Physics 4322

Spring 2014 - Section 14798

Introduction to Classical Electrodynamics - Part 2

Text - *Introduction to Electrodynamics,* 3^{rd} Edition; - David Griffiths
Publisher - Pretice-Hall

Supplementary Material - *Feynman Lectures on Physics* - R. Feyman (Addison-Wesley, 1965 - use library editions); *Electrodynamics (Chicago Lectures in Physics)*; T. Tsang; *Student's Guide to Maxwell's equations*; A. P. French *Relativity*

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Spring 2014

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Week Beginning	Lecture	Homework	Due Date
Jan 12	Ch 1-6	2.26, 3.24, 4.33, 5.35	Jan 26
	***** MLK Day Jan 20 ******		
Jan 19	Ch 7	7.1, 7.5, 7.8, 7.18	Feb 2
Jan 26	Ch 7	7.25, 7.28, 7.36, 7.58	Feb 9
Feb 2	Ch 7,12	12.4, 12.5, 12.8, 12.9	Feb 16
Feb 9	Ch 12	12.11, 12.15, 12.19, 12.27	Feb 23
	***** 1^{st} Exam Feb 18 ******		
Feb 16	Ch 12	12.33, 12.37, 12.43, 12.50	Mar 2
Feb 23	Ch 8	8.1, 8.3, 8.5, 8.6	Mar 9
Mar 2	Ch 8	8.7, 8.10, 8.11, 8.14	Mar 23
Mar 9		***** Spring Holiday ******	
Mar 16	Ch 9	9.2, 9.4, 9.11, 9.13	Mar 30
	***** 2^{nd} Exam Mar 27 ******		
Mar 23	Ch 9	9.20, 9.25, 9.29, 9.38	Apr 6
Mar 30	Ch 10	10.1, 10.4, 10.7, 10.10	Apr 13
Apr 8	Ch 10	10.12, 10.15, 10.19, 10.23	Apr 20
Apr 13	Ch 11	11.1, 11.4, 11.6, 11.9	Apr 27
	***** 3^{rd} Exam Apr 24 ******		
Apr 20	Ch 11	11.14, 11.15, 11.23, 11.31	May 2

Last Date to Drop — Mar 26
last Day of Class — April 28
Final Exam — Monday May 8 11:00-2:00p

The course will cover the topics of;

1. Review of Eletrostatics
    (a) Coulomb's Law
        i. Electric Field
        ii. Scalar Potential
    (b) Current Density
    (c) Ampere's Law
    (d) Biot-Savart Law
        i. Magnetic Field
        ii. Vector Potential
    (e) Static Maxwell's Equations
2. Electromotive Force and Moving Charge
    (a) Lorentz Force
    (b) Electromotive Force
    (c) Magnetic Flux - Induction
    (d) Faraday's Law
    (e) Electric Circuits
        i. Ohm's Law
        ii. Inductance
        iii. Time Dependent Currents
    (f) Time Dependent Field Energy
    (g) Time Dependent Maxwell's Equations
        i. Displacement Current
        ii. Magnetic Charge
        iii. Maxwell's Equations in Matter
    (h) Boundary Conditions
3. Relativity
    (a) Simultaneous Events
    (b) Postulates
    (c) Lorentz Tranformation
    (d) Views of Rapidly Moving Objects
        i. Moving Rod
        ii. Moving Clock

iii. 2-Dimensional Moving Object

(e) Twin Paradox

(f) Relativistic Transformations

i. 4 Vector Notation

ii. Energy-Momentum

iii. 4 Potential

iv. Field Transformations

v. Covarient Notation

(g) Kinematics

(h) Proper Time

(i) World Line

4. Symmetry and Conservation Laws

(a) Equation of Continuity

(b) Gauge Invariance

(c) Poynting Theorem - Conservation of Energy

(d) Stress Tensor - Conservation of Momentum

(e) Conservation of Angular Momentum

5. Wave Equation

(a) Solutions

(b) Amplitude and Intensity

(c) EM Waves

i. Complex Notation

ii. Plane Waves

iii. Spherical Waves

iv. Spectrum

v. Energy and Momentum

vi. Waves in Materials

(d) Transmission Lines

i. Reflection and Transmission

ii. Impedance

iii. Dispersion and Absorption

(e) Polarization

(f) Reflection from Surfaces

(g) Wave Guides

i. Rectangular Guides
ii. Modes - TE, TM, TEM
iii. Coaxial Guides

(h) EM Waves in Conductors

6. Potential Formualtion

(a) Maxwell's Equations in Potential Form
(b) Coulomb and Lorentz Gauge
(c) Retarded Potentials
(d) Fields of Point Charge
i. Lienard-Wiechert Potentials
ii. Jefimenko Equations

7. Radiation and Scatering

(a) Fields of a Moving Charge
(b) Electric Dipole Field
(c) Magnetic Dipole Filed
(d) Spherical Harmonics
(e) Multipole Expansions
(f) Radiated Power
(g) Dipole Absorption and Scattering
(h) Radiation Reaction

Your grade will be determined by:
3 in class exams 18% each
Home work 20%
Final Paper 26%

It is expected that the student has an understanding of Electrostatics as taught in the first semester of this course. Also it is assumed that the student has a mathematical background through the level of partial differential equations. While these subjects will be reviewed, they will be impossible to cover in the necessary depth needed for his class.

The Text covers a substantial amount of material, and the material is difficult. The student must devote the necessary time to learn the material. **ATTEND CLASS** and **see me** if you are having difficulty. **DO THE HOMEWORK**. You cannot expect to do well without doing the homework, and in fact you should work more problems than just what is assigned. What you take away from this course will be a strong function of your dedication in learning the material.

Turn the homework in on the date assigned. Late homework is not accepted. Homework solutions will be posted on the class website. There will be 3 in-class exams and a 3hr final. Grades are

determined as outlined by that percentages above.

All your submitted class work must be completed independently by you, although you may discuss the homework problems with others.