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Textbook: Physics for Scientists and Engineers.  
Serway and Jewett, Sixth Edition.  
Web page:: <http://www.pa.uky.edu/~gorringe/phy232/>

## PHY232. Electricity, Magnetism and Light. Fall 2007.

### 1 Course description.

PHY232 is the second semester of a two semester sequence in introductory physics for science and engineering students. PHY231 covers classical mechanics while PHY232 covers electricity, magnetism and light.

Lightning bolts and electric eels are two examples of the remarkable power of the electromagnetic force. The beginning of the scientific study of electromagnetism is credited to the ancient Greeks and their discoveries of the “marvelous attraction” of lodestone (an example of magnetism) and amber (an example of electricity). Little progress on electromagnetism was made during the dark ages and the middle ages, but beginning in the 17<sup>th</sup> century with a trickle of findings, and culminating in the 19<sup>th</sup> century with a rush of understanding. the theory of electromagnetism was uncovered. Matter is comprised of building blocks whose electrical charges and magnetic poles give rise to the rich, diverse and surprising properties of materials. The ability to generate electrical currents from motion, and generate motion from electrical currents, was responsible for turning a curious phenomena into a cornerstone of the modern age. The recognition that light was a self-sustaining vibrating bundle of electromagnetic waves answered one of natures most perplexing puzzles.

Understanding electromagnetism isn't about remembering lots of facts, equations, *etc* – it's about applying basic concepts and fundamental principles to a rich variety of physical phenomena. Electromagnetism is also not mathematics – while algebra, calculus and trigonometry are important (the course prerequisites are MA113, MA114 and MA213) – your success is determined by your understanding and your application of fundamental physical concepts to different physical problems.

## 2 Course format.

PHY232 comprises three lecture classes per week and one recitation class per week. The lectures classes are on Mondays, Wednesdays and Fridays in CP153 at 9:00–9:50 am and the recitations classes are on Thursdays. Please read the entire syllabus carefully – if you have questions about the structure or the administration of the course you will probably find the answer here.

Lecture time will be mostly devoted to the development, discussion and demonstration of the underlying physical principles of electricity, magnetism and light. Try to focus on the concepts and their application, not memorizing the formulas and plugging in numbers. Before each lecture you should read the assigned material that is listed in the course schedule.

Recitation time will be mostly devoted to the illustration of problem solving techniques and the sharpening of problem solving skills, *i.e.* how to apply the physical concepts to real problems. Your recitation instructor will work-out sample problems from the weekly homework assignments and answer your questions and queries on the weekly homework material. Before each recitation you should have attempted all the assigned problems from the weekly homework. The recitation is the student’s primary resource for interactive PHY232 instruction. Make sure to remember your recitation section number and your recitation instructor’s name.

## 3 Course grade.

Your course grade will be determined according to the following table:

Hour exams	2×100
Final exam	200
Online homework	100
Lecture quizzes	100
Recitation quizzes	100
Evaluation bonus	10
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Total	710
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An overall score of 90% or above will guarantee an A-grade, 80% or above will guarantee a B-grade, and 70% or above will guarantee a C-grade. Detailed information on the examinations, online homework, lecture quizzes and recitation quizzes is given below.

To succeed in PHY232 you must read the section assignments before each lectures classes and attempt the homework assignments before each recitation classes. Anticipate spending ten or more hours a week outside the classroom on reading and homework. Take an active role in the learning process – ask questions to yourself and your class-mates. Talk with your recitation instructor, laboratory instructor, or lecturer if you don’t understand something. When you read the textbook, identify the main concepts and their consequences. When you solve the problems, write down your solutions in a clear step-by-step manner.

### 3.1 Exam grades (2 × 100 points + 200 points).

The scheduled dates/times and relevant material for the hour exams and the final exam are given in the schedule at the end of this syllabus.

Each hour exam will comprise a multiple choice section and three problems. The multiple choice section will contain both true/false questions and multiple choice questions for a total of 25 points. The three problems are each worth 25 points for a total of 75 points. The grand total is 100 points per hour exam. For full credit on problems all working out – including relevant concepts, diagrams, equations, *etc* – must be clearly shown. The final examination is a comprehensive exam on the entire course material. The two-hour final exam is worth 200 points with a similar format to the one-hour exams.

During the hour exams and the final exam you are not allowed to consult text books, reference books, or class notes. An equation sheet containing relevant formulas and physical constants will be provided with each exam, *i.e.* memorization of constants and equations is unnecessary. You must bring your own calculator.

### 3.2 Homework grade (100 points).

Every student must register with the **WebAssign online homework service** for the required weekly homework assignments. Vouchers for WebAssign access are bundled with new textbook purchases at campus area bookstores, or students can purchase WebAssign access by personal credit card at <https://www.webassign.net/v4secure/>.

To begin using WebAssign go to the login page <https://www.webassign.net/login.html>. For your WebAssign ID use your UK active directory user ID. For the institution enter *uky* in lowercase. and for the password enter *phy232f07* in lowercase. After logging-in you should change your WebAssign password.

The weekly homework cycle is as follows. Each Friday the weekly homework assignment will be available on the WebAssign site. The problems will cover material on that Friday's class and next Monday/Wednesday's classes. At Thursday's recitation your recitation instructor will work out some problems from the assignment and answer your questions on the assignment. The deadline for completing the online homework is at 5:00 pm on the Friday after the recitation.

### 3.3 Lecture grade (100 points).

You must have a **TurningPoint “ResponseCard RF”** clicker to participate in the PHY232 course and the lecture quizzes. Clickers may be purchased at campus area bookstores either as a bundle with a new textbook or separately. After obtaining a clicker each student must register the clicker by going to <http://www.pa.uky.edu/~ellis/> and following the links for “teaching” and “register your clicker”. Note each clicker uses two type CR2032 batteries.

Each lecture class will include “concept quizzes”. The concept quizzes are multiple choice questions or true/false questions on the underlying concepts in the lecture material. Each “concept quiz” is worth four point – a correct answer will receive four points, an incorrect answer will receive two points, and no answer will receive zero points. To allow for possible absences without make-up quizzes each student will receive a 20-point credit at the beginning of the semester. Your semester score from concept quizzes will be capped at a 100-point total.

### 3.4 Recitation grade (100 points).

Your recitation grade is based upon the recitation quizzes. These quizzes will cover the material on the weekly homework assignment in a style that is similar to the homework problems and the exam problems. To avoid the need for make-ups your lowest two quiz scores Your quizzes will be graded and then returned by your recitation instructor.

### 3.5 Course evaluations (10 bonus points).

Course evaluations are an important component of our Department's instructional program. An online course evaluation system was developed to allow each student ample time to evaluate each component of the course and the instruction. The evaluation window for Fall 2007 will open on Monday, November 19, and close on Wednesday, December 5. To access the system during this time, simply go the Department of Physics Web page at <http://www.pa.uky.edu> and follow the link for course evaluations. You will need to use your student ID number to log into the system, and this will also allow us to monitor who has filled out the evaluation. However, when you log-in you will be assigned a random number that will keep all your comments and scores anonymous. Note 10 bonus points are given to each student on completing the online evaluation.

## 4 Excused absences, etc.

If you miss a hour exam with a valid excuse, you will receive a score based on the average of your other tests and the final. If you miss two tests with a valid excuse, you will receive an incomplete (I). Examples of excusable absences are (University Senate rule 5.2.4.2): (i) Illness of the student or serious illness of a member of the student's immediate family, (ii) the death of a member of the student's immediate family, (iii) trips for student organizations, university classes, and intercollegiate athletics. Each case requires written verification. When feasible the student should notify the instructor prior to the absence, and never more than one week after the absence. "Falling behind" and "sleeping in" are not valid excuses.

Lastly, cheating on exams and copying of homework are very serious academic offenses. Offenders are subject to punishment in accordance to University Senate rules section 6.3 and 6.4.

## 5 Where to get help?

- **Help desk:** Teaching assistants will answer physics questions at the physics help desk in microcomputer laboratory (CP 148).
- **Chem-Phys library:** You can find course materials (homework solutions, old examinations etc.) on reserve in the Chem-Phys library (CP 150). You can also find other physics textbooks.
- **Bulletin board:** Solutions to homework and examinations will be posted in the PHY232 bulletin board (between rooms 250 and 252 in the Chem-Phys building).
- **Your instructors:** Feel free to talk with your course instructors on physics problems. All instructors have office hours, or you can see them by appointment.

DATE	MATERIAL	READING ASSIGNMENTS	HOMEWORK ASSIGNMENTS
W Aug 22	Positive and negative charges, conducting and insulating materials, and charge conservation	23.1–2	
F Aug 24	Coulomb’s Law and superposition principle	23.3	
M Aug 27	The electric field and point charge assemblies	23.4	
W Aug 29	The electric field and continuous charge distributions	23.5	
F Aug 31	Lines of field	23.6	HW#1, 5pm
M Sep 3	Labor Day Holiday		
W Sep 5	Motion of charged particles under electric forces	23.7	
F Sep 7	Symmetry and geometry, electric flux and Gauss’ Law	24.1–2	HW#2, 5pm
M Sep 10	Examples of Gauss’ law with charge distributions	24.3	
W Sep 12	Examples of Gauss’ law with electrical conductors	24.4–5	
F Sep 14	Energy and force, electric potential and electric field	25.1-2	HW#3, 5pm
M Sep 17	Examples of calculating electric potentials and electric fields of charge distributions	25.3-5	
W Sep 19	Examples of calculating electric potentials and electric fields of charge distributions	25.3-5	
F Sep 21	Electrical conductors and electrical potentials	25.6	HW#4, 5pm
M Sep 24	<b>Test One</b> , Chap. 23,24,25		
W Sep 26	Capacitors and charge storage	26.1-2	
F Sep 28	Examples of capacitors, networks of capacitors	26.2-3	HW#5, 5pm
M Oct 1	Capacitors and energy storage	26.4	
W Oct 3	Capacitors and dielectric materials	26.5-7	
F Oct 5	Understanding of electrical currents, electrical resistance, and electrical power	27.1-3,6	HW#6, 5pm
M Oct 8	Ohms Law and examples of simple circuits	28.1-2	
W Oct 10	Kirchoff’s Rules and examples of complex circuits	28.3	
F Oct 12	RC circuits and electrical instruments	28.4–5	HW#7, 5pm

DATE	MATERIAL	SECTION ASSIGNMENTS	HOMEWORK ASSIGNMENTS
M Oct 15	Magnetic forces, magnetic fields and moving charges	29.1	
W Oct 17	Magnetic forces, magnetic fields and current carriers	29.2–3	
F Oct 19	Moving charged particles in magnetic fields	29.4–5	HW#8, 5pm
M Oct 22	Biot-Savart law for magnetic fields and applications	30.1–2	
W Oct 24	Ampere’s law for magnetic fields and applications	30.3–4	
F Oct 26	More illustrations of Biot-Savart’s and Ampere’s laws	30.1–4	HW#9, 5pm
M Oct 29	<b>Test Two</b> Chap. 26, 27, 28, 29, 30		
W Oct 31	Introduction to induction	30.5, 31.1	
F Nov 2	Examples of motional emfs	31.2-6	HW#10, 5pm
M Nov 5	Examples of transformer emfs	31.2-6	
W Nov 7	Inductors	32.1	
F Nov 9	RL circuits and electromagnetic energy	32.2-3,5	HW#11, 5pm
M Nov 12	LC circuits and electromagnetic energy	32.2-3,5	
W Nov 14	Maxwell’s equations and electromagnetic waves	31.7, 34.1-6	
F Nov 16	Maxwell’s equations and electromagnetic waves	31.7, 34.1-6	HW#12, 5pm
M Nov 19	Reflection and refraction	35.1-6	
W Nov 21	Thanksgiving break		
F Nov 23	Thanksgiving break		
M Nov 26	Geometrical optics and mirrors	36.1-2	
W Nov 28	Geometrical optics and lens	36.3-4	
F Nov 30	Physical optics and interference	37.1-3,6	HW#13, 5pm
M Dec 3	Physical optics and diffraction	38.1-3,4	
W Dec 5	polarization	38.6	
F Dec 7	Review		HW#14, 5pm
8:00am F Dec 14	<b>Final</b>	all material	