PHSC M01: PRINCIPLES OF PHYSICAL SCIENCE

Originator
ereese

Co-Contributor(s)

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College
Moorpark College

Discipline (CB01A)
PHSC - Physical Science

Course Number (CB01B)
M01

Course Title (CB02)
Principles of Physical Science

Banner/Short Title
Principles of Physical Science

Credit Type
Credit

Start Term
Spring 2021

Catalog Course Description
Introduces facts, principles and laws from physics, chemistry, and astronomy. Includes motion, force, energy, wave motion, electricity and magnetism, light, atomic and nuclear structure, chemical bonding and chemical reactions, solutions, organic chemistry, the solar system and planet Earth.

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
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

Entrance Skills
MATH M03

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.

Requisite Justification

Requisite Type
Prerequisite

Requisite
MATH M03

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	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.
2	develop working knowlege to analyze and solve simple problems in physics and chemistry.
3	develop working knowlege to evaluate and judge the results of physics and chemistry problems.
4	develop working knowledge to recall fundamental facts regarding physics, chemistry, and the solar system.

Course Content

Lecture/Course Content

- **2% - Scientific Method**
  - Laws, principles, theories
- **5% - Units and Measurement**
  - Data analysis
  - Problem-solving
- **7% - The Earth-Moon System**
  - Motions of Earth, timekeeping, and the calendar
  - Motions of the Moon
  - Phases and eclipses
  - Tides
  - The solar system

  - Members of the solar system
  - Properties of the solar system objects
  - Origin of the solar system
- **7% - Organic Chemistry**
  - Organic compounds
  - Hydrocarbons
  - Hydrocarbon derivatives
  - Organic compounds of life
- **7% - Water Solutions**
  - Nature of water
  - Dissolving and solubility
  - Concentrations
  - Acids, bases, and salts
  - The pH scale
- **8% - Chemical Reactions**
  - Chemical equations
  - Balancing equations
  - Types of chemical reactions
  - Quantitative analysis
- **7% - Chemical Bonds**
  - Valence electrons and ions
  - Ionic bonds
  - Covalent bonds
  - Compounds, names, and formulas
- **7% - Atoms and the Periodic Table**
  - Atoms and molecules
  - Bohr theory
  - Quantum theory
  - Electron configurations
  - Properties of elements
- **7% - Nuclear Physics**
  - Radioactivity
  - Radiation measurement and exposure
  - Nuclear fission, power plants
  - Nuclear fusion
  - Source of nuclear energy
- **7% - Light**
  - Sources and properties of light
  - Light phenomena
  - Quantization of energy
- **8% - Electricity and Magnetism**
  - Electrostatics
  - Electric force and electric field
  - Electric current
  - Voltage and resistance
  - Electrical power
  - Magnetic fields
  - Permanent magnets and electromagnets, Earth's magnetic field
  - Electromagnetic induction
  - Applications of electromagnetism
- **7% - Wave Motion and Sound**
  - Vibrations
  - Waves: mechanical and electromagnetic
  - Wave phenomena
  - Sound waves
  - Resonance, vibrating strings
- **7% - Heat and Temperature**

- Nature of matter
- Temperature and thermometers
- Heat and heat transfer
- Specific heat and phase change
- First law of thermodynamics
- Second law of thermodynamics

- **7% - Energy**
  - Potential energy
  - Kinetic energy
  - Work-Energy theorem
  - Conservation of energy principle
  - Energy transfer
  - Other forms of energy
- **7% - Motion**
  - Kinematics
  - Newton's Laws of motion
  - Momentum
  - Conservation of momentum
  - Circular motion
  - Universal law of gravitation

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
Essay exams
Group projects
Individual projects
Oral analysis/critiques
Objective exams
Oral presentations
Problem-solving exams
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

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:
The instructor will perform class demonstrations to explain the theory of physical science concepts studied in class. The instructor will model problem-solving on the board and then ask the students to further explore the concepts by working problems individually and/or in groups and then sharing with the class.

Representative Course Assignments

Writing Assignments

- Write a short essay or scientific report for an assigned physical science topic. An example would be: Write a scientific report about climate change and the numerous data supporting it.
- Answer questions from lectures, such as: What are the steps of the scientific method? Describe Newton's three laws of motion.

Critical Thinking Assignments

- Apply knowledge gained in the classroom to analyze and synthesize data gathered from hand-on activities and in class demonstrations. An example would be: Using the data from the in-class demonstration on momentum, calculate the final velocity of the 2 carts after colliding inelastically. Use the same data to calculate the kinetic energy lost and the percentage of total energy converted to heat and sound.
- Apply knowledge gained in the classroom to analyze and synthesize physical science problems. An example would be given a set amount of propane and oxygen how much carbon dioxide and water vapor would you form? Also determine the limiting reactant and how much of the excess reactant would be left.

Reading Assignments

- Read handouts provided by the instructor regarding current events related to physical science, summarize the article, and answer questions about the article.
- Read and study selected chapters from the textbook and the accompanying lecture notes, then answer questions or solve problems assigned by the instructor. An example would be: Read the chapter on Units, Unit Conversions, and Unit Analysis, then following the lecture, determine the SI units of power using power = work / time.

Skills Demonstrations

- Demonstrate the use of Excel spreadsheets for computational and graphing purposes. For example, plot x and y positions as a function of time for a projectile.
- Demonstrate the proper steps in identifying the external forces acting on an object in a free body diagram.

Other assignments (if applicable)
None.

Outside Assignments

Representative Outside Assignments

- Solve a variety of physical science problems related to the newly learned principles. Each topic covered will have associated problems that involve some basic to intermediate difficulty and requiring the application of multiple concepts in a single example.
- Interview a scientist, preferably in the discipline of your interest, asking them about their educational pathway, what motivated them to become a scientist, what they most like and value about their profession, what they least like about their job, how do they think they contribute to the society, etc.
- Go to a Von Karmen Lecture at the Jet Propulsion Laboratory (J.P.L.) located in Pasadena CA, write a summary of the talk. Make sure you ask a question of the speaker at the end of the talk or watch online webcast and send an email question about the talk.

Articulation

C-ID Descriptor Number
PHYS 140 (with PHSC M01L)

Status
Approved

Additional C-ID Descriptor(s)

C-ID Descriptor(s)	Status
CHEM 140 (with PHSC M01L)	Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
Cal Poly San Luis Obispo	PSC 101	The Physical Environment	4
CSU Los Angeles	NATS 100	Physical Science	4
CSU Northridge	PHSC 170	Introduction to Physical Science	4
CSU Channel Islands	PHSC 170	Foundations in Physical Science	4
CSU San Marcos	GES 105	Introduction to Physical Science	3

Comparable Courses within the VCCCD

PHSC R170 - Concepts in Physical Science
PHSC V01 - Concepts in Physical Science

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

B1. American History/Institutions

Approved

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
Tillery, Bill. *Physical Science.* 12th ed., McGraw-Hill, 2019.

Resource Type
Textbook

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

Resource Type
Textbook

Description
Shipman, James T., Jerry D. Wilson, Charles A. Higgins, and Bo Lou. *Introduction to Physical Science.* 15th ed., Cengage Learning, 2020.

Library Resources

Assignments requiring library resources

Written reflections on readings from newspaper and journal articles available in the Library's print and online resources.

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Research, using the Library's print and online resources, to gather information on the different factors effecting climate change (global warming) such as the greenhouse effect, glacial melting and retreat, fossil fuel burning, ocean level rise, deforestation, changes in thermo-haline circulation patterns and carbon dioxide levels (rising).

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 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. 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.

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 Physical Science 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. 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.
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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 Physical Science 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. 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.
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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
CCC000434431

DOE/accreditation approval date
MM/DD/YYYY