

Physics 212: General Physics II: Electricity and Magnetism

Syllabus

Instructor: Dr. Michael R. Gallis

Office Hours: MWF 1-1:50
R 2-2:50
or by appt

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Calculus-based introduction to classical electricity and magnetism, including such topics as, electric charge and electric fields, Gauss's law, electric potential, capacitance, current, resistance, and circuits, magnetic fields, and fields due to currents, induction and inductance, magnetism of matter, Maxwell's equations, and electromagnetic oscillations.

This course is designed to provide students with a working knowledge of the elementary physics principles mentioned above, as well as their applications, and to enhance their conceptual understanding of physical laws. Students attend two lectures, one recitation session, and one two-hour lab/activity period per week. Use of a combination of computer-based and traditional lab exercises is expected and collaborative learning exercises will be used in both lab and recitation settings. The introduction of data acquisition and analysis methods (often making use of modern computer tools) will be stressed in the laboratory/activity period.

The course is an important prerequisite for later work in many science and engineering disciplines.

-Penn State Undergraduate Degree Bulletin

Course Objectives

Develop understanding the concepts in electricity and magnetism, reinforce general problem solving skills and reinforce conceptual understanding through the use of problem solving skills.

Prerequisite: [MATH 140](#), [PHYS 211](#) Concurrent: [MATH 141](#)

The materials needed for this course are the same as those required for the prerequisite Physics 211. The text is University Physics by Young and Freedman, 13th edition (with Modern Physics, ISBN-10: 0321696867). The student is also required to have a TI-89 calculator or the equivalent (capable of scientific functions, solving simultaneous equations, and graphing functions). Physics 211 is a prerequisite for this course: knowledge of the material presented there is assumed. Math 140 is a prerequisite for Math 141, which is a corequisite: knowledge of the material presented those math courses to the level presented is also assumed. Some important material to be reviewed is indicated below, but the student should not feel constrained to limit review to this extent.

The Penn State Principles:

- I will respect the dignity of all individuals within the Penn State community
- I will practice academic integrity.
- I will demonstrate social and personal responsibility.
- I will be responsible for my own academic progress and agree to comply with all University policies.

Physics 212 provides an excellent opportunity to live the Penn State Principles to maximize your educational experience as you work in a collaborative learning environment.

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Expectations

As with any university course, student preparation is *essential*. The student is expected to read the material in the text before the corresponding lecture, and is expected to review the appropriate material, including handouts, before lab. The student is expected to attend every class, and will be held responsible for all work covered in the course. Students are expected to work every assigned problem **as a minimum**. There may be some additional homework problems assigned during the class.

Failure to take a scheduled exam will result in a grade of zero. Make-up exams will be given only in the event of illness (confirmed by a physician) or death in the immediate family. Lab reports are due at the beginning of lab, one week after the completion of the experiment (labs turned in after this time may be assessed an escalating late penalty). Missed labs must be made up (it is the *students* responsibility to see that arrangements are made), and any missing lab reports will result in the student receiving an F for the course. Missed quizzes will receive a grade of 0, and may not be made up (the student's lowest quiz grade will be dropped before calculation of their quiz average). Students will be supplied an equation sheet (consisting largely of equations from the relevant chapter summaries) for each exam to aid the student in remembering complex equations. A copy of the equation sheet is available to the students as part of the note packets and is also available on line. Physical constants needed for exams will be provided by the instructor. It is strongly advised that the students use the equation sheets as they do the homework, so that they are familiar with the equations and their appropriate use. Sample test questions are also available in the note packets and on line.

Academic Integrity

Students are expected to maintain the highest level of academic integrity, and maintain professional standards of conduct. The University's academic policy statement can be found at

<http://www.psu.edu/ufs/policies/47-00.html#49-20>

and the University's Code of Conduct can be found at

<http://www.sa.psu.edu/ja/conduct.shtml>.

Disability Services

Students with disabilities, whether physical, learning, or psychological, who believe that they may need accommodations in this class, are encouraged to contact Disability Services as soon as possible to ensure that such accommodations are implemented in a timely fashion. Please schedule an appointment to meet with the Disability Services Liaison (570-385-6127) to verify your eligibility for any classroom accommodations and for academic assistance related to your disability. The Office of Disability Services is located in the Counseling Office, Room 106, Student Services Building.

Grading Policy:

1. The grade will be determined by three midterm exams (100 points each), a 200 points *comprehensive* final , a 100 point laboratory grade based upon the laboratory reports, and a 100 point quiz/homework grade.
2. Grades will be *strictly* determined by standard cutoffs (90% for an A, 80% for a B, ...), where plus/minus grades are assigned as a refinement of this scale.

(Strongly) Suggested Review Topics:

Vectors	Motion (straight line and in a plane)
Newton's Laws	Work, energy and conservation of energy
Gravitation	Periodic Motion

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Physics 212 Course Outline

Exercises and Problems

Chapter	Problem
21 Electric Charge and Electric Field	Q 1-3,5,8,17,18,20 E 1,7,15,28,33,35,44,47,52,58,68,73,86
22 Gauss's Law	Q 2-5,8,9 E 6,8,12,14,21,28,39,47
23 Electric Potential	Q 2,8,9,18 E 3,4,19,20,39,41,45,46,56,57,63,64,67,85

Exam I

24 Capacitance and Dielectrics	Q 1,6-11 E 3,5,15,17,22,38,42,57,64-66
25 Current, Resistance and Electromotive Force	Q 1,4,6,7,11,12,17,23 E 3,6,17,26,39-41,58,69,70,80
26 Direct Current Circuits	Q 1,2,5-7,10,13,14,19,21 E 2,5,10,13,16,22,26,36,40,56,61,64,81

Exam II

27 Magnetic Field and Magnetic Forces	Q 1-4,6,8,14 E 1,6,15,16,23,30,33,38,41,46,53,54,56-58,68,74
28 Sources of Magnetic Field	Q 1,3,5,9,14 E 2,3,14,17,21,24,31,38,45,48,51,68,69,80
29 Electromagnetic Induction	Q 2,3,6,7,9,13 E 2,3,7,17,19,27,53,59,60

Exam III

30 Inductance	Q 5,6,13 E 1,8,11,12,16,20,32,32,35,36,43,48
31 Alternating Currents	Q 5,8,12,13,16-18 E 4-6,14,15,21,30,31,35,36,51,52
32 Electromagnetic Waves	Q 3-5,7,9,11,13 E 1,13,19,26,30,31,41,43,54,55

Final

Laboratory Experiments

1. Electric Charge
2. Electric Field Plotting
3. Capacitance
4. Current Voltage Characteristics
5. Wheatstone Bridge
6. Power Transfer in a DC Circuit
7. Force on a Conductor
8. Mag Field of a Straight Wire
9. The RC, LR Circuits
10. AC circuits
11. Speed of Light

(addition/modification of labs is at the discretion of the instructor)