PHSC M01L: PRINCIPLES OF PHYSICAL SCIENCE LABORATORY

Originator
ereese

Co-Contributor(s)

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College
Moorpark College

Discipline (CB01A)
PHSC - Physical Science

Course Number (CB01B)
M01L

Course Title (CB02)
Principles of Physical Science Laboratory

Banner/Short Title
Principles of Phy Sci Lab

Credit Type
Credit

Start Term
Spring 2021

Catalog Course Description
Examines some of the basic phenomena in physics, chemistry, and astronomy. Applies common, modern laboratory instruments, in hands-on experiments. Teaches the principles of data taking, reduction, synthesis, and analysis, in addition to the writing of scientific reports.

Taxonomy of Programs (TOP) Code (CB03)
1901.00 - Physical Sciences, General

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
Will not be required

Grading method
Letter Graded

Alternate grading methods
Student Option- Letter/Pass
Pass/No Pass Grading

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture

Activity

Laboratory
Minimum Contact/In-Class Laboratory Hours
52.5
Maximum Contact/In-Class Laboratory Hours
52.5

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
52.5
Total Maximum Contact/In-Class Hours
52.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
52.5
Total Maximum Student Learning Hours
52.5

Minimum Units (CB07)
1
Maximum Units (CB06)
1

Prerequisites
PHSC M01 or concurrent enrollment

Entrance Skills

Entrance Skills
PHSC M01

Prerequisite Course Objectives
PHSC M01-develop working knowlege to recognize, recall, and apply the simplified equations that describe physical phenomena involving mechanics, thermodynamics, electricity and magnetism, optics, modern physics, chemical bonds and reactions, and the solar system.
PHSC M01-develop working knowlege to analyze and solve simple problems in physics and chemistry.
PHSC M01-develop working knowlege to evaluate and judge the results of physics and chemistry problems.
PHSC M01-develop working knowledge to recall fundamental facts regarding physics, chemistry, and the solar system.

Requisite Justification

Requisite Type
Prerequisite

Requisite
PHSC M01

Requisite Description
Course not in a sequence

Level of Scrutiny/Justification
Content review

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	discern between relevant and irrelevant evidence, formulate appropriate hypotheses, and distinguish between experiments to determine which one(s) leads to an appropriate conclusion.
2	understand the scientific method and use the different parts to study the physical world.
3	relate the concepts of hypothesis, theory, and law within the context of science.
4	solve basic problems from physics, chemistry, and astronomy
5	relate the concepts of displacement, position, velocity, speed, and acceleration to the motion of objects and properly interpret speed versus time and distance versus time graphs.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	assemble and perform experiments in basic physics, chemistry, and astronomy, following instructions in the laboratory manual.
2	measure and record the data, including estimated uncertainty, using appropriate units.
3	reduce and analyze data, calculate experimental uncertainties, produce and analyze graphs, summarize the experiment and its results using an appropriate technical writing style
4	critically evaluate the experimental results and procedures using accepted values and other relevant information, and draw conclusions regarding the efficacy of the experimental procedure.
5	suggest changes to the experimental procedure which, if implemented, could reduce the experimental uncertainty and/or error.
6	suggest practical applications for the values measured, conclusions reached, or methods utilized in the experiment.

Course Content

Lecture/Course Content
N/A

Laboratory or Activity Content

- **4% - Lab Safety**
- **8% - Reaction Time**
  - Measurement systems
  - Uncertainty and significant figures
  - Scientific Notation
  - Conversion factors
  - Dimensional analysis
  - Percent concepts
- **8% - An Electrifying Experience (part 2)**
  - Measuring resistances, voltages, and currents
    - in parallel circuits
    - in series circuits
    - in combination
- **8% - Good Chemistry**
  - Classify matter as elements, mixtures, compounds
  - Describe the chemical properties of each
  - Examine during chemical reactions the energy changes, chemical reactivity, and chemical bonding
  - The speed of sound and the speed of light

  - Summarizing the electromagnetic spectrum
  - Sources of laser light and their interactions with other matter
- **8% - Sound**
  - Describe the differences between transverse and longitudinal waves
  - Analyze the properties of sound and it's relationship between frequency, wavelength, and velocity
  - Evaluate the relationship between sound intensity and decibel level
- **8% - Model Rockets**
  - Explain concepts of momentum and forces on rocket flight
  - Describe the flight of the rocket and the chemicals used as a propellant
- **8% - An Electrifying Experience (part 1)**
  - Demonstrate electric charge and how it is transferred in a circuit
  - Distinguish electric current, resistance and (AC and DC) voltage
- **8% - Chemical Mystery**
  - Correctly analyzing the chemical composition of various unknowns
  - Use the results to determine the types of unknowns
- **8% - Hot Stuff**
  - Phases of matter and associated phase change
  - Nature of heat transfer (radiation, convection, and conduction) and thermal energy
  - Conservation of energy and conversion from one form to another
- **8% - Staying Afloat**
  - Analyzing density of various materials
  - Explain how action and reaction forces of buoyancy interact
  - Work and mechanical energy
  - Forms of energy including thermal, nuclear, electric, magnetic, chemical, and solar
- **8% - Mechanical Advantage**
  - Studying the relationship between work, net force, and mechanical energy
- **8% - Right On Target**
  - Studying motion of objects as related through the concepts of displacement, position, velocity, speed, and acceleration
  - Proper interpretation of speed versus time graphs and distance versus time graphs
  - Explain how action and reaction forces are related to each other
- **8% - How High Is It**
  - Studying motion of objects as related through the concepts of displacement, position, velocity, speed, and acceleration
  - Proper interpretation of speed versus time graphs and distance versus time graphs

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Skills demonstrations
Written expression

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Classroom Discussion
Computational homework
Essay exams
Group projects
Individual projects
Laboratory activities
Laboratory reports
Oral analysis/critiques
Objective exams
Oral presentations
Projects
Problem-solving exams
Participation
Quizzes
Reports/Papers/Journals
Reports/papers
Research papers
Skills demonstrations
Skill tests or practical examinations

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Collaborative group work
Class activities
Class discussions
Distance Education
Demonstrations
Field trips
Group discussions
Guest speakers
Laboratory activities
Lecture
Practica
Small group activities

Describe specific examples of the methods the instructor will use:

- For each lab activity the instructor will:
  - explain the applicable theory and background information;
  - explain the use of technology and instrumentation as appropriate; and
  - demonstrate the data collection and analysis techniques as appropriate.

Representative Course Assignments

Writing Assignments

- Answer concept questions from the laboratory activity. An example would be: Define the terms pH, total dissolved solids, solubility, hardness, and alkalinity and then explain how each of these parameters is measured and the associated uncertainty in those measurements.
- Prepare formal laboratory reports which conform to the technical paper style specified by the instructor. An example would be the "Chemical Mystery Lab" to identify an unknown element that would include a lab report with an abstract, data presentation, detailed analysis and conclusion.

Critical Thinking Assignments

- Analyze the data collected from a laboratory experiment, evaluate the experimental results, determine whether or not the objectives of the experiment were met, and suggest improvements for the lab.
- Apply concepts learned to perform a detailed analysis. For example, perform a chemical mystery logic tree experiment by using the following tests solubility, ppt, acidity, vinegar test, tincture of iodine, alcohol, and phenolphthalein, and then identify of the unknown chemical based on the test results.

Reading Assignments

- Read the relevant sections of the course laboratory manual and/or handouts distributed by the instructor to prepare for the weekly experimental work.
- Conduct library or internet research to further explore concepts discussed in class. For example, research a different analytical method for identification and quantification of a particular environmental pollutant and write a summary of that new procedure.

Skills Demonstrations

- Demonstrate the use of Mettler analytical balance to determine mass of reactants and products to determine percentage yield.
- Demonstrate how to use the calipers to precisely measure a length and determine the associated uncertainty in that measurement.

Other assignments (if applicable)

N/A

Outside Assignments

Representative Outside Assignments

N/A

Articulation

C-ID Descriptor Number
PHYS 140 (with PHSC M01)

Status
Approved

Additional C-ID Descriptor(s)

C-ID Descriptor(s)	Status
CHEM 140 (with PHSC M01)	Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
CSU San Marcos	GES 110	Activities in Physical Science	1
CSU Monterey Bay	PHYS 121L	Integrated Physical Science laboratory	1

Comparable Courses within the VCCCD
PHSC R170 - Concepts in Physical Science
PHSC V01 - Concepts in Physical Science

District General Education

A. Natural Sciences

A2. Physical Science
Approved

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable
Yes

CSU Baccalaureate List effective term:
Fall 1995

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

B3 Laboratory Activity
Approved

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

Area F: Ethnic Studies

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

UC TCA

UC TCA
Approved

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 5C: Laboratory Science
Approved

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Manual

Description
Laboratory manuals are typically developed on-site:
Harper, Clinton. *Physics M01A Lab Manual* (Ver 2.8.4). Sunshine Publishing, 2017.

Resource Type
Manual

Description
Hewitt, Paul G., John A. Suchocki, and Leslie A. Hewitt. *Laboratory Manual for Conceptual Physical Science.* 6th ed., Pearson, 2016.

Resource Type
Manual

Description
Tillery, Bill. *Lab Manual for Physical Science.* 12th ed., McGraw-Hill, 2019.

Library Resources

Assignments requiring library resources
None.

Sufficient Library Resources exist
Yes

Distance Education Addendum

Definitions

Distance Education Modalities
Hybrid (51%–99% online)
Hybrid (1%–50% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.
Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.
Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	The instructor will post a problem relevant to concepts covered in the Physical Science M01L class which can be solved using 2 or 3 different methods. The instructor will then invite the students to comment on each methodology in terms of the application of the appropriate physics problem-solving techniques and suggest ways to improve the solutions to the posed problem.
E-mail	The instructor will email students with announcements about the course or an upcoming event. Students, in turn, may email the instructor with their questions or concerns. Depending on the situation, the students may also email their assignments or projects directly to the instructor, instead of posting it on the class web page.
Face to Face (by student request; cannot be required)	Students will have the option to meet the instructor in his/her office on campus in a classroom to work on problem-solving exercises in the presence of the instructor to get one-on-one help from the instructor. Also, the students may want to meet the instructor to have a face-to-face discussion about an issue of concern.
Other DE (e.g., recorded lectures)	The instructor may record the lectures and post them for students to view within a specified time frame to be ready for the accompanying problem-solving assignments.
Synchronous Dialog (e.g., online chat)	The instructor may be available on a certain day or days of the week within a certain time frame to help students and answer their questions via an online chat. This would be the equivalent of on-line office hours.
Telephone	The instructor may provide a phone number to the students where they can leave a voicemail and expect a call back within 24 hours.
Video Conferencing	The instructor may be available on a certain day or days of the week within a certain time frame to help students and answer their questions via live video conferencing. This would be the equivalent of on-line office hours. Also, the instructor may choose to present a lecture to the students via video conferencing.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
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100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	The instructor will post a problem relevant to concepts covered in the Physical Science M01L class which can be solved using 2 or 3 different methods. The instructor will then invite the students to comment on each methodology in terms of the application of the appropriate physics problem-solving techniques and suggest ways to improve the solutions to the posed problem.
E-mail	The instructor will email students with announcements about the course or an upcoming event. Students, in turn, may email the instructor with their questions or concerns. Depending on the situation, the students may also email their assignments or projects directly to the instructor, instead of posting it on the class web page.
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Examinations

Hybrid (1%–50% online) Modality
Online
On campus

Hybrid (51%–99% online) Modality
Online
On campus

Primary Minimum Qualification
PHYSICAL SCIENCES

Review and Approval Dates

Department Chair
07/29/2020

Dean
07/29/2020

Technical Review
09/03/2020

Curriculum Committee
09/15/2020

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
11/05/2020

Control Number
CCC000432958

DOE/accreditation approval date
MM/DD/YYYY