PHYS 242 EM01 - W15. Syllabus - Main Rules and Course Description

1 CONTACT INFORMATION

(I) Instructor

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- Office hours: Wednesdays from 01:00 PM to 02:00 PM. No need to make an appointment.

- Contact preferences: E-Mail. Note that I receive an average of 50 e-mails per day. Hence, it is highly appreciated if you send me e-mails only when strictly necessary.

(II) Teaching Assistants (TAs)

- (i) Ms. Carolyn T. Earnest
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- (iv) Mr. Feiruo Shen
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2 COURSE DESCRIPTION

- Calendar course description:
  Electricity and Magnetism 1
  Coulomb’s law, electric fields, Gauss’ law, potential, capacitance, properties of dielectrics, DC circuits, AC circuits

- Additional info:
  The course is taught without the aids of any slides. I believe the blackboard is the sole manner to teach a physics’ course. Feel absolutely free to ask as many questions as desired during the lectures. I do not make use of clickers, even though I tend to ask for feedback during the lectures. Do not be shy. Be aware that there is a lot of math in this course. The language of physics is math. The learning curve will be very hard. Thus, be patient and wait a few weeks before giving up on this course. It is worth mentioning that in the past several students that performed very poorly during the first few weeks of the course, scored almost perfect in the final!
  I performed several modifications to the official program. For instance, I will not cover
dielectrics and AC circuits. The main objectives of this course are a deep understanding of Maxwell’s equations and of lumped circuit elements such as capacitors, resistors, and inductors in the case of stationary currents.

3 TOPICS

(I) Electrostatic field in vacuum:
- Coulomb’s law and the superposition principle;
- Gauss’ theorem and the irrotational property of the electrostatic field.

(II) Electrostatic potential:
- Poisson and Laplace equations;
- Energy density;
- Electrostatic dipole.

(III) Conductors in vacuum:
- Conductors (and insulators);
- Electrostatic shields;
- Capacitors;
- Energy of a system of conductors.

(IV) Electrical current:
- Charges in motion and electrical currents;
- Current density and continuity equation;
- Electromotive force;
- Resistors, Ohm’s law and Joule’s law.

(V) Magnetostatic field in vacuum:
- Fundamental laws;
- Vector potential;
- Inductors.

(VI) Electromagnetic field:
- Electromagnetic induction and displacement current;
- Summary of Maxwell’s equations.

4 CALENDAR

- Lectures are on Mondays, Wednesdays, and Fridays from 08:30 AM to 09:20 AM in room PHY 313;
- Lectures start on time at 08:30 AM sharp. If you are late, enter the room from the rear not to disturb the class;
- Tutorials are on Fridays from 11:30 AM to 12:20 AM in room PHY 313;
- Tutorials will be given by TAs Ms. Earnest and Mr. Béjanin in alternate fashion. The first tutorial will be given by Ms. Earnest.
- I will be absent the entire week of March 2nd to March 6th;
- University holidays: Family Day on February 16th and Good Friday on April 3rd. This means that we will loose one lecture and 1 tutorial over the 13 weeks and 1 day of lectures. We will discuss how to make up for this lost lecture and tutorial.
### Table 1: HAs schedule

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<thead>
<tr>
<th>Hand-out</th>
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<td>January 14th</td>
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5 **ASSESSMENT**

(I) Home assignments (HAs): 20%.

(II) Midterm exam: 30%.

(III) Final exam: 50%.

While no points are given for attending the lectures, from the feedback I received in the past I believe it makes a huge difference to attend the lectures. In fact, I do not follow any textbook and my explanations at the board and notes are the only material available for the course.

6 **TUTORIALS**

- The first three tutorials will be a review of the basic math required for the course, mostly on coordinate systems, integrals, and vector calculus;

- The remaining tutorials will be devoted to correct the highlights of the six home assignments (HAs) and to review some material useful to solve some of the HAs and midterm and final exams.

7 **HOME ASSIGNMENTS**

- The HAs are very long and involved. In order to obtain a score of 100% on each HA, you are not required to solve the entire HA. The percentage of HA required to obtain 100% will be indicated in class, the day the HA is handed out. The reason why the HAs are so long is to give an opportunity to exercise extensively in preparation for the exams;

  Note that the solutions to almost all HAs are made available online, on Waterloo LEARN at [https://cas.uwaterloo.ca/cas/login](https://cas.uwaterloo.ca/cas/login). I strongly recommend to attempt to solve as much of each HA as possible without looking at the solutions. In fact, both midterm and final exam will be based on problems similar to those in the HAs. In brief, if you decide to barely copy the solutions to the HAs, you might be able to gain a full 20% from the HAs, however, you will likely fail the midterm and final, which sum up to 80% of the total course;

- All HAs will be graded by TAs. A schedule with the TA in charge of each HA will be made available by the end of the second week of lectures (i.e., by January 16);
8 MIDTERM

- Allowed time: 2.5 h;
- When: Tentative date 2015-02-13 from 05:30 PM to 08:00 PM;
- Where: TBA;
- Required equations will be provided at the end of the exam’s sheet;
- Books and/or any other electronic or paper-based aid are not allowed during the test;
- Students are not allowed to leave the exam room during the first 30 minutes and the last 10 minutes;
- Only verifiable illness or extenuating circumstances are deemed acceptable to miss the exam and to ask for a make up exam.

9 FINAL EXAM

Same rules as for the midterm. Date and time will be made available as soon as possible. Note that I allow students to trade their midterm exam grade for a final exam of 80% in total instead. This does not apply to the HAs.

10 LITERATURE

- The course is entirely based on my notes. Most of the notes are still handwritten, even though I am tempting to type some of them;
- The lectures will be made available on Waterloo LEARN on weekly basis. The lectures are organized for a set of two lectures of 80 minutes per week. Unfortunately, the Winter schedule is of 3 weekly lectures of 50 minutes each;
- Some pages of the lecture notes are omitted on purpose;
- Suggested readings: