KING FAHD UNIVERSITY OF PETROLUIM AND MINERALS
DEPARTMENT OF PHYSICS

ELECTRICITY AND MAGNETISM I

PHYS 305

SPRING 2007

Course Outline

Credit Hours	:	3
Prerequisites	:	PHYS 201, MATH 202
Class	:	Lecture: Su, Tu, 7:00 – 8:15 am, Room 6-100, Problem session: We 7:00 – 7:50 a.m., Room 6-100
Instructor	:	Prof. Dr. Ibraheem M. A. Nasser
Office	:	6-140
Phone	:	2234
Email	:	*imnasser@kfupm.edu.sa*
Office Hours	:	by appointment

Recommended Textbook

1- D. J. Griffiths "Introduction to Electrodynamics Theory", (3^{rd} Edition Prentice-Hall, 1999).

References

1- "Electricity and Magnetism" Edward M. Purcell. Berkley Physics Course –Vol. 2. (McGraw-Hill, NY 1963)
2- "Foundation of Electromagnetic Theory" by J. Reitz, F. Milford & R.W. Christy (3rd Edition, Addison-Wesley, 1979).
3- "Electromagnetic Fields & Waves" by P. Lorrain & D. Corson (2nd Edition, W.H. Freeman, 1970).
4- "Schaum's outline Series Theory and Problems of Electromagnetic" by J. A. Edminister (McGraw-Hill book company, 1979).

Course Description

An introduction to classical electrodynamics based on vector calculus. Topics covered include: Electrostatic Fields; Laplac's & Poisson's Equations; Dielectric Media; Magnetostatics.

Assessment

Activity	Weight
Weekly Homework Problems	35%
Term paper and class Activities	10%
First Major Exam (two hours)	15%
Second Major Exam (two hours)	15%
Final Exam (three hours)	25%

Student Evaluation

1. Weekly problem sets. Late problem sets will be accepted only if you receive permission from the instructor prior to the due date of the assignment. Homework should be legible and written or typed on one side of the page only. More points for computer oriented solution using Mathematica, Matlab, Maple (Scientific Work Place), etc.

2. Small term paper and class activities.

3. Two major examinations.

4. Final examination.

5. Class participation and individual initiative. Class attendance is required.

6. A weekly summary of your progress, conceptual difficulties, and class discussions and handouts.

Students are expected to spend 8-10 hours per week on the course outside of class time.

Acknowledgements
You are encouraged to collaborate and to seek help from other students to do the homework, but the final write-up should be your own. If you do obtain help, you should acknowledge it. Such an acknowledgement will not lower your grade.

Grading

$A^{+}\geq 90$	$90>A\geq 85$	$85>B^{+}\geq 80$	$80>B\geq 75$	$75>C^{+}\geq 70$	$70>C\geq 65$	$65>D^{+}\geq 60$	$60>D\geq 50$	$F<50$

Remarks :

1- Please be on time for the lecture. Presentations and class discussions are very important parts of the course.
2- No late homework will be given full credit. You loose grades per lat day.
3- A 10-20 minutes quiz will be given for each chapter.
4- The attached syllabus might change slightly, depends on students input.
5- Please try to read the material before coming to the lecture.
6- **Group work and discussion is strongly encouraged**, but the written and presented work should be done independently.

Xc: Chairman, Physics Department

Lecture Schedule for Phys 305

Wk. #	Date	SEC #	TOPICS	Homework
1		1.1.1-1.1.4 1.2.1-1.2.4	Overview of the course & Vector Analysis Vectors & Differential Calculus	
2		1.2.5-1.2.7 1.3.1-1.3.3 1.3.4-1.4.1	Gradient, Divergence & Curl Integral Calculus The Fundamental Theorems	
3		1.4.2-1.5.1 1.5.2-1.6.2 1.1.1-1.6.2	Curvilinear Coordinates Dirac Delta Function Vector Fields	
4		2.1.1-2.1.4 2.2.1-2.2.2 2.2.3-2.2.4	Coulomb's Law & Electric Field Divergence & Curl of Electrostatic Fields Gauss's Law	
5		2.3.1-2.3.2 2.3.3-2.3.5 2.4.1-2.4.4	Electric Potential Poisson's Equation & Laplace's Equations Work & Energy in Electrostatic	
6		2.5.1-2.5.3 2.5.4 2.1.1-2.5.4	Conductors Capacitors Review	
First Major Exam. Chaps. 1 & 2 (, 2008)				
7		3.1.1-3.1.4 3.1.5-3.1.6 3.2.1-3.2.4	Laplace's Equation in Rectangular Coordinates ,I,II and III -dimensions Uniqueness Theorem The Method of Images	
8		3.3.1 3.3.2 3.4.1	Separation of Variables in Rectangular Coordinates Separation of Variables in Spherical Coordinates Multipole Expansion	
9		3.4.2-3.4.4 3.1.1-3.4.4 4.1.1-4.1.4	Multipole Expansion Review Polarization & Dielectrics	
10		4.2.1-4.2.2 4.2.3-4.3.2 4.4.1	The Field of Polarized Objects The Field Inside a Dielectric Linear Dielectrics	
11		4.4.2 4.4.3-4.4.5 4.1.1-4.4.5	Linear Dielectrics Force & Energy in Dielectric Systems Review	
Second Major Exam. Chaps. 3&4 (, 2008)				
12		5.1.1-5.1.3 5.2.1-5.2.2 5.3.1-5.3.2	Lorentz Force Law The Biot-Savart Law The Divergence & Curl of B	
13		5.3.3 5.3.4-5.4.1 5.4.2-5.4.3	Ampere's Law Comparison of Magnetostatics & Electrostatics Multipole Expansion of the Vector Potential	
14		5.1.1-5.3.4 6.1.1-6.1.4 6.2.1-6.2.3	Review Magnetization The Field of a Magnetized Object	
15		6.3.1-6.3.2 6.4.1-6.4.2 6.1.1-6.4.2	The Auxiliary Field H. Linear & Nonlinear Media Review	