

# PHYS 100 – Concepts in Physics

## Syllabus

Fall 2008 – Sections 1 and 2

**INSTRUCTOR** Dr. Eduardo Sánchez Velasco.

### OFFICE

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Note: Do not use the phone or e-mail for grade related questions.

### OFFICE HOURS

Monday, Wednesday, Friday : 11:30 a.m. – 12:30 p.m.

Tuesday: 11:30 a.m. – 12:30 p.m. and 1:30 p.m. – 2:30 p.m.

These are my official office hours, but frequently I am in my office at other times; you should feel free to stop in at any time, or to make an appointment, if this is more convenient.

### CLASS HOURS

LECTURE: Monday, Wednesday and Friday, 1:30 p.m. – 2:20 p.m. in Magruder Hall 1096.

LAB Section 1: Thursday, 10:00 a.m. – 11:50 a.m. in Magruder Hall 1006.

LAB Section 2: Thursday, 1:00 p.m. – 2:50 p.m. in Magruder Hall 1006.

### CATALOG DESCRIPTION

This course presents an overview of our understanding of the physical world, covering some of the main concepts, theories, and experimental techniques of physics. While the course focuses primarily on the conceptual understanding of physics, it also explores some of its historical, technological, philosophical, and aesthetic aspects, and its place in the history of ideas. The range of possible topics includes Newton's laws of motion, gravity, heat, sound, electricity and magnetism, light, relativity, quantum theory, elementary particles and nuclear physics. Basic algebra skills are expected of the student. The course has a laboratory component that emphasizes quantitative measurements. *4 hours.*

### COURSE OBJECTIVES and LSP Physical Mode of Inquiry

This course will be a big tour of the way we understand the physical world. We will explore the evolution and some of the history of the main scientific ideas in Physics and of some of their applications. Students develop a conceptual understanding of the main scientific ideas in physics and are introduced to selected aspects of the evolution and history of these ideas. **This course fulfills the requirements for the LSP Physical Mode of inquiry.**

In the first part of the course we will concentrate on what can be called “classical physics”, which will include among other developments, newtonian mechanics, Newton's theory of gravity and electricity and magnetism. We will see how most of the every day phenomena of nature can be understood in terms of this “classical physics” picture of the world. We will also show the enormous predictive power of the theories developed. In the process we will look to the intellectual contributions of great physicists such as Galileo, Newton and Maxwell.

In the second part of the course we will look at “modern physics”: relativity, quantum theory and elementary particle physics. We will explain how the failure of the classical description of nature presented in the first part of the course lead to the introduction of relativistic and quantum ideas. We will explore some of the philosophical implications of this new view of the world, their apparent contradictions and the remaining open questions. We will also look at our present understanding of the fundamental blocks of matter, the elementary particles, and review the most recent theories to explain their interactions.

The course has an essential laboratory component. The laboratory includes experiments that emphasize quantitative measurements, analysis of data, and interpretation of results. They require using mathematical and graphical techniques, and directly handling experimental apparatus.

## TEXT AND MATERIALS

The required texts for this course are:

- *Conceptual Physics* (10<sup>th</sup> edition), by Paul G. Hewitt, Addison Wesley, 2006.
- *Laboratory Concepts*, version 2.8.2 (Fall 2008), by E. Velasco.

Hewitt’s book is the official text for this course. We will use it to supplement the lectures and for reading assignments. However during class we will cover some material not found on the text, specially in the last part of the course. Your attendance to class will be specially important to learn this material.

For the lab you must purchase the lab manual *Laboratory Concepts* mentioned above. Make sure you obtain the lab manual specially written for your section, as different instructors use different sets of notes. The lab manual reviews the conceptual material covered in the lab and will be essential to perform the experiments. You **MUST** bring it to the lab with you. You will need it to perform the experiments and to write the results.

☞ In addition every student **MUST** bring to every lab and lab exam a **scientific calculator**, and to be familiar with its use. You should also bring to the labs and lab exams a **metric ruler**.

## ACADEMIC DISHONESTY

Academic dishonesty of any form will not be tolerated in this class. Anyone caught cheating on a test, homework or lab will automatically receive a grade of zero on that test, homework or lab. Further disciplinary action consistent with University policy will be considered, including failing the course. Homework, exams and quizzes, unless instructed otherwise, must be done individually. For more information about the University policy on academic dishonesty, consult the appropriate sections of the Student Conduct Code (see the code at <http://saffairs.truman.edu/studentconductcode.asp>).

## STUDENTS WITH DISABILITIES

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Disability Services office (x4478) as soon as possible.

## EXAMS AND QUIZZES

There will be four closed book exams and two lab exams in this class. The tentative exam dates are listed at the end of this syllabus. All exams, **including the final** (exam #4), will be on the material covered since the preceding test. That is, they are not “comprehensive”. However, you may have to use as background for one exam material covered in previous exams. Lab exams will cover material from the lab sessions. In addition to these exams, there will be quizzes, usually on the content of homework assigned readings from the book or other materials. In exams and quizzes it will be expected a deep knowledge of the material. Having only a general understanding of the

material without a knowledge of the relevant details will not be enough. Finally, all exams and quizzes are without books or notes and must be done individually.

## **HOMEWORK POLICY**

The majority of the homework will consist of reading assignments followed by a quiz. In addition, there may be occasional homework projects during the course. Unless otherwise indicated, these projects should be done individually. I will consider academic dishonesty homework done in group or copied from any unauthorized source. You must turn in your homework projects **in person** at the **beginning** of the class session in which they are due, unless you have a valid reason not to attend the class. Homework handed in after the class has started will be considered late homework. **No late homework will be admitted without a valid excuse.**

## **MISSING A TEST, QUIZ, LAB OR CLASS**

Students are expected to attend all class sessions and labs. If you have a valid conflict that does not allow you to take an exam or quiz, or to be at the lab at the scheduled time, **contact me as soon as possible**, preferably before the event takes place. In any case you should see me **in person** as soon as possible. Missing a test, lab or quiz requires a valid excuse, otherwise a grade of zero will be assigned. I reserve the right to determine what is, and is not, a valid excuse. As a rule only extreme situations, such as serious medical problems, will be considered valid excuses. Field trips and sport events are not usually considered valid excuses unless previously arranged personally with me. In general, having other exams in the same day is not a valid excuse. Adjustments to make up missed exams, labs, or quizzes, if any, will be made at my discretion, and only in extreme situations.

It is your responsibility to be on time for all classes and labs. You are also responsible for showing on time to exams and quizzes. Alarm clock malfunctions and similar events are NOT considered valid excuses for being late or absent. If you are late to a class, you will not be able to turn in your homework or take a quiz, which usually are done at the beginning of the class. If you are late to a lab you may not be allowed to do it. Being late to an exam or quiz may disqualify you from taking that exam or quiz. The exact date of a quiz will be announced in a previous class; it is your responsibility to know that date. If you miss a class, make sure to ask if a quiz was announced in it. "I did not know there was a quiz today" is NOT a valid excuse for missing a quiz. The same applies to changes of date or time of an exam, date of due homework, or the content of the exams.

In most lab meetings there will be lab activities that will count towards the grade. Of course, you have to be in the lab on time to get a grade in that lab. In general, lab makeups will not be given. If you miss a lab due to unusual circumstances, please see me **as soon as possible**. Unless other arrangements have been made, any missed lab will be counted as zero. However, I will throw away the worst lab when computing the final grade. You can safely miss one lab for whatever reason without damaging your grade. Use it as a sick leave day.

## **GRADING POLICY**

The grade for this class will be obtained from 4 tests, two lab exams, lab activities, and from homework assignments and quizzes. Each exam will count 15% towards the final grade, lab activities (with the worst one thrown away) 20%, each lab exam 5%, and the remaining 10% from the occasional homework assignments and quizzes, each quiz counting the same as a regular homework. You **MUST** keep all graded materials, and be able to produce them in case of grade disputes.

|                      |      |
|----------------------|------|
| Homework and quizzes | 10%  |
| Exam #1              | 15%  |
| Exam #2              | 15%  |
| Exam #3              | 15%  |
| Exam #4              | 15%  |
| Lab activities       | 20%  |
| Lab exam #1          | 5%   |
| Lab exam #2          | 5%   |
| <hr/>                |      |
| Total :              | 100% |

The minimum guaranteed grading scale is as follows:

| Final Percentage | Final Letter Grade |
|------------------|--------------------|
| 90 to 100        | A                  |
| 80 to 90         | B                  |
| 70 to 80         | C                  |
| 60 to 70         | D                  |
| below 60         | F                  |

Final letter grades are normally assigned according to the table above. However, depending on class performance, or to reward class participation, at the end of the semester I may curve grades upward. If this curving is done and, for example, I add 1% to the final grade, a person with a final percentage of 79% may receive a B as a final letter grade, even though the above table indicates that a C would normally be assigned. However, **curving is not guaranteed, and you should not count on it.** I will never curve downward. As a rule, only the grades in the above table (A, B, C, D or F) will be given. Any other grade, like incomplete (IC), will be given at my discretion, and only under **very unusual and extreme circumstances**, like a serious medical problem. Poor performance will not qualify you for a grade other than A, B, C, D, or F.

### TENTATIVE COURSE OUTLINE

Some of the topics I intend to cover in the lectures, in their approximate order, are indicated below.

- Introduction and overview. Classical, relativistic and quantum physics.
- The basic building blocks of nature. Elementary particles.
- The atomic nucleus. Radioactivity.
- Motion. Kinematics. Vectors. Velocity and acceleration.
- Interactions and forces. Newton's laws of mechanics. Momentum.
- The solar system. Kepler laws. Newton's theory of gravity.
- Electromagnetism. Electrostatics. Coulomb's law. Electric and magnetic fields.
- Electromagnetic induction. Electromagnetic forces. Electric motors and generators.
- Maxwell's equations and electromagnetic waves. Waves and optics.
- Reflection, refraction, and dispersion. Interference and diffraction.
- Special theory of relativity. Relativistic mechanics.
- Relativity and gravitation. Black holes and other weird stuff.
- The birth of Quantum Theory. Planck, Einstein and Bohr.
- Quantum Mechanics.

Note that this is only a tentative list of material. I may change it to adapt to the needs of the class as we go along. The purpose of the class is for you to learn, not to follow a rigid plan. Your

feedback in this matter will be very helpful. Please let me know if you think I am going too fast or too slow, or if there are topics for which you would like a more detailed explanation.

### **TENTATIVE EXAM DATES**

Exam #1: Monday, September 22 in class.


Exam #2: Monday, October 20 in class.

Exam #3: Wednesday, November 12 in class.

Exam #4: Tuesday, December 9, 1:30 p.m. – 3:20 a.m. (Finals week).

Lab exam #1: Thursday, October 16 in the lab.

Lab exam #2: Thursday, December 4 in the lab.

 This schedule may change during the semester. Updated versions of this syllabus will be posted online at <http://www2.truman.edu/~velasco>