

# Ambrose University College

Winter 2011

## **PHY 123 – Introductory electromagnetism, Fluids and Thermal Physics**

**Instructor:** Dr. L. Braverman  
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**Course Description:** Topics include: Hydrostatics, Pressure and density, Archimedes' principle, apparent weight, floating; Thermal Physics: Temperature, heat and the First Law of Thermodynamics, Thermal expansion, The Kinetic Theory of Gases, Ideal and real gases, PVT diagrams; Electric charge and Electric field, Coulomb's Law, Electric potential, potential energy; capacitance. Electric current, resistance, Ohm's Law, Circuits, work, energy and Emf; Magnetic fields, Hall Effect, magnetic force on a current, Magnetic field due to a current, Ampere's Law, Induction and Inductance, Lenz's Law.

Physics Laboratory I: Experimental techniques, data collection, graphical analysis and report writing; Application to experiments in mechanics, thermodynamics and electromagnetism.

**Prerequisite:** Physics 211 (or equivalent with consent of the department).

**Textbook:**

Walker, J: Fundamentals of Physics, 8<sup>th</sup> or 9<sup>th</sup> ed. John Wiley and Sons, Inc. Part 2 and 3  
Textbook website: <http://www.wiley.com/college/hrw>

**Grading:**

There will be a short quiz every other week, one midterm and one final examination.

Quizzes	20%
Labs	15%
Midterm:	25%
Final:	40%

Student grades are earned according to the policy of the college.

**Tentative Lecture Plan:**

<b>Week</b>	<b>Topics</b>	<b>Reading</b>
<b>1</b>	Hydrostatics. Pressure, Archimedes' principle, apparent weight, floating.	14.1 – 14.7
<b>2</b>	Temperature, Heat, Internal energy and the first law of thermodynamics.	18.1 – 18.12, lecture notes
<b>3</b>	The kinetic model of gases	19.1 – 19.11, lecture notes
<b>4</b>	Electric charge; Coulomb's Law; Charge Conservation Law.	21.1 - 21.6
<b>5 –6</b>	Uniform electric field: Parallel-plate capacitor. Work, electric potential energy. Electric potential. Calculating the potential from the field. <b>Midterm Test</b>	22.1 – 22.9, lecture notes 24.1 – 24.12
<b>7</b>	Gauss' Law (optional). Capacitance and Capacitors, series and parallel connection of capacitors. Energy stored in the electric field.	23, 25.1 – 25.5, lecture notes
<b>8 – 9</b>	Current and resistance; Circuits, Emf.	Lecture notes, 26.1 – 26.9, 27.1 – 27.8, lecture notes
<b>10</b>	Magnetic fields. Field lines. The Lorenz force. Applications, e.g. mass spectrometer, velocity selector, cyclotron.	28.1 – 28.8, lecture notes
<b>11</b>	Magnetic fields produced by currents: straight-line current, circular loop, solenoid. Forces between parallel currents, Ampere's Law.	29.1 – 29.5, lecture notes
<b>12 - 13</b>	Induction and Inductance. Faraday's Law of induction, Lenz's Law. Review.	30.1 – 30.8, lecture notes