# PHYS M01: DESCRIPTIVE PHYSICS

**Originator**
ereese

**College**
Moorpark College

**Discipline (CB01A)**
PHYS - Physics

**Course Number (CB01B)**
M01

**Course Title (CB02)**
Descriptive Physics

**Banner/Short Title**
Descriptive Physics

**Credit Type**
Credit

**Start Term**
Spring 2021

**Catalog Course Description**
Introduces the basic principles of Newtonian mechanics, thermodynamics, wave motion, electromagnetism, optics, and modern physics. Examines topics such as kinematics, atomic nature of matter, relativity, and nuclear physics.

**Additional Catalog Notes**
This class is designed for students who have not previously taken a physics class.
Course Credit Limitations: UC (no credit if taken after PHYS M10A or PHYS M20A)

**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**
52.5
**Maximum Contact/In-Class Lecture Hours**
52.5

**Activity**

**Laboratory**

## 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**
**Minimum Outside-of-Class Hours**
105
**Maximum Outside-of-Class Hours**
105

## Total Student Learning

**Total Student Learning**
**Total Minimum Student Learning Hours**
157.5
**Total Maximum Student Learning Hours**
157.5

**Minimum Units (CB07)**
3
**Maximum Units (CB06)**
3

**Prerequisites**
MATH M03 or MATH M03B

## Entrance Skills

**Prerequisite Course Objectives**
MATH M03-solve linear and literal equations for a specified variable.
MATH M03-solve absolute value equations and absolute value inequalities.
MATH M03-determine if a relation is a function using the vertical line test and identify the domain.
MATH M03-graph linear equations and test whether two lines are parallel, perpendicular, or neither.
MATH M03-write the equation of a line in point-slope form, slope-intercept form, and standard form.
MATH M03-solve a system of equations in three variables by substitution or by the elimination method and solve applications.
MATH M03-factor polynomials including the sum and difference of cubes.
MATH M03-evaluate polynomial functions and solve polynomial equations by factoring and using the zero factor property.
MATH M03-simplify rational expressions, perform operations with rational expressions, simplify complex fractions, and determine the domain of a simple rational function.
MATH M03-divide by a polynomial using long division.
MATH M03-solve equations containing rational expressions and applications.
MATH M03-simplify rational exponent expressions using the properties of exponents and convert to radical notation.
MATH M03-put radical expressions into simplest radical form, perform operations with radicals, solve equations containing radical expressions, and determine domain of a simple radical function.
MATH M03-add, subtract, multiply and divide complex numbers.
MATH M03-solve quadratic equations by each of the following methods where applicable: factoring, the square root method, completing the square, and the quadratic formula.
MATH M03-solve equations that are in quadratic form and solve quadratic equations involving radicals and substitution.
MATH M03-solve non-linear inequalities in one variable.
MATH M03-graph quadratic functions showing the vertex and intercepts.
MATH M03-find the sum, difference, product, quotient, and composition of two functions.
MATH M03-identify one-to-one functions and use the horizontal line test to determine whether or not a function is one-to-one, and find the inverse of a one-to-one function.
MATH M03-describe the relationship between the function and its inverse geometrically and algebraically.
MATH M03-graph exponential and logarithmic functions, and convert equations from exponential form to logarithmic form and vice versa.

MATH M03-use logarithmic properties to rewrite logarithmic expressions and solve logarithmic and exponential equations and related applications.
MATH M03B-simplify rational exponent expressions using the properties of exponents and convert to radical notation.
MATH M03B-put radical expressions into simplest radical form, perform operations with radicals and solve equations containing radical expressions.
MATH M03B-add, subtract, multiply and divide complex numbers.
MATH M03B-solve quadratic equations by each of the following methods where applicable: factoring, the square root method, completing the square, and the quadratic formula.
MATH M03B-solve equations that are in quadratic form and solve quadratic equations involving radicals and substitution.
MATH M03B-solve quadratic inequalities in one variable.
MATH M03B-graph quadratic functions showing the vertex and intercepts.
MATH M03B-find the sum, difference, product, quotient, and composition of two functions.
MATH M03B-identify one-to-one functions and use the horizontal line test to determine whether or not a function is one-to-one.
MATH M03B-find the equation of the inverse of a one-to-one function.
MATH M03B-describe the relationship between the function and its inverse geometrically and algebraically.
MATH M03B-graph exponential functions and logarithmic functions.
MATH M03B-convert equations from exponential form to logarithmic form and vice versa.
MATH M03B-use logarithmic properties to rewrite logarithmic expressions.
MATH M03B-solve logarithmic and exponential equations and related applications.
MATH M03B-find the length and midpoint of a line segment.
MATH M03B-write the equation for a circle using its center and radius and sketch its graph.
MATH M03B-write the equation for an ellipse and for a hyperbola centered at the origin and sketch its graph. (optional*)

## Requisite Justification

**Requisite Type**

Prerequisite

**Requisite**

MATH M03 or M03B

**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 | apply the scientific method and use the different parts to study the physical world. |
| 3 | apply intermediate principles to solve problems involving kinematics, force, energy, momentum, waves, and thermodynamics. |

**Course Objectives**

| | Upon satisfactory completion of the course, students will be able to: |
|---|---|
| 1 | recognize, recall, and apply the simplified equations that describe physical phenomena involving mechanics, thermodynamics, wave motion, electromagnetism, optics, and modern physics. |
| 2 | demonstrate ability to solve elementary physics problems. |
| 3 | demonstrate ability to analyze and synthesize physics problems of elementary complexity and evaluate and judge the results of the solutions to these problems. |

## Course Content

**Lecture/Course Content**

- **20% - Part 1:  Mechanics**
  - Kinematics
  - Newton's laws
  - Energy and momentum
  - Rotational motion
- **10% - Part 2: Properties of Matter**
  - Atomic nature of matter
  - Solids, liquids, and gases
- **15% - Part 3: Heat**
  - Temperature and heat
  - Heat transfer
  - Change of phase
  - Thermodynamics
- **15% - Part 4: Wave Motion and Sound**
  - Vibrations and waves
  - Sound
- **20% - Part 5: Electricity and Magnetism**
  - Electrostatics
  - Electric current
  - Magnetism and induction
- **10% - Part 6: Optics**
  - Properties of light
  - Reflection and refraction
  - Wave optics and interference
- **10% - Part 7: Modern Physics**
  - Atomic physics and light spectra
  - Atomic nuclei
  - Nuclear fusion and fission
  - Relativity

**Laboratory or Activity Content**

N/A

## 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
Oral analysis/critiques
Objective exams
Oral presentations
Projects
Problem-solving exams
Quizzes
Reports/Papers/Journals
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
Internet research
Lecture
Small group activities

**Describe specific examples of the methods the instructor will use:**

Introduce basic concepts via lecture, presentation, demonstrations, and solving sample problems. Have students solve additional problems individually or in groups and share methods and results.

## Representative Course Assignments

**Writing Assignments**

- Draw free-body diagrams for a variety of physical situations; list and explain the basic concepts of the forces involved.
- Answer short essay conceptual questions, describing the physics concepts involved. For example: A disk and a sphere have the same mass and the same radius, and are released simultaneously at the top of an inclined plane. They roll down without slipping. Which will reach the bottom first, and why?

**Critical Thinking Assignments**

- Identify the various forces acting on a body, summarize them in a free body diagram and then add them using vector addition to describe the body's motion.
- Apply relevant physics and mathematical concepts to physics problems.
- Model a real world example with physics concepts. For example: When standing on a skateboard, initially at rest, a friend throws a very heavy ball towards you. You can either catch the object or deflect the object back toward your friend. What should you do in order to maximize your speed on the skateboard, and why?

**Reading Assignments**

- Read the textbook and study selected chapters and supplemental lecture material, then answer questions or solve problems assigned that reflect the new material.
- Read outside articles on physics concepts or articles that employ physics concepts relevant to this course. For example, find a news article that involves the concept of conservation of energy and share with the class.

**Skills Demonstrations**

- Demonstrate problem solving skills by applying relevant concepts in physics and mathematics during class discussions, homework assignments, in-class group assignments, quizzes and/or tests.
- Demonstrate the ability to work as a team by working on problems in groups and presenting to the class relevant concepts.

**Other assignments (if applicable)**

None

## Outside Assignments

**Representative Outside Assignments**

- Solve a variety of physics problems related to the newly learned principles. Each topic covered will have associated problems that involve some simple to intermediate problems requiring the application of multiple concepts in a single example.
- Research real-world examples that apply physics principles. For example, how does riding your bike (and as you move forward) demonstrate the concept of conservation of angular momentum? Begin by describing the rotation of the wheels. Note the direction of the angular velocity vector, and how does it relate to the angular momentum vector.

## Articulation

**Equivalent Courses at 4 year institutions**

| University | Course ID | Course Title | Units |
|---|---|---|---|
| Cal Poly San Luis Obispo | PHYS 104 | Introductory Physics | 4 |
| Cal Poly, Pomona | PHY 1050 | Fundamentals of Physcis | 3 |
| CSU East Bay | PHYS 1700 | Elementary Physics | 4 |
| San Francisco State Univ. | PHYS 101 | Conceptual Physics | 3 |

**Comparable Courses within the VCCCD**
PHYS V01 - Elementary Physics

## District General Education

### A. Natural Sciences

### 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

**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**
Ostdiek, Vern J., and Donald Bord. *Inquiry into Physics.* 8th ed., Cengage Learning, 2017.

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**Resource Type**
Textbook

**Description**
Hewitt, Paul. *Conceptual Physics. 12th ed., Pearson, 2014.*

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**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.

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## 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 examples that apply physics principles. For example, how does riding your bike (and as you move forward) demonstrate the concept of conservation of angular momentum? Begin by describing the rotation of the wheels. Note the direction of the angular velocity vector, and how does that relate to angular momentum vector.

## 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 M01 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.<br>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.<br>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. |

**Hybrid (51%–99% 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 M01 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) | Students will upload their assignments to the course webpage to be graded by the instructor. |
| Synchronous Dialog (e.g., online chat) | 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. |

**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 Physics M01 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) | Students will upload their assignments to the course webpage to be graded by the instructor. |

| | |
|---|---|
| Synchronous Dialog (e.g., online chat) | 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. |

## 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**
CCC000431728

**DOE/accreditation approval date**
MM/DD/YYYY