CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

ACADEMIC SENATE

GENERAL EDUCATION COMMITTEE

REPORT TO

THE ACADEMIC SENATE

GE-120-156

PHY 1510L – Newtonian Mechanics Laboratory (GE Area 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 revisioned course seeking GE status. It is based on two quarter system courses: PHY 131L (GE area B3) and PHY 132L (not a GE course). 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 Area B3.

RECOMMENDATION:

The GE Committee recommends approval of GE-120-156, PHY 1510L – Newtonian Mechanics Laboratory for GE Area B3.

PHY - 1510L - Newtonian Mechanics 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	1510L
Quarter Subject Area	PHY
Quarter Catalog Number	131L, 132L
Course Title	Newtonian Mechanics 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 1510. Experiments in Newtonian mechanics.

II. Required Coursework and Background

Prerequisite(s)	

Corequisite(s)	Co-requisite: PHY 1510
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: • Apply the principles of Newtonian mechanics to the analysis and interpretation of experimental data.

- Use measurement devices appropriately, record observations, determine the uncertainty in measured values, and compute derived quantities from data.
- Communicate their results and interpretations in written and oral reports.

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

Outcomes of this course will build student capacity in each of the following areas as defined by programmatic objectives for the general physics option in physics major.

PO 3. Experimental and Technological Skills

SLO 3a: Students will be able to set up and troubleshoot components of experimental and/or computational tools in order to perform a measurement or simulation of a physically relevant quantity or phenomenon.

SLO 3b: Students will be able to quantitatively describe the limitations of their experimental apparatus or algorithm, and use information on those limitations to determine uncertainties in measured quantities or precision of computed quantities.

SLO 3c: Students will be able to analyze experimental or simulation data and compare the results of the data analysis with predictions from physical theories.

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

Newtonian mechanics is foundational to the natural sciences and engineering, and the basic measurement and data analysis skills taught in this lab are integral to quantitative investigation in most or all natural science fields. The emphasis of this course is testing foundational concepts from a lecture course using measurements that are simple in their principle of operation but require careful quantitative reasoning to interpret. The basic operation of, for instance, a stop watch used to time the motion of an object, is not complicated, but translating a series of time and distance measurements into a graph that can be usefully analyzed to test principles of Newtonian mechanics may require the performance of a few intermediate calculation steps. Likewise, the determination of the uncertainty in even a simple measurement can be conceptually challenging, despite the simplicity of operating a stop watch or similarly elementary device. Those conceptual challenges, however, are closely analogous to the challenges in determining the uncertainty in more sophisticated measurements in a wide variety of scientific fields.

Describe how these outcomes relate to the associated GE Learning

Ia. Write effectively for various audiences.

Outcomes listed below.*	Students will produce weekly written reports on experimental investigations of physical phenomena. The reports will be written for a technically literate audience, and 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 physical theory 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 physical theories. When the data is of suitable quality, they will use their data to infer physical quantities (e.g. the acceleration of gravity, the density of an object, the viscosity of a liquid) 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 1510L Laboratory 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*

Access to a computer with spreadsheet and word processing software
Internet access to access the course website
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
overhead screen
white board/dry erase markers
adjustable lighting
balances

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 these specific topics:

- Measurements and Uncertainty

- Constant Acceleration Motion
- Vector Properties of Forces
- The Atwood Machine
- Dynamics of Uniform Circular Motion
- Conservation Laws
- Static Equilibrium
- Rotational Dynamics
- Simple Harmonic Motion
- Specific Gravity and Archimedes' Principle

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*

small group activities
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 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). 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: Apply the principles of Newtonian physics to the analysis and interpretation of experimental data.	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 results and interpretations in written and oral reports.		X	X

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 evaluation methods to the outcomes.*

Student Learning Outcomes	Pre-lab quizzes	Class presentations	Written Lab Reports
GE SLO I a: Write effectively for various audiences.			X
GE SLO Ib: Speak effectively to various audiences.		X	
GE SLO I c: Construct arguments based on sound evidence and		X	X

reasoning to support an opinion or conclusion.			
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

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

Department/ College Required ECO Information (Optional)	