PHYS-UA 131 001 “Electricity & Magnetism” Welcome to the class!

Alexander Y. Grosberg

This course is designed to introduce the concepts of electrodynamics – one of the most fundamental branches of physics, and to teach the students to solve at least simple problems in that field.

MAJOR TOPICS TO BE INCLUDED:

1. Static electric and magnetic fields, in vacuum and in media;
2. Electrostatic problems;
3. Electrodynamics;
4. Electromagnetic waves;
5. Relativity, magnetic field as a relativistic manifestation of electricity.

This is an “ideal world” plan. In reality, because of time constraints, some of the topics will be developed to a greater depth than others.

PRE-REQUISITES

The class is designed mainly for students majoring in physics, although majors in other natural sciences, mathematics, and engineering are also welcome. No sophisticated mathematics will be used, but sufficiently mature understanding of calculus and vectors, as well as a certain level of familiarity with vector calculus is expected. No programming virtuosity is required, but simple computations may be useful. Physics II and III is usually also expected. If you are in doubt about you meeting these requirements, you are advised to see the instructor.

BOOKS AND OTHER SOURCES

There is no book which can serve as a single text for the class. Mostly we will be using “Introduction to Electrodynamics”, by David J. Griffiths; the newest is 3rd edition. We will also use as an important supplement “Electricity and Magnetism”, by Edward Purcell.

There are nearly infinitely many other good books on the subject, including classical sources such as “Classical Electrodynamics”, J. Jackson; “The Classical Theory of Fields” (Course of Theoretical Physics Series, volume 2), and “Electrodynamics of Continuous Media” (volume 8), by L.D. Landau and E.M. Lifshitz. Good students usually browse at least several of them in the library.

Additional reading from current journals may be assigned during the semester.

CONSTANTS AND UNITS

Unfortunately, units in electrodynamics is a much more involved issue than in mechanics. We will have to pay much attention to it. In particular, any answer to any question in home works or exams will be considered unsatisfactory unless units are properly indicated.

HOME WORKS

The VERY IMPORTANT part of the course will be problem solving in every week home works. The solutions of some (not all!) home works will be available on the course web site, they will be considered as a hand-out material and students will be expected to study them carefully, like a text.

In general, a significant amount of reading and thinking will be expected to succeed in class.

GRADING

Grading will be largely based on the home works. Every homework assignment will include about 5 or so problems. Every problem will be graded on the scale from 0 to 3 (0,1,2,3). That means, $3n_j$ is the maximal grade for the home work $j$ with $n_j$ problems; if you receive $\xi_{ij}$ for problem $i$ in home work $j$, where $i = 1, 2, \ldots, n$, then percentage will be computed as $x_j = \frac{\sum_{i=1}^{n} \xi_{ij}}{3n_j}$, and this will be done for every homework assignment. Homeworks will be due one week after they are handed out (i.e., placed on the Blackboard). No late homeworks will be accepted. There will be one mid-term test and the final exam. The dates for both tests will be adjusted later. Mid term test will be given in regular class time. The 3-hours final exam will be scheduled for one of the days of the finals week. Tests and exams will be graded by the same scheme as homeworks. Final overall percentage, $x$, will be chosen as the better of the three:

- average of all HW’s except the three weakest ones (65%), midterm (10%) and the final (another 25%).
- average of all HW’s (75%) except the weakest two, and the final exam (another 25%).
- average of all HWs (85%) and midterm (15%).

Final letter grade will be determined based on the percentage using the following formula: $A$ if $x \geq 0.85$; $A-$
if $0.85 > x \geq 0.8$; $B+$ if $0.8 > x \geq 0.75$; $B$ if $0.75 > x \geq 0.7$; $B-$ if $0.7 > x \geq 0.65$; $C+$ if $0.65 > x \geq 0.55$; $C$ if $0.55 > x \geq 0.5$; $C-$ if $0.5 > x \geq 0.45$; Anything below 0.45 is not a passing grade. There will be no “curve”.

**ORGANIZATIONAL MATTERS**

Office hours for the instructor: after the class or by appointment.

Class time: MW from 11:00 – 12:15, room 102. Recitation time: T 3:30-4:45, room 421