CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

ACADEMIC SENATE

GENERAL EDUCATION COMMITTEE

REPORT TO

THE ACADEMIC SENATE

GE-112-156

PHY 1050L – Physics of Musical Sound Laboratory (GE Areas B1 and B3)

General Education Committee	Date: 06/29/2016
Executive Committee Received and Forwarded	Date: 08/17/2016
Academic Senate	Date: 08/31/2016 First Reading
	09/28/2016 Second Reading

BACKGROUND:

This is a new course seeking GE status. Its name under the quarter system is PHY 105L - Physics of Musical Sound Laboratory (1 unit). It will be offered as a 1-unit Laboratory course under the semester system.

RESOURCES CONSULTED:
Faculty
Department Chairs
Associate Deans
Deans
Office of Academic Programs

DISCUSSION:

The GE Committee reviewed the ECO for this course and found it to satisfy the GE Student Learning Outcomes and other requirements for GE Areas B1 and B3.

RECOMMENDATION:

The GE Committee recommends approval of GE-112-156, PHY 1050L – Physics of Musical Sound Laboratory for GE Areas B1 and B3.

PHY - 1050L - Physics of Musical Sound Laboratory

C. Course - New General Education* Updated

General Catalog Information

****READ BEFORE YOU BEGIN****

1. Import curriculum data from the Catalog by clicking on the following icon . It is a BEST PRACTICE to always import data on existing courses. This will limit the opportunity for data errors.
2. Turn the help text on by clicking on the following icon .
3. All fields with an asterisk (*) are required fields. If left blank, the request will not be launched and cannot be acted upon.
4. Run and attach an impact report by clicking to show all courses and programs impacted by this proposal.
5. Attach additional documentation by clicking .

College/Department	Physics and Astronomy
Semester Subject Area	PHY
Semester Catalog Number	1050L
Quarter Subject Area	PHY
Quarter Catalog Number	105L
Course Title	Physics of Musical Sound Laboratory
Units*	(1)
C/S Classification *	C-16 (Laboratory)

To view C/S Classification Long Description click: http://www.cpp.edu/~academic-programs/scheduling/Documents/Curriculum%20Guide/Appendix_C_CS_Classification.pdf

Component*	Laboratory
Instruction Mode*	Face-to-Face
Grading Basis*	Graded Only
Repeat Basis*	May be taken only once

If it may be taken multiple times, limit on number of enrollments	**1**
Cross Listed Course Subject Area and Catalog Nbr (if offered with another department)	
Dual Listed Course Subject Area and Catalog number (If offered as lower/upper division or ugrd/grad)	
Choose appropriate type (s) of course(s)*	☐ Major Course ☐ Service Course ☑ GE Course ☐ None of the above
General Education Area / Subarea*	**B3**

To view the General Education SubArea definitions, click http://www.cpp.edu/~academic-programs/scheduling/Documents/Ch.3-GeneralEducationProposals.pdf.

I. Catalog Description

Catalog Description	Laboratory to accompany PHY 1050. Experimental study of sound, music, and related physical phenomena.

II. Required Coursework and Background

Prerequisite(s)	Co-Requisite: PHY 1050

Corequisite(s)	
Pre or Corequisite (s)	
Concurrent	

III. Expected Outcomes

List the knowledge, skills, or abilities which students should possess upon completing the course.*	On successful completion of this course, students will be able to: 1. Measure the intensity, frequency, wavelength, and spectra of sounds in situations relevant to music.

2. Use measurement devices appropriately, record observations, determine the uncertainty in measured values, and compute derived quantities from data.
3. Communicate their results and interpretations in written and oral reports.
4. Describe, in qualitative terms, the physical conditions that need to be realized to demonstrate common acoustic effects like resonance and interference.

If this is a course for the major, describe how these outcomes relate to the mission, goals and objectives of the major program.

Explain how the course meets the description of the GE SubArea(s). Please select appropriate outcomes according to the GE Area/SLO mapping.

How the course meets the description of GE subarea B1: Acoustics is a branch of physics that combines fundamental principles (wave propagation, energy, interference, etc.) with technological applications, and biological relevance (hearing in most animals, echolocation in bats and whales), while being intrinsic to music and the performing arts. All key aspects of the physical theory of sound will be examined, and the biology of hearing will, by necessity, be covered, as the ears are the means by which the musical arts are experienced. As a course that presents fundamental physical science principles in a context of wide relevance to students' development of broader cultural appreciation, this course is fully in keeping with the objectives of general education.

How the course meets the description of GE subarea B3: Students in this class will learn to perform quantitative measurements of acoustic phenomena and relate those measurements to qualitative observations. Students will perform experiments on phenomena that may, in many cases, already be somewhat familiar, but will use those experiments to probe the phenomena on a deeper level than every day experience. The experiments will illustrate both fundamental physical phenomena and theories, and also the applications of those theories in everyday life and the arts.

Describe how these outcomes relate to the associated GE Learning Outcomes listed below.*

The course satisfies all of the expected Student Learning Outcomes for GE subareas B3:

Ia. Write effectively for various audiences.

Students will produce weekly written reports on experimental investigations of acoustic phenomena. The reports will receive written feedback from the instructor each week to help the students improve their writing skills over the course of the semester.

Ib. Speak effectively to various audiences.

Students will take turns giving short presentations on their results and interpretations at the end of each lab session, to learn from each other's findings before going home to write their reports. The instructor will provide feedback on these presentations, which students will give multiple times during the semester.

Id. Construct arguments based on sound evidence and reasoning to support an opinion or conclusion.

Students will explain how their laboratory data is (or isn't) consistent with the acoustic principle or phenomenon being studied in each experiment, and will explain how any errors identified in the results are (or aren't) consistent with the known sources of imprecision in their experimental procedure.

Ie. Apply and communicate quantitative arguments using equations and graphical representations of data.

Students will produce reports that include detailed data tables, the equations used to analyze the data in the tables, and (when appropriate) graphs that summarize their findings.

IIa. Apply scientific methods and models to draw quantitative and qualitative conclusions about the physical and natural world.

Students will compare their laboratory results with the predictions of acoustic theories. They will compare their results with known results (e.g. the fundamental frequency of a particular note, or the speed of sound in different media) and will compare their results with values known from previous, professional measurements.

General Education Outcomes*	**Ia. Write effectively for various audiences** **Ib. Speak effectively to various audiences.** **Id. Construct arguments based on sound evidence and reasoning to support an opinion or conclusion.** **Ie. Apply and communicate quantitative arguments using equations and graphical representations of data.** **IIa. Apply scientific methods and models to draw quantitative and qualitative conclusions about the physical and natural world.**

To view the mapping, click https://www.cpp.edu/~academic-programs/Documents/GE%20SLO%20Mapping.pdf

IV. Instructional Materials

Provide bibliography that includes texts that may be used as the primary source for instruction, and other appropriate reference materials to be used in instruction. The reference list should be current, arranged alphabetically by author and the materials should be listed in accepted bibliographic form.

Instructional Materials*	PHY 1050L lab manual.

Faculty are encouraged to make all materials accessible. Indicate with an asterisk those items that have had accessibility (ATI/Section 508) reviewed. For more information, http://www.cpp.edu/~accessibility

V. Minimum Student Material

List any materials, supplies, equipment, etc., which students must provide, such as notebooks, computers, internet access, special clothing or uniforms, safety equipment, lockers, sports equipment, etc. Note that materials that require the assessment of a fee may not be included unless the fee has been approved according to University procedures.

Minimum Student Material*
Computer (as needed)
Internet service
e-mail
calculator
Notebook
graph paper

VI. Minimum College Facilities

List the university facilities/equipment that will be required in order to offer this class, such as gymnastic equipment, special classroom, technological equipment, laboratories, etc.

Minimum College Facilities*	External Support

Library Services
Stockroom
Graphic Services
Information Technology (IT) Services
Classroom Management System (e.g. BB)
Copier

Physical Space & Major Equipment

laboratory with 12 stations and seating for 24 students
Laboratory equipment for producing and measuring sound and analyzing spectra, as well as equipment for studying simple harmonic oscillations in visual contexts.
Musical instruments

overhead screen
white board/dry erase markers
adjustable lighting

VII. Course Outline

Describe specifically what will be included in the course content. This should not be a repetition of the course description but an expansion that provides information on specific material to be included in the class, e.g. lecture topics, skills to be taught, etc. This should not be a week-by-week guide unless all instructors are expected to follow that schedule.

Course Outline*

Course elements are organized around experiments that investigate the following topics:

- Oscillatory motion
- Relating qualitative and quantitative aspects of sound: The relationship between pitch and frequency, the relationship between wavelength and pitch, and the relationship between power, decibels, and perceived loudness.
- Standing waves
- Spectral measurements and their relationship to the pitch of a sound.
- Perception of sound by the human ear
- Characteristics of human voices
- Reverberation and room acoustics
- Acoustic properties of common musical instruments
- The output of digital musical instruments
- Simple electronics relevant to music

VIII. Instructional Methods

Describe the type(s) of method(s) that are required or recommended for the instruction of this course (lectures, demonstrations, etc.). Include any method that is essential to the course, such as the use of particular tools or software.

Instructional Methods*
Lecture
problem-solving
discussion
small group activities
peer instruction
laboratory exercises/hands on practice
Experimentation
writing a laboratory report

IX. Evaluation of Outcomes

Describe the methods to be used to evaluate students' learning, i.e. written exams, term papers, projects, participation, quizzes, attendance, etc.*

Students will be evaluated on the basis of 3 types of assignments:
1) Pre-lab quizzes: Students will take quizzes at the beginning of each lab session. These quizzes will cover the principles that will be investigated in the day's experiment, as well as key aspects of the procedure and data analysis (which students will be assigned to read about prior to the day's experiment).

2) Class presentations: Students will take turns giving short presentations to the class on their data at the end of each lab session. The purpose of these presentations will be for groups to compare their results and interpretations prior to writing reports. Instructors will provide feedback on presentations.

3) Written lab reports: Students will write a report on each week's experiment, summarizing the experimental methods used, their quantitative data, their process for analyzing their data, and their findings.

Describe the meaningful writing assignments to be included.*

Meaningful writing assignments: Students will produce weekly lab reports (typically 2 pages). Lab reports will describe the experimental procedure, results (including tables and graphs as appropriate), analysis of data, and interpretation of data. Expectations for the quality of the written work will rise during the course of the semester, as students will be expected to improve in response to feedback. These lab reports will be subject to written critiques and feedback by the instructor and, when feasible and appropriate, peers.

Discuss how these methods may be used to address the course and program outcomes, as appropriate. Include or attach a matrix to align the evaluation methods to the outcomes.*

Student Learning Outcomes	Pre-lab quizzes	Class presentations	Written Lab Reports
Course SLO 1: Measure the intensity, frequency, wavelength, and spectra of sounds in situations relevant to music.	X	X	X
Course SLO 2: Use measurement devices appropriately, record observations, determine the uncertainty in measured values, and compute derived quantities from data.		X	X
Course SLO 3: Communicate their		X	X

results and interpretations in written and oral reports.			
Course SLO 4: Describe, in qualitative terms, the physical conditions that need to be realized to demonstrate common acoustic effects like resonance and interference.	X		X

Course SLO 1: Measure the intensity, frequency, wavelength, and spectra of sounds in situations relevant to music. Students will perform acoustic measurements on a weekly basis. They will be quizzed on the principles underlying these analyses before starting the experiment (to incentivize preparation), they will present preliminary interpretations to the class at the end of lab sessions, and they will present detailed written analyses in weekly lab reports.

- **Course SLO 2: Use measurement devices appropriately, record observations, determine the uncertainty in measured values, and compute derived quantities from data.** Students will summarize their measurements and observations in detailed weekly written reports as well as preliminary oral reports. They will also be quizzed on the basic principles of their measurement devices (including methods for estimating uncertainty) prior to the beginning of each experiment, to incentivize preparation.
- **Course SLO 3: Communicate their results and interpretations in written and oral reports.** Students will take turns giving oral presentations on preliminary results and interpretations, and will produce weekly written reports.
- **Course SLO 4: Describe, in qualitative terms, the physical conditions that need to be realized to demonstrate common acoustic effects like resonance and interference.** Students will write lab reports in which they describe the steps and manipulations that were necessary in order to achieve the acoustic effects being studied in the week's experiment.

If this is a general education course, discuss how these methods may be used to address the associated GE Learning Outcomes listed below. Include or attach a matrix to align the

Student Learning Outcomes			
	Pre-lab quizzes	**Class presentations**	**Written**

evaluation methods to the outcomes.*

			Lab Reports
GE SLO I a: Write effectively for various audiences.			X
GE SLO Ib: Speak effectively to various audiences.		X	
GE SLO Id: Construct arguments based on sound evidence and reasoning to support an opinion or conclusion.		X	X
GE SLO Ie: Apply and communicate quantitative arguments using equations and graphical representations of data.			X
GE SLO IIa: Apply scientific methods and models to draw quantitative and qualitative conclusions about the physical and natural world.	X		X

- **GE SLO I a: Write effectively for various audiences**. Students will produce weekly written lab reports.
- **GE SLO Ib: Speak effectively to various audiences.** Students will take turns giving oral presentations on preliminary results and interpretations at the end of each lab session.
- **GE SLO Id: Construct arguments based on sound evidence and reasoning to support an opinion or conclusion.** Students will produce lab reports in which they assess whether experimental data is consistent with the principles being studied, and will explain in their reports which features of their data are (or aren't) consistent with the principles being studied, and how their interpretation is affected by the strengths and limitations of their measuring devices.
- **GE SLO Ie: Apply and communicate quantitative arguments using equations and graphical representations of data.** Students will produce reports in which the interpretation of their data is in large part quantitative, will explain which equations they used for their analysis, and will produce graphs (when appropriate) to summarize their data.
- **GE SLO IIa. Apply scientific methods and models to draw quantitative and qualitative conclusions about the physical and natural world:** Students will write reports in which they

	explain how their measurements are (or aren't) consistent with models and principles from the science of acoustics.

X. This OPTIONAL Section is for describing Course/Department/College specific requirements.

Department/ College Required ECO Information (Optional)	