Tentative Syllabus for Physics 250: Spring 2012

Professor: Dr. Stuart Hutton
Office: Derby Center: 248 Research Lab: Derby 219: General Physics lab: 148
Phone: 870 307 7560
Email: stuart.hutton@lyon.edu
To access the Physics Gateway: http://hutton.lyon.edu

During class periods and during tests:
cell phones are to be switched off.

Office Hours

I will schedule several office hour blocks. I will be very close to my office or research lab during these times. Otherwise, I will usually be close to my office or research lab. If you want to find me outside of office hours, make an appointment so that you will be sure to find me. My schedule is located on the physics home page which you may review to determine office hours.

Grading

As a general guide to grades, grades will be assigned as follows:

100-90]	(90-80]	(80-70]	(70-60]	<(60
A	B	C	D	F

In this course, you will have several grading opportunities, tests, homework and in-class problems. The various weight of each of these activities in your final point grade is shown below. **Late assignments will normally not be accepted. Additionally, since we will be doing in-class problems, poor attendance will negatively affect your grade: in particular, you will not receive credit for class participation for unexcused absences. There are no make-ups for in-class worksheets.**

Tests (4 tests and 1 [comprehensive] final exam)=85%
Each test is worth 17% of your grade.
Homework / in-class problems/ class participation=15%
Note: Physics Lab (Phy251) is a separate course and as such the grade in Phy251 has no impact upon the grade in Phy250.

Your work on tests will be graded for correctness and clarity. **Failure to supply details leading to a result will result in very little credit for a problem**. If you want full credit for a problem, **you must** supply the logical steps that led to the result and the result **must include proper units**. Diagrams should be included where appropriate to define quantities used in your result. Homework and worksheets will be graded for completion.

Course Description

In this course you will be exposed to fundamentals of physics. Among the topics that we will cover are mechanics, waves and thermodynamics. Refer to Assessable Learning Outcomes for a more complete presentation of topics.

Course Objectives

As a consequence of this course, you should obtain an enhanced understanding of the fundamentals of physics. In addition, you should come away from this course with an ability to solve fundamental problems involving physical principles.

Course Prerequisites

You are expected to be proficient with algebra and trigonometry. It is strongly recommended that your life will be made easier if you review trigonometry. Additionally you must satisfy the calculus prerequisites for physics 250.

Text

The textbook in this course is:

Physics 250:
Principles of Physics, Serway and Jewett, Fourth edition
ISBN: 0-534-49143-X

You may use earlier editions of this text (which can be obtained at much lower prices online {$0.25 for example is a low price}) but you will need to be sure to read the correct portions of the text.

The schedule is designed around this particular text edition. You may use earlier or later editions but you will need to be sure to read the correct portions of the text. The text must be considered to be a very important resource so students are expected to be reading along in the text as the course progresses.

You have many resources on the campus: the library, your colleagues and your professor. Your prime learning resource, however, must be considered to be the classroom: **punctual** and **complete** class attendance is expected**. Absences will negatively impact your final grade**. **Tardiness is considered to be an unexcused absence and will negatively impact your final grade**.

Attendance

The Lyon College Catalogue for 2011-2012 states:

Students are expected to attend all class periods for the courses in which they are enrolled. They are responsible for conferring with individual professors regarding any missed assignments. Faculty members are to notify the Registrar when a student misses the equivalent of one, two, three, and four weeks of class periods in a single course. Under this policy, there is no distinction between "excused" and "unexcused" absences. A reminder of the college's attendance policy will be issued to the student at one week, a second reminder at two weeks, a warning at three weeks, and notification of administrative withdrawal and the assigning of an "F" grade at four weeks. Students who are administratively withdrawn from more than one course will be placed on probation or suspended (see Academic Probation and Academic Suspension).

Academic Honesty

It is expected and encouraged that students in this class will work together on homework problems. If you use reference work, be sure to include proper references. On tests, students are required to keep notes and books closed except as instructed. **Your professor will supply all the paper needed for the tests.** Any questions during tests should be directed to the professor only. **CELL PHONES AND OTHER WIRELESS OR NETWORKED DEVICES (INCLUDING COMPUTERS) MAY NOT BE USED DURING TESTS**, If you do use such devices during a test, it will automatically be considered to be a violation of the Lyon College Honor Code.

All graded work in this class is to be pledged in accordance with the Lyon College Honor Code.

"Students seeking reasonable accommodations based on documented learning disabilities must contact the Office of Academic Services at 307-7332."

Tentative Schedule: R.1 for Physics 220 and Physics 250 and Physics 251 Spring 2012

labs	Worksheet Number	Date	220: Cutnell: 8th ed. Assignment Reading : Homework	250:Serway 4th ed Assignment: Reading: homework
	Worksheet 01: Electrostatics 1	W January 11	chapter 18	chapter 19
Lab01A: Electrostatics 1		F January 13	chapter 18	
	MLK Day: no class	**M: January 16**		
		W January 18	chapter 18	
Lab 01: Electrostatics	Worksheet 02: Electrostatics 2	F January 20	chapter 19	chapter 19
		M January 23	chapter 19	chapter 20
	Worksheet 03: Gauss' Law	W January 25	chapter 19	chapter 20
Lab 02: Lab Problems	Worksheet 03A: Problems	F January 27	chapter 19	
		M: January 30		
	Untest01	**W February 01**		
	Test #1	**F: February 03**		
Lab (03): Series and parallel RC	Worksheet 04: potential	M February 06	chapter 19	chapter 21
	Worksheet 05: capacitance	W February 08	chapter 19	chapter 21
	Worksheet 07: emf, RC circuit	F February 10	chapter 20	chapter 21
Lab (04) EMF and RC	Worksheet 08: Kirchoff's laws 1	M February 13	chapter 20	chapter 21
	Worksheet 09: Kirchoff's laws 2	W February 15	chapter 20	chapter 21
	Worksheet 06: Problems	F February 17	chapter 21	chapter 22
Lab05: current balance	Worksheet 10: Magnetic fields 1	M: February 20	chapter 21	chapter 22
	Worksheet 11: Magnetic fields 2	W February 22	chapter 22	chapter 23
	Worksheet 12: Ampere's law	F February 24	chapter 22	chapter 23
		M February 27		
Lab 06: magnetic Levitation	**Untest02**	W February 29		
	Test #2	F March 02		
	Spring Break	**March 03 – March 11**		
	Worksheet 13: Calculating B	M: March 12	chapter 22	chapter 23
Lab 07: solenoids	Worksheet 14: Faraday's law	W March 14	chapter 22	chapter 23
	Worksheet 15: Inductance	F March 16	chapter 23	chapter 23
	Worksheet 17: RLC Circuits 1	M March 19	chapter 23	Chapter 23
Lab 08: oscilloscopes	Worksheet 18: RLC Circuits 2	W March 21	chapter 23	chapter 24
	Worksheet 19: Thin Lens Eqtn 1	F: March 23	chapter 26	chapter 26
Lab 09: focal length	Worksheet 20: Thin Lens Eqtn 2	M: March 26	chapter 26	chapter 26
	Untest03	**W March 28**		
	Test #3	**F March 30**		
	Worksheet 21: Refraction	M April 02	chapter 26	chapter 25
	Worksheet 22: Mirror Eqtn	W: April 04	chapter 25	chapter 25
	Easter Vacation	**April 06 – April 09**		
	Worksheet 23: Multiple lenses	W: April 11	chapter 25	chapter 25
Lab 10: reflection	Geometrical Optics, Ray trace	F: April 13	chapter 25	chapter 27
	Worksheet 24: Thin fims	M April 16	chapter 27	chapter 27
	Worksheet 25: interference	W April 18	chapter 27	chapter 28
	TEM Waves	F April 20	chapter 24	chapter 24
	Untest04	**M April 23**		
	Test #4	**W April 25**		
	Bohr Model/Last Day of Class	M April 27	chapter 30: 30.1 – 30.4	Chapter 29: 29.1, 29.2
	Final Exams	**April 29 – May 01**		

PHY 250 FUNDAMENTALS OF PHYSICS II / 3 credits/ Study of the basic principles of electromagnetism, light propagation, optics employing differential and integral calculus. Prerequisite: MTH 220 and either PHY 210 or PHY 240 or permission of professor.

General Education Objectives (proposed)

1. Students can apply critical thinking to pose and answer questions.

2. Students can use the processes and methods of science and mathematics to demonstrate how reproducible results give rise to the discovery of fundamental laws and the development of theories.

3. Students can articulate a basic knowledge of current scientific understanding of the universe and the scientific and mathematical laws that govern it.

4l Students can summarize, interpret, analyze, and critically evaluate data and reports relating to the natural sciences and mathematics.

Integration with MTH220: the math prerequisite is appropriate for this course. Differentiation involves polynomials and trigonometric functions and limited partial integration together with the gradient operator. Integration involves normal integration from MTH210, but additionally includes simplified surface integration and line integration. These topics are covered in MTH220 and more extensively in MTH230, and with permission of the professor, the two courses (PHY250 and MTH220) can be concurrently taken. Although students extensively use Gauss's law and Ampere's law in integral form, the mathematical treatment of these topics is less full-blown than one would find in a course with students having an extensive background in MTH230. When more advanced techniques are required, the students are provided with the mathematical background necessary.

A non-exhaustive list of intended learning outcomes follows

Integration with MTH 220: the math prerequisite is appropriate for this course. Differentiation involves polynomials and trigonometric functions and limited partial integration together with gradient operator. Integration involves normal integration from Mth210 but additionally includes simplified surface integration and line integration. These topics are covered in MTH220 and more extensively in MTH230, and with permission of professor, the two courses (phy250, mth220) can be concurrently taken. Although students extensively use Gauss's law and Ampere's law in integral form, the mathematical treatment of these topics is less full-blown than one would find in a course with students having an extensive background in MTH230. When more advanced techniques are required, the students are provided with the mathematical background necessary.

(a) Ability to understand electrostatic and magnetostatic units and definitions and conservation of charge.
(b) Ability to obtain resultant forces through application of Coulomb's law for discrete and simple continuous charge distributions.
(c) Ability to perform algebraic analysis to find the net electrostatic force resulting from superposition of distributions of several discrete charges and for simple continuous charge distributions.
(d) Ability to understand the connection between electrostatic force and electrostatic field, and to recognize the physical reality of the electric field.
(e) Ability to obtain electric fields from application of Gauss's Law[8] in integral form to regionally constant charge distributions and to charge distributions which vary as a function of position.
(f) Ability to understand electrostatic field maps and to be able to sketch such maps for simple charge distributions.
(g) Ability to understand and perform calculations involving electrostatic potential energy and electrostatic work.
(h) Ability to understand the connection between electric potential and electric potential energy.
(i) Ability to understand and mathematically analyze the connection between electric potential and electric field in the case of potentials which vary as some general function of position.
(j) Ability to obtain the capacitance of a system from fundamental considerations and to be able to expand this to linear dielectrics.
(k) Ability to obtain the energy density and total energy of a parallel plate capacitor.
(l) Ability to analyze the effect of electrostatic and magnetostatic fields upon the motion of a charged particle.
(m) Ability to understand motion of a magnetic dipole in an external magnetic field.
(n) Ability to obtain magnetic fields from simple current distributions using Ampere's Law in integral form. Application of the law of Biot-Savert to simple geometries for magnetostatic field calculation[9].

(o) Ability to perform calculations of induced magnetic field from Faraday's Law in simple situations and also in situations where the analysis is not possible for non-calculus students (including inductance, self inductance and mutual inductance).
(p) Ability to obtain the magnetostatic energy density and total energy of an ideal solenoid.
(q) Ability to perform calculations involving the following circuits: Series RC, Series RL, Series RLC. As part of this, students are required to be able to work with circuits where real impedances can be calculated[10]. Ability to apply Kirchoff's circuital laws[11].
(r) Ability to perform calculations involving Snell's law for optics and to subsequently have the ability to understand chromatic aberration in actual lens systems.
(r) Ability to perform thin lens equation calculations to obtain results related to the characterization of resultant image formation.
(s) Ability to perform spherical mirror calculations to obtain results related to the characterization of resultant image formation.
(t) Ability to perform multiple thin lens calculations to analyze simple optical systems.
(u) Exposure to the theoretical basis for the thin lens equation, the spherical mirror equation, Snell's law and ray tracing.
(v) Ability to recognize critical angle and Brewster angle applications and to perform calculations with each and polarization effects.
(w) Ability to understand and perform calculations involving thin film interference.
(x) Ability to understand and perform calculations involving single slit interference, multiple slit interference and diffraction gratings. Ability to understand and perform calculations related to the theoretical basis for limitations of resolution powers of thin lenses and diffraction gratings.
(y) Exposure to the basis for the unification of electrodynamics, magnetism and optics based upon Maxwell's equations. Exposure to the differential forms of Maxwell's equations. Identification of the needed modifications to Ampere's law for electrodynamics and magneto dynamics (the displacement current).
(z) Exposure to the connections and continual reference to the basis for understanding the unification between classical electrodynamics, magnetism and optics (Phy250) and classical mechanics and thermodynamics (Phy240).