Phys 6570 Electromagnetic Theory I

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Textbook: Classical Electromagnetism, 3-rd edition
J.D. Jackson
ISBN: 0-471-30932-X

Meeting times: scheduled time: MWF 10:00am … 10:50am

Office hours: MWF, 11:00 am –11:50 am; other times by appointment

Class format: As any math-intensive subject, electromagnetism is best understood by solving problems. Therefore, students are required to read and work through the relevant material before the class. The instructor will summarize the material during one or two classes per week. Students will solve and discuss selected homework problems the remaining classes.

Prerequisites: Math Methods II

Homework grading policy: Student's performance while solving the problem on the blackboard will count towards 50% of homework score. The other 50% of homework score will be based on graded homeworks. Teamwork is permitted and encouraged during homework solutions. However, it must be acknowledged.

Quizzes: will be based on material covered in class. Quizzes are closed/books/notes, and will be assigned throughout the problem-solving classes;

Midterm exam: is closed books, closed notes, based on problems assigned for in-class and homeworks.

Final exam is closed books, closed notes, based on homework problems and on problems solved in class. One single-sided formula sheet (prepared by the students) will be available during final exam.

Regrade policy: It is student's responsibility to prove that grading mistake has been made. When the issue of the regrade concerns the general method of solving the problem, partial credits, etc., the student will be asked to solve the problem on the blackboard in with closed books/closed notes. The instructor will then question the student on the related course material, and assign a new grade for the problem. The new grade can be higher or lower than the original grade.

Grading policy: The grade is determined according to the total score based on:

In-class performance/homeworks:	20%
Quizzes	30%
Midterm:	25%
Final exam:	25%

File Version: 11/18/2016

E-mail communication with instructor: The instructor will use SIS to e-mail important course updates, class notes, etc. to the class. It is assumed that the students regularly check their e-mail.

Missed classes/exams/homeworks: as a rule, there are no makeup exams/homeworks/quizzes. In extraordinary circumstances (severe but short illness, jury duty, etc.) the homework may be postponed, the makeup exam can be arranged, or the score of other assignments can be prorated to cover the missed work. In these cases, the student must inform the instructor as early as possible, and obtain a written approval.

Academic integrity: any suspected cheating or other academic fraud cases will be reported and prosecuted according to UML policy: (http://www.uml.edu/catalog/undergraduate/policies/academic_dishonesty.htm)

Students with disabilities: will be accommodated according to general policy of the University. Please contact Disability Services at Wellness Center (x4-6800)

Tentative Course Schedule:

Week #		Chapter	Analytical HW	Numerical HW
1	Sep 2	No class (comp exam)		
2 3	Sep 7, 9 Sep 12, 14, 16	1.1-1.11, 1.13	1.3, 1.5, 1.6, 1.21 (a) (due 9/21)	1.21(b), V1
4 5 6	Sep 19, 21, 23 Sep 26, 28, *30* Oct 3,5,7	2.1-2.7 2.10,2.11	Section 2.7, prbs. 2.2, 2.3, 2.7,2.9, 2.26 (due 10/11)	V2,V3, 2.26
7 8	Oct 11,12,14 Oct 17, *19*, 21	3.1-3.10	3.3, 3.5, 3.7, V4 (due 10/24)	V5, V6
9 10	Oct 24, 26§, 28 Oct 31, Nov 2,4	4.1-4.5, 4.7	4.1, 4.2*, 4.7, 4.9, V7, V8 (due 11/14)	4.11, V9
11 12	Nov *7*,9 Nov 14,16,18	5.1-5.4 5.6-5.12	V10, 5.3, 5.10, 5.15 V11,5.19 (due 11/28)	
13	Nov 21, 23	5.15, 5.16	5.21	
14 15	Nov 28, 30, Dec. 2 Dec. 5, 7, 9	6.1-6.4, 6.7	6.1, 6.3, 6.5	

Quiz, HW solution, §=midterm, *=Extra Credit

Updated versions of the schedule will be posted online/e-mailed to the class.

Additional problems (Vxx):

1. Solve problem 1.21 using relaxation technique
2. Demonstrate that solutions obtained with relaxation method are consistent with analytical results of Sec. 2.10,
3. Demonstrate that the solution obtained with relaxation method are consistent with analytical results of Sec. 2.11
4. Starting from recurrence relations, derive
    a. Bessel equation
    b. Legendre equation
5. Analyze the convergence of the series 3.23 from the textbook; plot the partial sums, as well as the mean deviation between the partial sum of 3.23, and the function shown in Fig.3.2 as the function of the number of terms in the partial sum.
6. Plot the potential along the z axis using Eq.(2.22) from Jackson and using series (3.33) with appropriately chosen A_l, B_l coefficients.
7. Derive Eq. (4.18) from Jackson
8. Calculate effective permittivity of a multi-layer mixture formed by layers of permittivity ϵ_i, concentration p, dispersed within host layers of permittivity ϵ_h. Note: your permittivity is anisotropic (depends on direction)! Calculate permittivity in the direction along the layers and perpendicular to layers.
9. Extend your relaxation technique to ponderable media. Use your numerical codes to calculate the field inside a polarizable cylinder (relative polarizability ϵ_i) subject to homogeneous electromagnetic field, directed *perpendicular* to the cylinder. Check your solution analytically. Does your code work for $\epsilon_i < 0$?
10. Derive Eq.(5.36)
11. Section 5.12