Principles of Physics II (PHY 112)

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Contact Information

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Course Description

An introductory course in classical physics, designed for students who desire a rigorous mathematical approach to college physics. Calculus is used throughout. Topics include thermodynamics, electricity, electric circuits, magnetism, and optics, with associated laboratory.

Course Objectives

1. Learning fundamental principles and theories of physics, in particular thermodynamic theory and electromagnetic theory.
2. Learning factual knowledge and terminology of physics (for example, the description of electromagnetic phenomena using the ideas and language of electric and magnetic fields)
3. Learning to *apply* theories of physics to solve problems

Brief Outline

1. Thermodynamics
2. Electricity
3. Electric Circuits
4. Magnetism
5. Light and Optics

Course Outline

1. Thermodynamics
   A. Thermal Energy (also called Internal Energy)
   B. Heat and Work cause changes in Thermal Energy
   C. Heat Capacity, Specific Heat
   D. Ideal Gas Law
   E. Kinetic Theory (Kinetic Energy of an Ideal Gas)
   F. First Law of Thermodynamics (Conservation of Energy)
   G. Isothermal, Isobaric, Adiabatic, and Constant Volume Processes
   H. Relationship between Heat, Heat Capacity, and Temperature
   I. Relationship between Work, Pressure, and Volume
   J. Second Law of Thermodynamics
2. Electricity
   A. Electric Charge
   B. Coulomb's Law
   C. Electric Field
   D. Force on a Charged Particle from an Electric Field
   E. Electric Potential
   F. Voltage
   G. Relation between Electric Potential and Electric Field
   H. Electric Field and Electric Potential produced by a Point Charge
   I. The Capacitor
   J. Electric Energy
   K. Relation between Force, Electric Field, Potential Energy, and Electric Potential
3. Electric Circuits
   A. Batteries
   B. Electric Current
   C. Resistance
   D. Ohm's Law
   E. Resistivity
   F. Electric Power
   G. Alternating Current
   H. Resistors in Series and Parallel
   I. EMF
   J. Kirchhoff's Rules
      1. Kirchhoff's Current Rule (Junction Rule)
      2. Kirchhoff's Voltage Rule (Loop Rule, or "playing the voltage game")
   K. EMF's in series and parallel

   L. Capacitors in series and parallel
4. Magnetism
   A. Magnetic Field
   B. Electric Currents produce Magnetism
   C. Force on a Current-carrying Wire from a Magnetic Field
   D. Force on a moving Charged Particle from a Magnetic Field
   E. Magnetic Field produced by a long straight Wire carrying Current
   F. Magnetic Field produced by a Loop (qualitative)
   G. Force between two parallel Wires
   H. Magnetic Flux
   I. Faraday's Law (Flux Rule)
   J. Lenz's Law
   K. The Electric Generator
5. Light and Optics
   A. Ray Tracing
   B. Reflection
   C. Refraction
   D. Index of Refraction
   E. Snell's Law
   F. Total Internal Reflection
   G. Focal Length
   H. Object and Image Positions and Heights
   I. Magnification
   J. Thin Lens Equation
   K. Wavelength, Frequency, Speed of a Light Wave
   L. Interference (Wave Counting)

Textbook

The textbook for the course is *Physics for Scientists and Engineers* (6th edition) by Paul A. Tipler and Gene Mosca, ISBN 1-4292-0124-X.

Class Attendance and Participation

Please turn off cell phones during class. A portion of your course grade is based on class participation. On a typical day, we will consider one or more conceptual questions. I will ask you to answer these questions as best you can. For these in-class conceptual questions, you will not be graded on whether you get the right answer, but only on whether you participate. Of course, you must attend class in order to participate and earn participation points.

Exams

There will be three 50-minute exams during the normal class time. The exams will contain both conceptual questions to be answered in words and problems to be solved. No computers, cell phones, music players, or any electronic devices with wireless or network capability are allowed during exams. You will be allowed to use a calculator during exams. Business and graphing calculators are allowed but not required. At the end of the semester, we will have a comprehensive final exam.

Homework

There will be weekly, computer-based homework assignments. The purpose of these assignments is to give you an opportunity to work with the concepts that we discuss in class and that you read about in the textbook. ("The only way to learn physics is to do physics.") I encourage you to start work *early* on the homeworks. This way you will have multiple opportunities to see me before the deadline.

The homework is available on a web site, using a computer-based learning environment called *moodle*. Moodle is similar to Blackboard in some ways, but it has additional features that let me offer the kind of homework assigments that I find most effective in learning physics.

One-time registration

Before you can work on the homework sets, you need to get signed up with the moodle site that I have set up. Please follow these instructions.

- Go to `http://quantum.lvc.edu/moodle/` . It should say "Dr. Walck's Moodle Site."
- Choose Physics 112.
- Click "Create new account" in the lower right.
- Enter your information and click "Create my new account."
- Check your email for a message from "Dr. Walck's Moodle Site," and click on the link.
- You are registered.

As soon as you are registered and I post the homework, you can begin to work on it. You only need to register once at the beginning of the course.

You do not need to do a homework assignment in one sitting. In fact, you should not. You can do a few problems one day and a few more the next day. If you get a problem wrong, you can try it again, although your grade decreases slightly with each additional attempt, so don't just guess.

Important details about moodle

Do not include units when submitting answers to homework problems. Each problem should tell you what units to use. If no unit is specified, use the appropriate standard SI unit (for example, kg, m, s, A). Enter only the numerical answer into the computer.

Do not count significant figures of the given numbers to decide how many significant figures to include in your answer. The computer will regard your answer as correct if you

are within 1% of what it regards as the correct answer. So, keep at least 3 or 4 significant figures in your calculations regardless of the number of significant figures given in the problem.

Do not type commas in your answers, such as `39,450`. Instead, type `39450`.

You may use exponential notation in your answer if you wish. Instead of `39450`, you may type `3.945e4` or `3.945E4`.

When you have answered all of the problems on the homework assignment, *you must click the box that says* **Submit all and finish**. If you fail to click this box, your grade will not be recorded. On the other hand, do not click this box until you are finished with the entire homework assignment.

Laboratory

There will be a weekly 3-hour laboratory session in which we will do activities designed to clarify how the concepts presented in class apply to the physical world. Before each laboratory session, please download, print, and read the laboratory activity for that day. The laboratory activities are located at the course web site at `http://mas.lvc.edu/~walck/phy112/labs/`.

Grading

Your grade will be determined by a weighted average as indicated in the table below.

Exams	45%
Homework	20%
Laboratory	15%
Class Participation	5%
Final Exam (comprehensive)	15%

Your letter grade for the course is determined by the weighted average. The minimum weighted average (out of 100) required for each letter grade is indicated below.

A	93
A-	90
B+	87
B	83
B-	80
C+	77
C	73
C-	70
D+	67
D	63
D-	60
F	0

Your grade is not an indication of how much I like you. It is not an indication of your worth as a person. It is my judgement of your accomplishment in learning physics, in particular the portion of physics that we studied.

Office Hours

Please feel free to stop by my office any time to chat. I will make a special effort to be in my office during the office hours posted on my door (also listed on my web page). We can also make an appointment to get together if that is convenient for you.

General Education

Principles of Physics II (PHY 112) may be taken to satisfy a portion of the Liberal Studies component of the College's General Education requirement. The course satisfies the Natural Science area (L3) of the Liberal Studies component. Courses in the Natural Science area present findings, concepts, and theories of science, develop an understanding of scientific methods of inquiry, engage students directly in the practice of science, and prepare students to think critically about scientific issues. Physics 112 is an L3 course because it explores a foundational theory of science, electromagnetic theory, and because it engages students directly with the physical world in the laboratory activities of the course.

Disabilities Services Syllabus Statement

If you have a physical, medical, psychological, or learning disability that is going to impact your attendance or require accommodation, please let me know. In order to ensure that your learning needs are appropriately met, you will need to provide documentation of your disability or medical condition to the Director of Disability Services in Humanities 206-D, 867-6071. The Office of Disability Services will then provide a letter of verification of disability that describes the accommodations needed for this class.

Academic Honesty

At http://www.lvc.edu/catalog/acad-reg-procedures.aspx you can find LVC's Academic Honesty Policy. This code asks each student to do their own work in their own words:

A student shall neither hinder nor unfairly assist the efforts of other students to complete their work. All individual work that a student produces and submits as a course assignment must be the student's own. Cheating and plagiarism are acts of academic dishonesty.

Cheating is an act that deceives or defrauds. It includes, but is not limited to, looking at another's exam or quiz, using unauthorized materials during an exam or quiz, and furnishing false information for the purpose of receiving special consideration, such as postponement of an exam, essay, quiz or deadline of an oral presentation.

Students who take part in violations such as cheating or plagiarism are subject to a meeting with the associate dean of the faculty, who has the authority to take further action, up to and including expulsion from the College.

Regarding homework, you are free to discuss homework problems with others, and talk about the methods for solving them. I expect you to do your own homework, and to submit you own work. Regarding exams, I expect you to keep your eyes on your own exam. On days when we have an exam, I ask that you refrain from wearing baseball caps or other hats that would keep me from seeing your eyes during the exam.

Class Schedule

Date	Topic	Read before class	Due
01/18	MLK Holiday		
lab	No lab		
01/20	Specific heat		
01/22	Latent heat	18-1, 18-2	
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01/25	Latent heat		
lab	Homework setup		
01/27	Ideal gas law	17-3	
01/29	First law of thermodynamics	18-3	HW 1
—			
02/01	Thermodynamic processes	18-5, 18-6	
lab	Calorimetry		
02/03	Adiabatic process	18-9	
02/05	Coulomb's law	21-1, 21-2, 21-3	HW 2
—			
02/08	Electric Field	21-4	
lab	Practice Exam 1		
02/10	*Exam 1* (Thermodynamics)		
02/12	Lorentz Force Law	21-6	
—			
02/15	Electric Field superposition	22-1	
lab	Electricity		
02/17	Continuous charge		
02/19	Electric potential energy		HW 3
—			
02/22	Electric potential		
lab	Using a Multimeter		
02/24	Electric potential		
02/26	Capacitor		HW 4
—			
03/01	Spring vacation		
lab	Spring vacation		
03/03	Spring vacation		
03/05	Spring vacation		
—			
03/08	Gauss's law	22-2	
lab	Circuits I		
03/10	Gauss's law	22-3	
03/12	Electric circuits		HW 5
—			
03/15	Resistance		
lab	Practice Exam 2		
03/17	*Exam 2* (Electricity)		

03/19	Power	
—		
03/22	Circuit analysis	
lab	Circuits II	
03/24	Circuit analysis	
03/26	Magnetic field	HW 6
—		
03/29	Lorentz force law	
lab	Oscilloscope	
03/31	Biot-Savart law	
04/02	Easter vacation	
—		
04/05	Easter vacation	
lab	Easter vacation	
04/07	Magnetic flux	
04/09	Emf	HW 7
—		
04/12	Faraday's law	
lab	DC Motor Lab	
04/14	Lenz'z law	
04/16	Refraction	HW 8
—		
04/19	Thin lenses	
lab	Practice Exam 3	
04/21	*Exam 3* (Circuits, Magnetism)	
04/23	Spherical mirrors	
—		
04/26	Ray tracing	
lab	Geometrical Optics	
04/28	Interference	HW 9
04/30	Interference	
—		
05/03	Diffraction	
lab	Wave Optics	
05/05	Diffraction	HW 10