

# PHYS 5303, Spring 2013: CLASSICAL ELECTRICITY AND MAGNETISM – I

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| <b>Instructor</b> | Stefan K. ESTREICHER<br>office: Sci 134 tel: 742-3723<br>email: <a href="mailto:Stefan.Estreicher@ttu.edu">Stefan.Estreicher@ttu.edu</a>  | web page: <a href="http://jupiter.phys.ttu.edu/stefanke">http://jupiter.phys.ttu.edu/stefanke</a><br>office hours: TX 9:30-10:30; WF 1:30-2:30 |
| <b>Schedule</b>   | Tue + Thu, 8:00 - 9:20, Sci 010   |  |
| <b>Textbook</b>   | J.D. Jackson, <i>Classical Electrodynamics</i> , 3 <sup>rd</sup> ed. (Wiley, NY, 1999)  |  |
| <b>Homeworks</b>  | Four sets of homework will be assigned. The solutions will be discussed in class at the due date.   |  |
| <b>Tests</b>      | Two in-class tests on <b>Tuesday March 5</b> and <b>Tuesday April 30</b> . Each test will consist of general questions from the lecture (30 min) and problems (50 min). Some of the problems will be almost identical to homework problems. |  |
| <b>Final</b>      | The comprehensive final will be in class, on <b>Monday May 13</b> , from <b>7:30-10:00 am</b> (official schedule).  |  |
| <b>Grades</b>     | average HW grade = 30%                      each test = 20%                      final = 30%<br>A = 100-85; B = 84-70; C = 69- 60; D = 59-50; F < 50. Don't make an F. Don't make anything below an A.                                      |  |

## Content

1. **Introduction:** historical overview; units; vector analysis;  $\delta$ -functions; coordinate systems, fields and boundary conditions
2. **Electrostatics:** Coulomb's law; capacitance
3. **Boundary value problems:** some techniques to solve Poisson and Laplace eqs.
4. **Multipole expansions, dielectrics:** electric multipoles; energy; conductors; dielectrics
5. **Magnetic field, Faraday's law:** Biot-Savart; multipole expansion; magnetism in materials; energy; inductance
6. **Maxwell's equations, conservation laws:** Ampère-Maxwell; potentials; conservation of energy and momentum
7. **Electromagnetic waves:** if time permits, we will start chapter 7

## Objectives

- \* develop an understanding of the basic equations of classical EM,
- \* become familiar with the mathematical tools necessary to formulate problems,
- \* learn how to set up problems in electrostatics and magnetostatics
- \* solve boundary value problems
- \* understand Maxwell's equations in terms of fields and potentials, in free space and in materials,

## Outcomes

After completing this course, graduate students should be

- \* understand the basic equations of classical EM,
- \* be familiar with the mathematical tools necessary to formulate problems,
- \* know how to set up problems in electrostatics and magnetostatics
- \* be able to formulate and solve boundary value problems
- \* understand Maxwell's equations in terms of fields and potentials, in free space and in materials,

In-class discussion, questions and problems in the homework, tests, and final will address the attainment of these issues.

## Students with disabilities

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

## Religious holy days

Texas House Bill 256 requires institutions of higher education to excuse a student from attending classes or other required activities, including examinations, for the observance of a religious holy day. The student shall also be excused for the time necessary to travel. An institution may not penalize the student for the action and allows for the student to take an exam or complete an assignment from which the student is excused. No prior notification of the instructor is required [*note added*: but would be highly appreciated].