Syllabus (two pages):
PHYS 512 – Classical Electromagnetism, Spring 2014
Class: MW, 5:00 pm – 6:15 pm, Science Building, Room 103

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Textbook: **Classical Electrodynamics** J.D. Jackson, Classical Electrodynamics, John Wiley & Sons, New York, 1999, third edition.

Catalog Description: Three semester hours. A course designed to introduce students to classical electrodynamics: electrostatics, magneto-statics, multiple expansions, solution of boundary value problems, slowly varying currents, electromagnetic energy and momentum, Maxwell's equations and applications. We will cover the first 6 chapters of the book.
1. Introduction to electrostatics.
2. Boundary-value problems in electrostatics I.
3. Boundary-value problems in electrostatics II.
4. Multipoles, electrostatics of macroscopic media, dielectrics.
5. Magnetostatics, Faraday's law, quasi-static fields.
6. Maxwell's equations, macroscopic electromagnetism, conservation laws

Examination There will be 2 tests, plus a comprehensive final covering all course material. The tests will consist of questions selected from problems at the end of each chapter of the textbook. Each test counts toward 30% of the final score. The comprehensive final will be 40% of the final score.

Pre-requisites This course requires a basic knowledge of classical mechanics, namely, the Newton and Lagrange formulation of mechanics and of basic electromagnetism from introductory physics courses.

Grades: 90% or above on final average is an "A", 80-89% = "B", etc.

Goals and Learning Outcomes for this Course

This course is an introduction to classical electrodynamics, without which one is absolutely unable to understand modern science. It covers the topics which are used to predict and use the behavior of electric and magnetic fields. Classical Electromagnetism has numerous applications to several areas of science. It covers the topics of electric and magnetic forces and fields, their interaction with molecules, solid materials, nuclei, and elementary particles. The course also develops a good knowledge in special functions and their connection to mathematical physics. These special functions include Bessel functions and special harmonics among others. Of particular interest is the study of boundary value problems, which is encountered in many other areas of physics. This course is typically taken by graduate physics students.

Goal 1: Students will understand the discipline-specific knowledge in classical electromagnetism, covering the subjects:

1. Introduction to electrostatics.
2. Boundary-value problems in electrostatics I.
3. Boundary-value problems in electrostatics II.
4. Multipoles, electrostatics of macroscopic media, dielectrics.
5. Magnetostatics, Faraday's law, quasi-static fields.
6. Maxwell's equations, macroscopic electromagnetism, conservation laws

Objective 1: Students will know the concepts of classical electromagnetism and demonstrate a proficiency in the fundamental concepts in this area of science.

Objective 2: Students will be able to explain concepts of classical electromagnetism and to show a working knowledge of a broad array of physical phenomena that are based upon fundamental concepts of charges, fields, and their interactions with matter.

Goal 2: Students will have strong physical reasoning and problem solving skills and apply these skills to the solution of theoretical and applied problems.

Objective 1: Students will be able to solve problems using their knowledge and skills in modern physics. They will use critical thinking skills to formulate and solve quantitative problems in applied physics.

Objective 2: This course will offer a curriculum emphasizing physical science to produce professionals capable of applying broad theoretical insight to solution of practical problems**.**

Assessment

The following measures will be used to assess the success of this course in achieving the above objectives:

Student Work: exams.

- The course will have 2 midterm tests, plus a comprehensive final covering all course material.

- The total grade will consist of written exams.

  A typical exam question is shown below. Expect 5 of similar questions in each midterm exam, and 8 in the final exam.

  "An insulated, spherical, conducting shell of radius a is in a uniform electric field E_0. If the sphere is cut into two hemispheres by a plane perpendicular to the field, find the force required to prevent the hemispheres from separating
  (a) if the shell is uncharged;
  (b) if the total charge on the shell is Q."

Student Perception Survey: to determine whether students believe that they have achieved the objectives of the Physics Graduation.

- This survey will be developed in the Spring of 2014, and administered to students at the end of the semester.

- The physics department utilizes an online questionnaire provided via the MyLeo TamuC system with statements regarding various elements of instruction. These comments are given to the instructor and department head soon after the grades are recorded. If students have concerns about the classroom experience during the semester they should inform the instructor of those concerns and failing a satisfactory response may, as a last resort, contact the physics department head with those concerns.

Students with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services