

PHYSICS 208 Fall 2018

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Course website: <http://people.physics.tamu.edu/etanya/P208/P208.htm>

Office hours: MW- 1:30-3:00 or by appointment

There will be weekly help sessions and the evening help desk. Please check the website for updates.

Meeting times and location:

Lecture MWF 9:10 – 10 a.m. MPHY 204

Section 501 Recitation M 11:00-12:20 pm in MPHY 335; lab M 12:30-1:50 pm in MPHY 212

Section 502 Recitation M 12:30-1:50 pm in MPHY 334; lab M 2:00-3:20 pm in MPHY 211

Section 503 Recitation T 8:00-9:20 am in MPHY 335; lab T 9:30-10:50 am in MPHY 212

Section 504 Recitation W 5:00-6:20 pm in MPHY 335; lab W 6:30-7:50 pm in MPHY 212

Section 505 Recitation R 9:30-10:50 am in MPHY 335; lab R 11:00-12:20pm in MPHY 212

Exam1 T Sept. 25 at 7:00pm

Exam2 T Oct. 23 at 7:00pm

Exam3 T Nov. 27 at 7:00pm

Final M Dec. 10, 8:00-10:00am in MPHY 204

Textbook: “Don’t Panic: Volume II”, by William H. Bassichis, 5th Edition

We will use clickers for various kinds of assessment: pop quizzes, homework quizzes, in class discussion, etc.

WebAssign is required for the labs.

Prerequisites: PHYS 218; MATH 152 or MATH 172

Goal: Master the fundamentals of physics to open the way to understanding subsequent courses in physical science and engineering.

TENTATIVE SCHEDULE

Week (tentative dates)	Topic	Learning Objectives
Aug. 27	Mechanics Review Coulomb’s Law	Polar coordinates, potential functions Force between charged particles

Sept. 3	Electric Forces Electric Fields	Systems of particles Concept of a field
Sept. 10	Electric Potentials	Electric potential, voltage for systems of charges
Sept. 17	Gauss's Law	Derivation of Gauss's Law starting with Coulomb's Law
Sept. 24	EXAM I Applications of Gauss Capacitors	Symmetric distributions, conductors and insulators, capacitance
Oct. 1	Current Ohm's Law	Definition of current, macroscopic and microscopic form of Ohm's Law
Oct. 8	Simple Circuits	Solution of time independent circuits with resistors, batteries and capacitors
Oct. 15	Magnetic Forces	Forces on charges and current carrying wires in magnetic fields
Oct. 22	EXAM II Magnetic Fields	Sources of magnetic fields, Ampere's Principle
Oct. 29	Ampere's Law	Derive and apply Ampere's Circuital Law
Nov. 5	Induced EMF Inductance	Define inductance. Induced electromotive force. Faraday's Law
Nov. 12	Time Dependent Circuits	Application of Faraday's Law to time dependent circuits
Nov. 19	Time Dependent Circuits	Continue study of time dependent circuits
Nov. 26	EXAM III Maxwell's Equations Waves	Introduce Maxwell's modification and obtain the wave equation. Speed of light
Dec. 3	Review	Review
Dec. 10, 8 – 10 am	FINAL EXAM	

COURSE POLICIES

- 1) It is your responsibility to determine what material is being covered each class and the dates of all exams
- 2) Team work is encouraged outside of class but not on exams
- 3) You should expect a quiz each class
- 4) No calculators or notes are permitted on exams
- 5) Makeup exams are only for University excused absences (see Student Rule 7 for details <http://studentrules.tamu.edu/rule07>)
- 6) You should come to lecture having read about the topic and tried problems
- 7) You should come to recitation with questions on problems

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Grading: Exams 50%, Lab 5%, Quizzes 5%, Final 40%

Scale: 90-100 A, 80-89 B, 60-79 C, 45-59 D, <45 F. Grades may be adjusted upward.

You must pass both the lecture (3 midterm exams, final exam, homework) and laboratory parts of the course in order to pass the course. If your grade on the Final Exam is higher than your lowest grade on one of the three exams during the semester, the grade on the Final will replace that one lowest exam grade in computing the course grade (it will only replace one grade in case of two exams having the same lowest grade). The Final Exam grade cannot be used to replace an exam that has been missed without a University excused absence. The missed exam will count as a zero when computing your final grade.

LEARNING OUTCOMES

Week 1 Mechanics Review and Coulomb's Law

- a. Calculate the potential energy function for various conservative forces in Cartesian coordinates
- b. Calculate the potential energy function for gravity in polar coordinates
- c. Calculate the Coulomb force exerted on a charged particle by other charged particles, using Coulomb's Law and Superposition

Week 2 Electric Forces and Fields

- a. Define vector fields
- b. Calculate the gravitational field from Newton's Law of gravity
- c. Calculate the electric field produced by a point charge
- d. Calculate the force on a charge due to a continuous distribution of charges
- e. Calculate the electric field produced by various charge distributions

Week 3 Electric Potential Functions

- a. Determine the electric potential function for simple electric fields in Cartesian coordinates
- b. Determine the electric potential function due to a single charge
- c. Determine the electric potential function due to a collection of charges

- d. Determine the electric potential function due to a continuous distribution of charges
- Week 4 Derivation of Gauss's Law
- a. Define the area vector
 - b. Define solid angles and the total solid angle
 - c. Calculate electric flux for simple fields and surfaces
 - d. Calculate the contributions to flux for a single charge enclosed in an arbitrary surface
- Week 5 Applications of Gauss's Law and Capacitors
- a. Determine the symmetry of the electric field for the three soluble geometries
 - b. Determine the appropriate Gaussian surface to evaluate the flux
 - c. Distinguish the difference between perfect insulators and perfect conductors
 - d. Determine the appropriate charge inside a Gaussian surface for the two cases
 - e. Combine the calculation of fields and potential functions to derive the capacitance of the three soluble systems
 - f. Analyze circuits with capacitors and batteries
- Week 6 Current and Ohm's Law
- a. Define current and gain qualitative understanding of resistivity, resistance, and Ohm's Law
 - b. Obtain microscopic form of Ohm's Law in terms of current density vector
 - c. Derive drift velocity
- Week 7 Simple, Time Independent Circuits
- a. Obtain Kirchhoff's Laws from Conservative Nature of electric fields and conservation of charge
 - b. Analyze time independent circuits with batteries, capacitors and resistor
- Week 8 Magnetic Fields
- a. Consider phenomena leading to introduction of magnetic fields
 - b. Calculate the motion of charged particles in magnetic and electric fields
 - c. Find the magnetic force on a current carrying wire
- Week 9 Ampere's Circuital Law
- a. Apply Ampere's Principle to infinitely long thin wire
 - b. Apply Ampere's Principle to a current carrying loop
 - c. Evaluate magnetic flux through a surface
 - d. Verify Ampere's Circuital Law for simple paths
 - e. Apply the Circuital Law to simple situations, e.g. coaxial cable
- Week 10 Induced EMF and Inductance
- a. See the need for introducing induced EMF by a demonstration
 - b. Calculate the time derivative of magnetic flux for various situations
 - c. Understand the non-conservative nature of the resulting electric field
- Week 11 More Inductance and Simple Time Dependent Circuits
- a. Analyze RL circuits
 - b. Analyze RC circuits, ignoring L
- Week 12 Time Dependent Circuits
- a. Analyze RLC Circuits with batteries
 - b. Analyze RLC circuits with time varying power supplies

- c. Compare RLC circuits with forced, damped harmonic oscillator
- d. Understand the origin of resonances

Week 13 Maxwell's Equations

- a. Analyze a charging capacitor to see the need for displacement currents
- b. Demonstrate the resulting consistency of Ampere's Law with displacement currents included
- c. Demonstrate the effect of including displacement current in conservation of charge equation
- d. Obtain the differential form of Faraday's Law and Ampere's Law in vacuum

Week 14 Electromagnetic Waves

- a. Obtain the wave equation from Maxwell's Equations
- b. Demonstrate that a sinusoidal electric and magnetic field satisfy the wave equation
- c. Calculate the resulting wavelength, frequency relations
- d. Determine the velocity of propagation of the wave, the speed of light.

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit <http://disability.tamu.edu>.

The Aggie Honor Code is "*An Aggie does not lie, cheat, or steal or tolerate those who do.*" For more information, refer to the Honor Council Rules and Procedures on the web at <http://aggiehonor.tamu.edu>