Course Syllabus

Department: Science Technology

Date: Fall 2014

I. Course Prefix and Number: PHY105

   Course Name: Physics of Sound

   Credit Hours and Contact Hours: 4 credit hours, 5 contact hours

   Catalog Description including pre- and co-requisites: An introductory course in physics for students who have not had high school physics, designed for non-science majors. This is a required course for music majors as well as Music Recording Technology majors. Emphasizes: Scientific method, measurement, laboratory proficiency: and includes some selected topics from motion, waves, sound production and detection, musical instruments, standing waves as they relate to our daily lives. This fulfills the laboratory science requirements for non-science degrees.

   Prerequisite: MAT 095 with a grade of C+ or better or placement into Math Level 1 or higher.

   Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:

   This is a required course for music majors as well as Music Recording Technology majors. Appropriate for any non-science major such as Elementary Education, Business majors, or anyone who needs a general Laboratory Science course. Meets the SUNY Gen-Ed requirement for Natural Science.

II. Course Student Learning Outcomes:

   Students will:

   • Demonstrate an understanding of the methods scientists use to explore natural phenomena, specifically wave phenomena with an emphasis on sound waves, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis; and

   • Demonstrate application of scientific data, concepts, and models in the physical sciences, specifically, the Physical concepts associated with sound waves.

   • Interpret and draw inferences about Physics concepts from mathematical models such as formulas, graphs, tables and schematics;

   • Represent mathematical information symbolically, visually, numerically and verbally;

   • Employ quantitative methods such as, arithmetic, algebra, or geometry, to solve problems;
• Estimate and check mathematical results for reasonableness; and recognize the limits of mathematical and statistical methods as it applies in the process and completion of the Physics of sound laboratory exercises and data-taking activities.

• Identify, analyze, and evaluate sound wave laboratory results as they occur in their own or others’ work; and develop well-reasoned arguments and conclusions from the analysis of data taken during experiments.

• Perform the basic operations of personal computer use; use basic research techniques; and locate, evaluate and synthesize information from a variety of sources when creating and completing laboratory reports and research papers.

College Learning Outcomes Addressed by the Course:

- writing
- computer literacy
- oral communications
- ethics/values
- reading
- citizenship
- mathematics
- global concerns
- critical thinking
- information resources

III. Assessment Measures (Summarize how the college and student learning outcomes will be assessed):

<table>
<thead>
<tr>
<th>List identified College Learning Outcomes(s)</th>
<th>Specific assessment measure(s)</th>
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<tr>
<td>Writing</td>
<td>Students will</td>
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<td>- complete approximately 10 laboratory reports requiring extensive narrative regarding their observations and conclusions.</td>
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<td>- have the opportunity to revise or improve what they have written in order to improve their grades on the reports.</td>
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| Mathematics                                  | Student will                   |
|                                             | - make use of basic arithmetic and algebra in the completion of lab reports and/or quizzes, exams, projects |

| Critical Thinking                            | Students will                  |
|                                             | - complete laboratory reports in which they apply scientific reasoning and critical thinking skills to interpret and synthesize scientific data from a variety of sources. These reports will include hypothesis testing, mathematical analysis, graphing, cause and effect analysis, and experimental design. |

| Computer Literacy                            | Students will                  |
|                                             | - Use Microsoft office or equivalent to write-up lab reports and generate |
Students will:
- Complete and submit an end of semester written project and/or in-class presentation involving in-depth research about some sound wave topic using, as sources of information, our e-text, the library and/or internet.

IV. Instructional Materials and Methods

Types of Course Materials:

Textbook, Calculator, graph paper, online resources

Methods of Instruction (e.g. Lecture, Lab, Seminar …):

Lecture, Laboratory Exercises, Demonstrations, Seminar.

V. General Outline of Topics Covered:

- Learning the language.
  - The nature of science
  - The nature of sound
  - The measures of physics
- Waves and Vibrations
  - Simple harmonic motion, springs and pendulums
  - Waveforms, types and characteristics
  - Addition of two waves
  - Standing waves and resonances
- Sound
  - Production
  - Propagation: reflection, refraction, diffraction, interference
  - Sound effects: Doppler shifts, sonic booms, beats.
  - Sound intensity
- Complex waves
  - Synthesis of complex waves
  - (Fourier) analysis and creation of complex waves
  - Tone color
- The human ear and voice
  - Physiology
  - Perception of sound
  - Analysis of vocal sounds and speech.
- Instruments
  - Stringed instruments
  - Percussion instruments
- Flutes and Pipes
  - Reed instruments
- Temperaments
- Acoustics
- Electronic sound
  - Recording
  - Computers and CD’s
  - Synthesizers