td>9/26 Violin and its performance (Mr. Yamada) (Ch. 18)</td>
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<td>6</td>
<td>10/1 Review I</td>
<td>10/3 1st Midterm test</td>
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<td>7</td>
<td>10/8 Spectrum and Fourier</td>
<td>10/10 Analyze the sound lab [Group 1 only] [ch.3]</td>
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<td>8</td>
<td>10/15 Impulse response (ch11, 12)</td>
<td>10/17 Analyze the sound lab [Group 2 only] [ch.3]</td>
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<td>9</td>
<td>10/22 Ear: Origin of Perception (Ch. 21, 22, 23, 24)</td>
<td>10/24 Small group session (problem-based learning)</td>
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<td>10</td>
<td>10/29 Review II</td>
<td>10/31 2nd Midterm test</td>
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<td>11</td>
<td>11/5 Wind Instruments (ch16), voice (ch17)</td>
<td>11/7 Vegetable instrument? lab [Group 1 only]</td>
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<td>12</td>
<td>11/12 Loudness (Ch22)</td>
<td>11/14 Vegetable instrument? lab [Grop 2 only]</td>
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<td>13</td>
<td>11/19 Pitch Perception (Ch.23)</td>
<td>11/21 Small group session (problem-based learning)</td>
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<td>14</td>
<td>11/26 Timbre (Ch.24)</td>
<td>11/28 Thanksgiving</td>
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<td>15</td>
<td>12/3 TBA</td>
<td>12/5 Review III [All]</td>
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<td>12/12 Final Exam</td>
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