

1. Where are we in the universe? What information can we glean with naked eyes?

What is our human frame of reference? How special is it? Naked-eye astronomy means "seeing" the local heavens, both day and night: the moon, Sun, phases, eclipses, solstices, and the main reason for seasons.

2. The Basic Rules: Why and how do things change their motion?
Doesn't anything ever stay the same as time passes?

Everything always changes, changes, changes: how can we grasp such a world? The remarkable insights of Newton in describing the cause of physical change are the roots of modern physical science. What do forces give to objects? Are there thousands of different forces? Only four? Are there any limits to what can happen? Energy is an idea which, like an enormous river, runs through and touches all of physics. What are some constraints on what can happen in the physical world?

3. How does energy get from one place to another?

What is involved in creating "traveling energy"? What humanly created ideas allow us to deal with the seeming magic of empty-space, long-range, action-at-a-distance forces like gravitational forces? How do objects with apparently empty space between them get the message to move toward each other? One can send matter from one place to another, or simply send energy without sending matter: the important physics of traveling energy. The latter involves waves and oscillations: sound, music, light, radio, TV, microwaves, and ocean waves.

4. The Basic Model: How can one account for --or actually count -- invisible entities? How does one deal with an invisible, but real, world?

Since neither atoms nor angels can be seen, isn't identifying "atoms" as the cause of some natural phenomena a lot like assigning invisible angels as causative agents? Or is the evidence for atoms much stronger? "Counting invisible atoms and molecules" is an essential process in modern chemistry, biology, genetics, neurochemistry, nutrition, viral control, super-conductivity -- almost anything you can name. How can we possibly count invisible atoms and molecules? As one famous chemist put it: "Fortunately, the logic of these scholars [chemists and physicists] is as simple as the logic of children."

5. Is physical science at atomic levels different from our ordinary reality?

What is modern physics' view of light and color and electricity? Electromagnetic waves --light, color, microwaves, radio, TV, gamma-rays -- are the only way we know the rest of the universe is out there. Rainbows, thin-film interference, mirages, interference, diffraction, light-scattering: why the sky is blue and sunsets red. What really exists in our physical environment? How uncertain is science about its own explanations and its measurements? Has the mechanics of atoms --the study of their motion and energy -- fundamentally undermined our classical physical knowledge of the world?

The lecture and laboratory portions of the course are completely entwined and integrated. Only a single grade reported for this course. Part of the content is covered in lecture, and part is experienced in the laboratory.

The lecture portion aims at providing a connected overview of human reasoning that leads to an up-to-date classical physical-science model of the world. We humans continually create our expression of science to describe the physical world as we experience it. This course aims to clarify and make accessible the ideas, models, strategies, visions, and creativity that form the basis for current thinking about the physical world. The laboratory portion is where much of the memorable learning occurs, as one realizes "Oh, that's what all that talk was about!" We recognize this fact by making your laboratory grade 30% of your course grade.

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**A webpage for this class can be found at <http://www.csulb.edu/~gpickett/ps112.html>
Lecture notes for this section can be downloaded there.**

REQUIRED TEXTS: 1. *Physics, The Reasoning*; Physical Science 112 Lecture Text (Campus Bookstore)
2. *Physical Science Laboratory Manual*, Patrick Kenealy. (Campus Bookstore)

LABORATORY: The laboratory sections will meet during the first week.

You must be registered in a laboratory section, and successfully complete it, in order to get a grade for the course. *A calculator is REQUIRED for lab: get one with trigonometric functions on it.*

GRADING: It is certainly possible to do valuable thinking without leaving the slightest trace to evaluate, even by yourself. But we value evidence of your thinking about the concepts introduced and used in this course. The following will be the evidence:

1. Laboratory reports are a very important part of the course.
They will reflect *your experience* in the lab, not some idealized goal. We want your conclusion based on your experiment.
2. Reports on Take-Home Experiments, and other assignments.
Assigned questions, problems, and take-home-experiments should be on time and ready to be presented.
3. Performance on exams: There are no make-up exams regularly scheduled. However accommodations can be made if notification is made in advance for serious, legitimate reasons, or if a serious, documented, legitimate excuse is presented within one week of the exam date.
Hourly exams will be averaged with the Take-Home Exp grades to produce 45% of your grade.

Take-Home Exps.	15%
One-Hour Exams	30%
Lab Reports & Activities	30%
Final Exam	<u>25%</u>
	100%

After your total course grade percentage is established, we wish to use the following scale:
A, 90-100%; B, 80-89%; C, 70-79%; D, F, less than 70%. Extra credit is regularly assigned during lecture. Attending lecture is the best way to keep up-to-date.

Feel free to ask questions or offer comments – in person or in writing – at any time in any form or style.

(*Subject to change with at least 1-week's notice.)

PHSC 112 LAB SCHEDULE

Your lab section might have online material available at <http://beachboard.csulb.edu> , but the bulk of the online material for the lecture part of the course may be found at <http://www.csulb.edu/~gpickett/ps112.html> where you will find PDF files containing lecture notes, the syllabus, and other materials.
THIS SCHEDULE SUBJECT TO CHANGE. YOUR LAB INSTRUCTOR WILL KEEP YOU UP TO DATE ON THE LAB SCHEDULE.

Week of Aug. 30	INTRO.	Lab manual, Rules, Safety forms, Read #1 in advance. Begin Exp.#1.
Sept. 6	Exp. #1:	Measurements/Predictability: How do you get someone to agree with you?
Sept. 13	Exp. #2:	Waves, Oscillations, and Musical Harmony
Sept. 20	Exp. #3:	The Exquisite Problem of Describing Motion
Sept. 27	Exp. #4:	Free Fall: Galileo' s Ingenious Argument from an Indirect Measurement
Oct. 4	Exp. #5A: Exp. #5B:	Oscillating Systems: The Spring–Mass System, a Standard "Model" of SHM Oscillating Systems: The Pendulum, an "Approximate Model" of SHM
Oct. 11	Exp. #6A, 6B:	The Problem of Agreeing with Someone
Oct. 18	Exp. #7:	Two Universal Fundamental Ideas* *provided you carefully define what you are talking about.
Oct. 25	Exp. #8:	Waves and Resonances: A Fundamental Description of a Way to Transfer and Store Energy
Nov. 1	Exp. #9:	The Wave–like Nature of Light: Interference and Diffraction
Nov. 8	Exp. #10:	"Seeing" the Structure of Atoms and the Composition of Stars
Nov. 15	Exp. #11:	Counting Invisible Entities: Energy, Atoms, and Molecular Chemistry
Nov. 22	THANKSGIVING, no labs	
Nov. 29	Exp. #12:	The Last Experiment
Dec. 6	NO LABS. Hand in Write–up for Last Exp. ASAP, but no later than scheduled day of your regular lab meeting during this week.	