PHYS M10BL: GENERAL PHYSICS II LABORATORY

Originator
htaouk

Co-Contributor(s)

Name(s)
Reese, Erik (ereese)

College
Moorpark College

Discipline (CB01A)
PHYS - Physics

Course Number (CB01B)
M10BL

Course Title (CB02)
General Physics II Laboratory

Banner/Short Title
General Physics II Laboratory

Credit Type
Credit

Start Term
Spring 2021

Catalog Course Description
Examines the basic real-world phenomena in electromagnetism, optics, and modern physics. Applies common modern laboratory instruments in hands-on experiments. Teaches and relates the principles of data taking, reduction, synthesis, and analysis, in addition to the writing of scientific reports using appropriate units and significant figures.

Taxonomy of Programs (TOP) Code (CB03)
1902.00 - Physics, 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
(L) Letter Graded

Alternate grading methods
(O) Student Option- Letter/Pass
(P) 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
PHYS M10AL and PHYS M10B or concurrent enrollment

Entrance Skills

Prerequisite Course Objectives
PHYS M10AL-assemble and perform experiments in mechanics, thermodynamics, and wave-motion.
PHYS M10AL-measure and record the data, including estimated uncertainty, using appropriate units.
PHYS M10AL-reduce and analyze data, calculate experimental uncertainties, produce and analyze graphs, and summarize the experiment and its results using an appropriate technical writing style.
PHYS M10AL-critically evaluate the experimental results and procedures using accepted values and other relevant information and draw conclusions regarding the efficacy of the experimental procedure.
PHYS M10AL-suggest changes to the experimental procedure which, if implemented, could reduce the experimental uncertainty and/or error.
PHYS M10AL-suggest practical applications for the values measured, conclusions reached, or methods utilized in the experiment.
PHYS M10B-analyze simple static charge distributions and calculate the resulting electric field and electric potential.
PHYS M10B-analyze simple current distributions and calculate the resulting magnetic field.
PHYS M10B-predict the trajectory of charged particles in uniform electric and magnetic fields.
PHYS M10B-analyze DC circuits in terms of current, potential difference, and power dissipation for each element.
PHYS M10B-analyze basic situations involving reflection and refraction, and use this analysis to predict the path of a light ray.
PHYS M10B-analyze situations involving interference and diffraction of light waves and apply these to situations including double slits, diffraction gratings, and wide slits.
PHYS M10B-understand the limitations of classical physics and begin to develop an awareness of the importance of modern physics (i.e., quantum theory and special relativity) in the natural world.
PHYS M10B-recognize, recall and apply the equations that describe physical phenomena involving electromagnetism, optics, modern physics, and relativity.
PHYS M10B-demonstrate the ability to analyze, solve, evaluate and judge the results of the solutions of physics problems of greater than average complexity.

Requisite Justification

Requisite Type
Prerequisite

Requisite
PHYS M10AL

Requisite Description
Course in a sequence

Level of Scrutiny/Justification
Closely related lecture/laboratory course

Requisite Type
Corequisite

Requisite
PHYS M10B

Requisite Description
Course in a sequence

Level of Scrutiny/Justification
Closely related lecture/laboratory course

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	analyze electrical and modern physics systems.
3	understand the scientific method and use the different parts to study the physical world.
4	recognize intermediate concepts and the essence of problems involving electricity, magnetism, and modern physics.
5	apply intermediate principles to solve problems involving electricity, magnetism, and modern physics.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	assemble and perform experiments in electromagnetism, optics, and modern physics following instructions in the laboratory manual.
2	measure, record and analyze real-world experimental data, including appropriate use of units and significant figures.
3	reduce and analyze data, calculate experimental uncertainties, produce and analyze graphs, and summarize the experiment and its results using an appropriate technical writing style.
4	critically evaluate and relate the results of experimental data and procedures using accepted values and other relevant information and draw conclusions regarding the efficacy of the experimental procedure as discussed in the lecture portion of the class.
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

- 2% - Measurement, Uncertainty, and Uncertainty propagation
- 7% - Equipotential and Electric Field Plotting
- 7% - Ohm's Law and Potentials
- 7% - D.C. Circuits (Series and Parallel)
- 7% - The Oscilloscope

- 7% - Capacitance
- 7% - RC Circuits
- 7% - Speed of Light
- 7% - Lenses, Mirrors and Eyes
- 7% - Measuring the Index of Refraction
- 7% - Young's Double Slit
- 7% - Diffraction of Light
- 7% - Polarization of Light
- 7% - Emission Spectroscopy of Hydrogen
- 7% - Absorption of Radiation

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

Instructional Methodology

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

Audio-visual presentations
Computer-aided presentations
Collaborative group work
Class activities
Class discussions
Distance Education
Demonstrations
Group discussions
Guest speakers
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Internet research
Laboratory activities
Lecture
Practica
Small group activities

Describe specific examples of the methods the instructor will use:

For each lab activity the instructor will:

- review the theory underlying the experiment,
- demonstrate the use of instruments and the related technology,

- provide guidance to the proper data collection and analysis techniques, and
- warn of pitfalls in the wrong use of the equipment or in the data collection.

Representative Course Assignments

Writing Assignments

- Prepare formal laboratory reports which conform to the technical paper style as guided by the instructor. An example is an analysis of resistors in series and parallel, including an abstract, data presentation, detailed analysis, and conclusion.
- Write conclusions and analyses in informal laboratory reports using an appropriate technical language style, and respond to questions that require an essay or a brief written answer.

Critical Thinking Assignments

- Suggest changes in the experimental procedure which could lower the experimental uncertainty of the results. For example, explain how we could make more accurate measurements of the permeability of free space with the current balance.
- Use applicable theory and laws to predict the behavior of a system and/or design a new system. For example, design an electric circuit consisting of at least 5 resistors in series and parallel combination and determine the potential difference across each resistor theoretically. Build the circuit on a breadboard, measure the voltage differences and compare the measured and calculated values and corresponding percent errors.

Reading Assignments

- Read the relevant sections of the laboratory manual and/or handouts to prepare for the weekly experimental work and make any necessary theoretical calculations.
- Research how the concepts applied in the labs of this course apply to real-word examples by using library resources (both physical and online) and other credible sources. For example, apply physical principles and experimental techniques developed for interference and diffraction to model the multi-colored pattern seen on soap bubbles and oil slicks.

Skills Demonstrations

- Setup the digital oscilloscope to automatically measure and display the peak-to-peak voltage, the frequency, and the period of a sinusoidal signal generated by a function generator.
- Show how to realize a resistive circuit diagram on a breadboard, and how to use the bench instruments to measure the voltage difference across and the current through a given circuit element.

Other assignments (if applicable)

None

Outside Assignments

Representative Outside Assignments

- Analyze the collected data and interpret plots, to report results and answer the question of whether the data are consistent with theory or not in your formal lab report.
- Complete the lab report computations, plots, analysis, and write-up, and research examples of real-world applications. For example explain how the shape of speakers for concerts at large venues relates to interference and diffraction concepts explored in the lab.

Articulation

C-ID Descriptor Number

PHYS 110 (with PHYS M10B)

Status

Approved

Additional C-ID Descriptor(s)

C-ID Descriptor(s)	Status
PHYS 100S (with PHYS M10A+M10AL+M10B)	Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
Sonoma State	PHYS 209B	General Physics Laboratory	1
CSU San Bernardino	PHYS 2500L	General Physics Lab	1
CSU Northridge	PHYS 100BL	General Physics II Laboratory	1

Comparable Courses within the VCCCD

PHYS R102L - College Physics 2 Laboratory
PHYS V02BL - General Physics II Laboratory: Algebra/Trigonometry-Based

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:
F1995

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 M10B Lab Manual* (Ver 1.3.2). Sunshine Publishing, 2014.

Resource Type
Manual

Description
Loyd, David, *Physics Laboratory Manual*, 4th ed., Cengage, 2014.

Resource Type
Manual

Description
Wilson, Jerry, and Cecilia Hernandez-Hall, *Physics Laboratory Experiments*, 8th ed., Cengage, 2015.

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)	Students may be required to post their ideas or solutions for class-related material on the course discussion boards. Students may also be required to comment on the posts of other students, including constructive criticism.
E-mail	Instructor may email students with announcements about the course or other college events and opportunities and answer student questions. Students may email questions and possibly assignments or projects, depending on the nature of the class, directly to the instructor.
Face to Face (by student request; cannot be required)	Students may have the option to visit the instructor in their office on campus for office hours or to discuss other class-related items.
Other DE (e.g., recorded lectures)	Instructor may use other instruction methods appropriate to the subject matter. For example, pre-recorded lectures may be posted perhaps leading to a class discussion on the discussion boards.
Synchronous Dialog (e.g., online chat)	Instructor may hold class in a regular schedule but in an online format using a program such as ConferZoom. Office hours may also be held in this manner or with an online chat tool.
Telephone	Students may have the option to call the instructor and/or the instructor may call students to facilitate office hours or to discuss other class-related items.
Video Conferencing	Instructor may hold class in a regular schedule but in an online format using a program such as ConferZoom. Office hours may also be held in this manner.

Hybrid (51%–99% online) Modality:

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Telephone	Students may have the option to call the instructor and/or the instructor may call students to facilitate office hours or to discuss other class-related items.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students may be required to post their ideas or solutions for class-related material on the course discussion boards. Students may also be required to comment on the posts of other students, including constructive criticism.
E-mail	Instructor may email students with announcements about the course or other college events and opportunities and answer student questions. Students may email questions and possibly assignments or projects, depending on the nature of the class, directly to the instructor.
Face to Face (by student request; cannot be required)	Instructor may email students with announcements about the course or other college events and opportunities and answer student questions. Students may email questions and possibly assignments or projects, depending on the nature of the class, directly to the instructor.
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Examinations

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

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

Primary Minimum Qualification
PHYSICS/ASTRONOMY

Review and Approval Dates

Department Chair
9/29/2020

Dean
9/29/2020

Technical Review
10/15/2020

Curriculum Committee
10/20/2020

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
11/18/2020

Control Number
CCC000435069

DOE/accreditation approval date
MM/DD/YYYY