PHYSICS 7600: Electromagnetic Theory I
COURSE OUTLINE: WINTER 2015

INSTRUCTOR: Professor J. M. Wadehra

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OFFICE HOURS: Mondays and Wednesdays from 9:30 AM to 10:30 AM or by appointment or, simply, drop by.

COURSE PREREQS: PHY 6610, PHY 7110

MEETING PLACE: Mondays, Wednesdays and Fridays from 10:40 AM to 11:35 AM in Room 185, Physics Bldg.

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1. **COURSE MATERIAL/EXTRA READING**.

   TEXT: *Classical Electrodynamics* by J. D. Jackson   Third Edition (John Wiley & Sons, 1998)

   The assigned text covers all the material for this course. A few reference books that cover similar materials at roughly the same level are:

   Classical Electricity and Magnetism by W. K. H. Panofsky and M. Phillips   (Addison - Wesley, 1962)

   Electrodynamics of Continuous Media by L. D. Landau and E. M. Lifshitz   (Pergamon Press, 1960)

   The Classical Theory of Fields by L. D. Landau and E. M. Lifshitz   (Pergamon Press, 1975)

   You may wish to refer to these books for additional reading about topics that interest you.

2. **HOMEWORK ASSIGNMENTS**.

   A few problems from the text and from other sources will be assigned every week. You are expected to work out these assignments *independently* and turn in the solutions for grading by due date. Late homework assignments will not be accepted.

3. **EXAMS AND GRADING**.

   Your grade in the course will be determined, as follows, by your performance in three exams and in solutions of assigned homework problems:

First Hourly Examination	100 points
Second Hourly Examination	100 points
Final Examination	200 points
Homework	100 points
TOTAL	500 points.

   Tentative dates for hourly exams are Friday, February 13 and Friday, March 27; these exams will be held in the classroom. Results of the hourly exams as well as the graded homework problems will be handed back in the class. The final exam will be on Tuesday, May 5 at 8:00 AM in room 185 of Physics Research Building. The final exam will cover all the material of this course; however, there will be slight emphasis on material not covered by the first and the second hourly exams.

4. **LEARNING OBJECTIVES/OUTCOMES**

   At the successful completion of this course, you will be able to appreciate the unity of electric and magnetic phenomena and should be able to utilize the advanced mathematical techniques used in electrodynamics.

5. **TOPICS TO BE COVERED.**

I anticipate that we will be covering first seven chapters of the textbook during this semester.

Topics Covered in PHY 7600: Winter 2015

Week Starting	Topics to be covered	Exams
January 12	Divergence theorem, Stoke's theorem, solid angles, Dirac delta function	
January 19	Electrostatics, electric field, Gauss's law, electrostatic potential	
January 26	Boundary conditions, dipole layer	
February 2	Dirichlet and Neumann conditions, uniqueness theorem, Green's functions	
February 9	Electrostatic energy, Method of images for a plane, Green's function for a plane	EXAM 1
February 16	Method of images for a sphere, Green's function for a sphere	
February 23	Solutions of Laplace's equations, Separation of variables in various coordinate systems	
March 2	Multipole moments, Dielectric materials, Clausius-Mossotti equation	
March 9	Boundary value problems in dielectrics, Magnetostatics, Ampere's law	
March 16	Spring Break	
March 23	Vector potential, Boundary conditions, Boundary value problems in magnetostatics	EXAM 2
March 30	Faraday's law, Maxwell's equations	
April 6	Poynting's theorem, Conservation laws	
April 13	Plane electromagnetic waves, Linear and circular polarization	
April 20	Reflection and refraction of electromagnetic waves, Snell's law, Total internal reflection	
April 27	Catch up	
Tuesday May 5		FINAL EXAM