PHYS M10B: GENERAL PHYSICS II

Originator
htaouk

Co-Contributor(s)

Name(s)
Reese, Erik (ereese)

College
Moorpark College

Discipline (CB01A)
PHYS - Physics

Course Number (CB01B)
M10B

Course Title (CB02)
General Physics II

Banner/Short Title
General Physics II

Credit Type
Credit

Start Term
Spring 2021

Catalog Course Description
Introduces electricity, magnetism, direct-current circuits, optics, and modern physics. Uses trigonometry to develop the subject matter. Examines topics such as geometric optics, physical optics, relativity, quantum physics, and nuclear physics.

Additional Catalog Notes
Designed for students who need a trigonometry based physics course.
Course Credit Limitations: UC (PHYS M10A/B combined with PHYS M20A/B/C: maximum credit, one series)

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
Minimum Contact/In-Class Lecture Hours
70
Maximum Contact/In-Class Lecture Hours
70

Activity

Laboratory

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
70
Total Maximum Contact/In-Class Hours
70

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
140
Maximum Outside-of-Class Hours
140

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
210
Total Maximum Student Learning Hours
210

Minimum Units (CB07)
4
Maximum Units (CB06)
4

Prerequisites
PHYS M10A

Entrance Skills

Prerequisite Course Objectives

PHYS M10A-demonstrate ability to analyze, synthesize physics problems of reasonable complexity and evaluate and judge the results of the solutions to these problems.
PHYS M10A-demonstrate ability to analyze and solve physics problems of greater than average complexity.
PHYS M10A-recognize, recall, and apply the equations that describe physical phenomena involving mechanics, thermodynamics, and wave motion. Demonstrate ability to analyze and solve physics problems of at least average complexity.

Requisite Justification

Requisite Type
Prerequisite

Requisite
PHYS M10A

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) lead to an appropriate conclusion.
2	analyze electrical and modern physics systems.
3	apply 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	analyze simple static charge distributions and calculate the resulting electric field and electric potential.
2	analyze simple current distributions and calculate the resulting magnetic field.
3	predict the trajectory of charged particles in uniform electric and magnetic fields.
4	analyze DC circuits in terms of current, potential difference, and power dissipation for each element.
5	analyze basic situations involving reflection and refraction, and use this analysis to predict the path of a light ray.
6	analyze situations involving interference and diffraction of light waves and apply these to situations including double slits, diffraction gratings, and wide slits.
7	explore 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.
8	recognize, recall and apply the equations that describe physical phenomena involving electromagnetism, optics, modern physics, and relativity.
9	demonstrate the ability to analyze, solve, evaluate and judge the results of the solutions of physics problems of greater than average complexity.

Course Content

Lecture/Course Content

- **14% - Electrostatics**
  - Electric charge
  - Electric field and electric field lines
  - Coulomb's Law, electric force
  - Conductors in electrostatic equilibrium
  - Gauss's Law for electric fields
  - Motion of a point charge in a uniform electric field
  - Electric potential energy
  - Electric potential and equipotential surfaces
  - Capacitors, dielectrics
  - Capacitors in series, parallel, and combinations
  - Energy stored in a capacitor
- **10% - Nuclear Physics**
  - Nuclear structure and the nuclear force
  - Nuclear stability and binding energy
  - Radioactivity
  - Radioactive decay rates and half-life
  - Induced nuclear reactions

    - Nuclear reactions and elementary particles
    - Nuclear fission
    - Nuclear fusion
    - Beta decay and the neutrino
    - Fundamental forces and exchange particles
    - Elementary particles
    - The quark model
    - Force unification theories and the early universe
- **10% - Quantum Physics**
    - Quantization: Plank's hypothesis
    - Blackbody radiation
    - Quanta of light: photons and the photoelectric effect
    - Quantum "particles": Compton scattering
    - Spectroscopy and early models of the atom
    - The Bohr model of the hydrogen atom; atomic energy levels
    - Lasers
    - Quantum mechanics and atomic physics
    - Matter waves: the de Broglie hypothesis
    - The Schrodinger wave equation
    - Atomic quantum numbers and the periodic table
    - The Heisenberg uncertainty principle
    - Particles and antiparticles
- **10% - Relativity**
    - Classical relativity
    - The Michelson-Morley experiment
    - Postulates of relativity, simultaneity, and ideal observers
    - Time dilation and length contraction
    - Velocities in different reference frames
    - Relativistic kinetic energy, momentum
    - Total energy, and mass-energy equivalence
- **10% - Physical Optics**
    - The wave nature of Light
    - Constructive and destructive interference
    - Young's double slit experiment
    - Thin-film interference
    - Gratings
    - Diffraction and Huygens's principle
    - Diffraction by a single slit
    - Diffraction and resolution of optical instruments
    - Polarization
    - Atmospheric scattering of light
- **10% - Geometric Optics**
    - Waves, rays, and Huygens's principle
    - The laws of reflection and refraction, Snell's Law
    - Total internal reflection and Brewster's angle
    - Dispersion, fiber optics
    - Plane mirrors and spherical mirrors
    - Thin lenses
    - The formation of images through reflection or refraction
    - Lenses in combination, microscopes, telescopes
    - The human eye
    - Diffraction and resolution
    - Color
- **10% - Alternating Current**
    - Sinusoidal currents and voltages
    - Utility power and electricity in the home
    - Resistors, capacitors, and inductors in AC circuits

- Phasors
- LC, RC, RLC, series, and parallel circuits
- Resonance in an RLC circuit, quality, and bandwidth
- Converting AC to DC and filters
- Transformers

- **14% - Magnetism and Electromagnetic Induction**
  - Magnetic fields
  - Magnetic force on a moving charge and resulting motion
  - Charged particles in crossed electric and magnetic fields
  - Magnetic force on a current-carrying wire
  - Torque on a current loop
  - Magnetic field due to an electric current
  - Ampere's Law
  - Magnetic materials
  - Motional emf and electric generators
  - Faraday's Law
  - Lenz's Law and back emf in motors
  - Eddy currents
  - Mutual and self-inductance
  - LR circuits
- **12% - Electric Current and Circuits**
  - Electric current
  - EMF and circuits
  - Resistance and resistivity
  - Kirchhoff's loop and junction rules
  - Series and parallel circuits
  - Ammeters and voltmeters
  - Power and energy in circuits
  - RC circuits
  - Electrical safety

Laboratory or Activity Content

Not Applicable.

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
Oral analysis/critiques
Objective exams
Oral presentations
Problem-solving exams
Quizzes
Reports/papers
Research papers
Skills demonstrations

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
Lecture
Small group activities

Describe specific examples of the methods the instructor will use:

Instructor will use audiovisual presentations, demonstrations, animations and simulations to explain difficult concepts underlying the content of this course. The instructor will reinforce these concepts by working example problems and engaging the students in learning activities. Students interest in the subject will be stimulated by relating its principles to applications relevant to their daily lives and individual areas of interests.

Representative Course Assignments

Writing Assignments

- Research and write a short report comparing and contrasting refracting and reflecting telescopes. What are the advantages and disadvantages of each?
- Analyze concepts as they apply to real life situations. Example: "If the magnetic fields produced by the x-, y-, and z-coils in an MRI imaging machine are changed too rapidly, the patient may experience twitching or tingling sensations. What do you think might be the cause of these sensations? Why does the much stronger static field not cause twitching or tingling?"

Critical Thinking Assignments

- Model real world examples with physics concepts. For example, when you rub a balloon on your hair, it acquires a negative charge. If you bring it near an electrically neutral soda can lying on its side on a table, the can will roll towards the balloon and follows its motion. The balloon will even stick to a wall or ceiling. Write a concise argument explaining why electrically neutral objects are attracted to the electrically charged balloon.
- Apply relevant physics and mathematical concepts to physics problems. For example, in a MRI scanner, the main superconducting solenoid is 1.8 m long and 30 cm in radius. During normal operation, the current through the windings is 100 A, the resistance of the winding is zero, and the magnetic field magnitude is 1.5 T. (a) What is its inductance? (b) The magnet is started by connecting the solenoid to a power supply. It takes 8.0 min for the current to go from zero to 100 A. What is the EMF of the power supply?

Reading Assignments

- Study the assigned textbook readings as outlined in the syllabus, download and review the posted lecture notes, and complete related assignments and quizzes.
- Read the technical briefs that illustrate how physics principles are used in real-life applications. For an example, as an application of Farady's Law of induction, read the ground fault interrupter and the magnetoencephalogram briefs.

Skills Demonstrations

- Demonstrate problem solving skills by applying relevant concepts in physics and mathematics.
- Demonstrate the ability to work as a team by working on problems in groups and presenting to the class concepts related to Faraday's Law.

Other assignments (if applicable)

None.

Outside Assignments

Representative Outside Assignments

- Solve a variety of physics problems that apply the newly learned principles. Each topic covered will have associated problems that involve some intermediate to advanced problems requiring the application of multiple concepts in a single example.
- Multiple choice chapter quizzes are posted online for the students to take whenever they are ready to further test their understanding of the materials.
- Research real world examples that apply physics principles. For example, how does Faraday's Law relate to credit cards?

Articulation

C-ID Descriptor Number
PHYS 110 (with PHYS M10BL)

Status
Approved

Additional C-ID Descriptor(s)

C-ID Descriptor(s)	Status
PHYS 100S (with PHYS M10A+M10AL+M10BL)	Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
CSU, Northridge	PHYS 100B	General Physics II	3
San Francisco State	PHYS 121	General Physics II	3
Sonoma State	PHYS 210B	General Physics	3

Comparable Courses within the VCCCD
PHYS R102 - College Physics 2
PHYS V02B - General Physics II: 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

B1 Physical Science
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 5A: Physical Science
Approved

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Classic Textbook
No

Description
Giambattista, Alan. *Physics*. 5th ed., McGraw-Hill, 2020.

Resource Type
Textbook

Classic Textbook
No

Description
Serway, Raymond, and Chris Vuille. *College Physics.* 11th ed., Cengage, 2017.

Resource Type
Textbook

Classic Textbook
No

Description

Urone, Paul, and Roger Hinrichs. *College Physics*. OpenStax, 2020, http://openstax.org/details/books/college-physics. Accessed 15 October 2020.

Library Resources

Assignments requiring library resources

Use the Library's print and online databases specializing in science, such as Elsevier ScienceDirect to research current topics in physics.

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Research, using the Library's online databases, a real world example that apply physics principles. For example, describe the physics behind PET or MRI imaging and share this information with the class via presentation, report, an article, or other method.

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 Physics 10B 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. The instructor may also require students to be present on-line for a certain number of hours per week and have a dialogue with one another; for example, a student may post a question about solving a problem and other students will try to answer his/her question.
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. Students will upload their assignments to the course webpage to be graded by the instructor.
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. The instructor may also require students to be present on-line during certain hours of the week and have a dialogue with one another; for example, a student may post a question about solving a problem and other students will try to answer his/her question. This would be a live discussion session.
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.

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100% online Modality:

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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
CCC000430274

DOE/accreditation approval date
MM/DD/YYYY