# PHYSICS 9HD: Fall 2010, MWF 10:00-10:50, Physics 148

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**TEXT:** *Electricity and Magnetism* by Edward Purcell.

The text is now out of print, but copies have been made and will be available at the campus bookstore.

Students are responsible for all sections of the text assigned in the schedule below, whether or not covered in class, and, IN ADDITION, all lecture material which is not covered in the text. Be alert for possible alterations to schedule. We will cover Chapters 1-9, **except** sections 4.4-4.6, 6.3, and 7.7.

**Tentative SCHEDULE FOR READING AND LECTURES — 9HD**

| Lecture | Day | Date | Topic | Reading (Purcell) |
|---|---|---|---|---|
| 1 | Fri. | Sept. 24 | Coulombs' Law, Electric Field | 1.1-1.4 |
| 2 | Mon. | Sept 27 | Electric potential energy, integrating to find $\vec{E}$ field | 1.5 -1.8 |
| 3 | Wed. | Sept. 29 | Flux and Gauss's Law | 1.9-1.13 |
| 4 | Fri. | Oct. 1 | Force on charge layer, energy in electric field, electric potential | 1.14-1.15, 2.1-2.6 |
| 5 | Mon. | Oct. 4 | Divergence, Laplacian | 2.7-2.12 |
| 6 | Wed. | Oct. 6 | Curl, Stokes Theorem | 2.13-2.16 |
| 7 | Fri. | Oct. 8 | Electric conductors | 3.1-3.2 |
| 8 | Mon. | Oct. 11 | Uniqueness Theorem, Method of images | 3.3-3.4 |
| 9 | Wed. | Oct. 13 | Capacitance | 3.5-3.8 |
| 10 | Fri. | Oct. 15 | Capacitors in circuits | |
| 11 | Mon. | Oct. 18 | Electric current, Ohm's Law | 4.1-4.3 |
| 12 | Wed. | Oct. 20 | DC circuits, Kirchoff's Laws | 4.7-4.10 |
| 13 | Fri. | Oct. 22 | Variable currents | 4.11 |
| 14 | **Mon.** | **Oct. 25** | **Midterm 1** | **Chapters 1-3** |
| 15 | Wed. | Oct. 27 | Special relativity, moving charges | Appendix A, 5.1-5.4 |
| 16 | Fri. | Oct. 29 | Electric fields of moving charges | 5.5-5.7 |
| 17 | Mon. | Nov. 1 | Fields and forces of moving charges | 5.8-5.9 |
| 18 | Wed. | Nov. 3 | Forces on currents-carrying wires, magnetic fields | 6.1-6.2 |
| 19 | Fri. | Nov. 5 | Using Ampere's Law to find magnetic field from wire, coil, solenoid, torus | |
| 20 | Mon. | Nov. 8 | Biot-Savart Law | 6.4-6.6 |
| 21 | Wed. | Nov. 10 | Lorentz transformation of $\vec{E}$ and $\vec{B}$ fields, Hall effect | 6.7-6.9 |
| 22 | Fri. | Nov. 12 | Electromagnetic induction | 7.1-7.5 |
| 23 | Mon. | Nov. 15 | Mutual inductance, self inductance, energy in $\vec{B}$ field, circuit with self-inductance | 7.6-7.7 (result only), 7.8-7.10 |
| 24 | Wed. | Nov. 17 | A.C. circuits | 8.1-8.4 |
| 25 | **Fri.** | **Nov. 19** | **Midterm 2** | **Chapters 4-6** |
| 27 | Mon. | Nov. 22 | More A.C. circuits, displacement current | 8.5, 9.1-9.2 |
| 28 | Wed. | Nov. 24 | Maxwell's equations | 9.2-9.4 |
| | **Fri.** | **Nov. 26** | **Thanksgiving Holiday** | |
| 29 | Mon. | Nov. 29 | Electromagnetic waves, energy transport in waves | 9.4-9.7 |
| 30 | Wed. | Dec. 1 | Polarization of light | |
| 31 | Fri. | Dec. 3 | Quarter Review | |
| | **Wed.** | **Dec. 8** | **Final Exam, 10:30am-12:30pm, Physics 148** | **Chapters 1-9** |

**EXAMS:**

There are two midterms and one final examination. See schedule given above. Each midterm will be given during a class period and will be 50 minutes in length. The final exam is 2 hours in length and will be comprehensive, covering all of the material in the course. No makeups are available on the midterms. If you have an excused absence from a midterm, the grading will be arranged to weight the remaining midterm and the final examination more heavily.

The final exam is scheduled on December 8, 10:30 a.m. - 12:30 p.m. in Physics 148.

For each midterm examination, you will be permitted to bring one sheet of 8 1/2 x 11 inch paper with formulas and information which you have written or typed on both sides (but not reduced photocopies of problem sets, notes, or the midterm review summary sheet). You should also bring your calculator to do arithmetic. No laptops, notebook computers, ... allowed. Plain white paper for the exams will be provided. The same rules apply to the final examination, but you may bring THREE sheets of formulas as described above.

Answers to exam questions must show the basic principles used in the solution. All work for problems must be shown on the exams. **Answers without explanation or with unreadable/disorganized explanations and/or steps will not receive credit, even if correct.**

**DISCUSSION/LABORATORY**

**TA: Alexander Saw**

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There is a mandatory discussion/laboratory. Discussions will be on Tuesdays and laboratories on Thursdays. Discussions begin on Tuesday Sept. 28 and laboratories on Thursday Sept. 30. They continue throughout the quarter, except there is no lab on Thanksgiving day. Both the discussions and the laboratories will be in Roessler 166. The schedule of laboratories is below.

**9HD Lab Schedule, Fall 2010, Roessler 166**

Section A01: Thursday 2:10 pm – 4:00 pm; Section A02: Thursday 4:10 pm – 6:00 pm.

| **Lab Number** | **Title/Topic** | **Date** |
|---|---|---|
| 1 | Making and Moving Charge | Sept. 30 |
| 2 | Electric Fields and Potentials | Oct. 7 |
| 3 | A Charged Capacitor | Oct. 14 |
| 4 | Simple Circuits | Oct. 21 |
| 5 | Capacitor and Changing Voltages | Oct. 28 |
| 6 | Magnetic Forces | Nov. 4 |
| 7 | Induction and Field Plotting | Nov. 11 |
| 8 | Induction in Action | Nov. 18 |
| **No Lab** | **Thanksgiving** | **Nov. 25** |
| 9 | Circuits Applied | Dec. 2 |

Grading is on a high pass, pass, low pass or fail basis. **Failing the laboratory means failing the course.** A 'pass' in the laboratory means your 9HD course grade is unaffected by your laboratory performance. A 'high pass' in the laboratory increases your course grade by 1/3 of a grade point (e.g. B increases to B+). A 'low pass' means your course grade will be reduced by 1/3 of a grade point (e.g. B decreases to B-). If your course grade is A, however, a high pass in the laboratory will not increase your grade to A+.

**9HD Discussion Schedule, Fall 2010, Roessler 166**

Section A01: Tuesday 2:10 pm – 4:00 pm; Section A02: Tuesday 4:10 pm – 6:00 pm.

**HOMEWORK**

Homework will be graded. Homework is due at the beginning of the lecture class period, usually on Fridays. No late homework will be accepted. Your lowest homework score (including at most one homework you don't hand in) will be dropped. See tentative schedule below. Solutions will be placed on my website after the due dates.

**Tentative PROBLEM ASSIGNMENTS**

| Date Due | Set # | Problem Assignment from Purcell |
|---|---|---|
| Fri. Oct. 1 | 1 | 1.3,1.5,1.6,1.7,1.8,1.11,1.16,1.24 |
| Fri. Oct. 8 | 2 | 1.18,1.20,1.30,1.33,2.1,2.8 |
| Fri. Oct. 15 | 3 | 2.4,2.7,2.14,2.15,2.19,3.1,3.5 |
| Fri. Oct. 22 | 4 | 3.6,3.10,3.11,3.12,3.14 |
| Fri. Oct. 29 | 5 | 4.1,4.8,4.17,4.20,4.21,4.22 |
| Fri. Nov. 5 | 6 | 4.15 (use Fig. 4.16, p. 152),4.25,4.32,5.1,5.5,5.8,5.15 |
| Fri. Nov. 12 | 7 | 5.6,6.2,6.3,6.4,6.5,6.12,6.27 |
| Mon. Nov. 24 | 8 | 7.3,7.4,7.7,7.9,7.14,7.15,7.17 |
| Fri. Dec. 3 | 9 | 8.3,8.7,8.13,9.1,9.5,9.9 |

You may work on the homework in groups, but it is your responsibility to write up your own solutions to the problems.

Students are encouraged to do their homework in the same format that will be acceptable for solutions on the examinations. In other words, the solutions should clearly indicate the physical principles being used and have logical steps a grader can understand, including showing which numbers are associated with which variables and where the numbers are coming from.

**GRADING:**

- Homework: 20%
- Each Midterm: 20% (for a total of 40%)
- Final: 40%

An excused midterm will cause the remaining midterm to be weighted at 40%. An unexcused midterm will cause you to lose that 20% of your possible point/grade total.

**ASSISTANCE:**

Office Hours for J. Gunion, Rm 441, Physics: Wed. 11am – 12noon; Thur. 1pm – 2pm; or by appointment. I will also usually be available immediately after class.

Office Hours for Alexander Saw, Rm 168, Roessler: Wed. 1:00pm – 2:00pm.

If there is demand, additional regular hours may be arranged.

**WEB PAGE:**

There will be a web page for the course. It will be found under the 'courses' section of my home page: `higgs2.ucdavis.edu/gunion/home.html`. Updates of this schedule will be linked just below the 9HD course section. Problem solutions, exam solutions and other materials will be linked when appropriate.