Physics 622
Syllabus

1/22/2014

Richard Raspet

Phone: 662-915-5888 (NCPA)

E-Mail: raspet@olemiss.edu

Office: 2018 NCPA

Office hours: call to make sure I am in, MWF afternoons and TTh all day.

Text: *Classical Electricity and Magnetism,* Panofsky and Phillips, Dover Publications, Mineola, New York (2005) - re-publication of the Second Edition of the text

Suggested references:

Wyld, *Mathematical Methods for Physics,* Perseus books (1999)
Griffiths, *Introduction to Electrodynamics*, Addison Wesley(1999)
Abramowitz and Stegun, *Handbook of Mathematical Functions*, Dover
Jackson, *Classical Electrodynamics,* John Wiley & Sons

Grading:

3	Tests
2	Homework and Pop Tests
1	Notebook
2	Final
8	

100-87.5	A
87.5-75	B
75-62.5	C
62.5-50	D
<50	F

I do not use the +/- grading system

Academic Regulations:

Regular attendance is expected. Every class is important. Please do not come late. Homework is to be turned in at the beginning of class. Every absence in excess of three will deduct 3% from the final average.

Goals:

To develop an understanding of Electricity and Magnetism and to develop your math skills as applied to physics.

In this semester we study the interaction of electromagnetic fields with charges. First we develop the electromagnetic wave equation with sources and study multipole radiation. Next, we develop the kinematic relations of special relativity and introduce the idea of covariance to the formulation of relativistic electromagnetics. This idea is used to study the electromagnetic fields of moving and accelerating charges. Then the charges and fields are treated in unison to develop equations of motion for charged particles. The equations of motion are then solved in order to investigate the interaction of radiation with charged particles for the purpose of studying scattering and dispersion.

Expectations:

You are expected to read the text material before class and after class. It is expected that you will be able to reproduce any derivation presented on tests and the exam. It is required that you take notes in class or print out my notes and annotate or recopy these notes after class so that you can use these notes to study. The notebook should also contain graded homework and tests and corrected solutions. The notebook will be taken up and graded once during the semester and at the end of the semester. The grading rubric for the notebook is the last page of the syllabus. The problems in this course are similar to and often derived from research problems. You should study the material before working the problems. Solving these will develop your ability to do independent research. Some of the homework problems are difficult. You should start working on the problems early to allow time to think about the difficult ones. I try to select problems that can be worked by the principles in the current chapter.

University of Mississippi Creed:

The University of Mississippi is a community of learning dedicated to nurturing excellence in intellectual inquiry and personal character in an open and diverse environment. As a voluntary member of this community:

I believe in respect for the dignity of each person

I believe in fairness and civility

I believe in personal and professional integrity

I believe in academic honesty

I believe in academic freedom

I believe in good stewardship of our resources

I pledge to uphold these values and encourage others to follow my example.

The syllabus below is subject to change to accommodate instruction and/or student needs.

Date	Chapter	Homework Due
Jan 22	Waves and metallic boundaries 13 - 1,2,3	
Jan 24	Cylindrical cavities, circular cavities, wave guides 13 - 4,5	
Jan 27	Wave guides 13 - 5,6	
Jan 29	Spherical waves 13 - 8	Worked exam due
Jan 31	Scattering by a sphere 13 - 9	
Feb 3	Scattering by a sphere continued13 - 9	
Feb 5	Wave equation for potentials, solution by Fourier analysis 14-1,2	
Feb 7	Radiation fields 14 - 3	
Feb 10	Radiated energy 14 - 4	Problem Ch 13
Feb 12	Hertz potential and methods 14 - 5,6,7	
Feb 14	Review of Homework 13 and worked exam.	
Feb 17	Multipole radiation 14- 8,9,10	
Feb 19	Background, Relativistic kinematics 15-6, 16-1,2,3	
Feb 21	Lorentz transformation, geometric interpretation, 16-3,4	Problem set Ch 14
Feb 24	Review of Homework 14, velocity trans 16-5	
Feb 26	Test 1, Ch 13-14	Test 1.
Feb 28	Lorentz transform, Tensor relations, conservation of momentum 17-1,2,3	
Mar 3	Minkowski force, energy momentum, collisions 17- 4, 5,6	Drop day Mar 4
Mar 5	Covariant formulation of electrodynamics 18-1,2	
Mar 7	Electromagnetic field tensor, Lorentz force 18-2,3	
Mar 10 -14	Spring break	
Mar 17	Lienard-Wiechert potentials, uniformly moving charge 19-1,2	Problem set Ch 17
Mar 19	Direct solution of wave equation, convection potential 19-3,4	
Mar 21	Radiation from an accelerated charge, low velocity 20-1,2	Problem set Ch 18
Mar 24	Radiation velocity parallel to acceleration 20-3	
Mar 26	Radiation for circular orbits 20-4	Problem set Ch 19
Mar 31	Radiation from arbitrary velocity and acc. 20-5	
Apr 2	Bremsstrahlung, Cerenkov radiation 20-6,7	
Apr 4	Test 2, Ch 15-18	Test 2
Apr 7	Radiation reaction, transform of free radiation field 21-1, 2	
Apr 9	Electromagnetic energy and mass 21-4,5	
Apr 11	Reaction, direct computation from retarded fields 21-6,7	Problem set Ch 20
Apr 14	Covariant description of mechanical properties 21-8,9	
Apr 16	Good Friday, no class	
Apr 18	Relativistic equations of motion 21- 11,12,13	
Apr 21	Radiation, scattering and dispersion, Damped SHO 22-1	
Apr 23	Forced vibrations, scattering by free electrons 22-2,3	Problem set Ch 21
Apr 25	Test 3, Chapters 19-21	Test 3
Apr 28	Scattering by bound electrons, absorption of radiation 22-4,5	
Apr 30	Volume distribution of scatterers 22-7, 8, 9	
May 2	Rayleigh scattering, dispersion 22-10	Problem set Ch 22
May 7	Final Exam 8:00am	

Notebook grades:

1. 50% - print out class notes. Compile home works and tests. Bind or put in ring binders.

2. 20% - annotate note - add additional math materials

Or

25% - recopy and correct notes adding annotation and math notes

3. 20% - correct and rework wrong home works and tests

4. 5% - table of contents, chapter outlines and or summaries