GRADUATE SCHOOL OF ENGINEERING AND MANAGEMENT

Department of Engineering Physics

PHYS 601 – Electrodynamics I

Course Syllabus

Fall 2019

Meeting Times	MTWF 1200 – 1250
Location	Building 641 Room 220
Instructor	Maj Dan Emmons
Office Location	Building 640 Room 221D
Office hours	Open door policy
Contact Information	937-255-3636 ext 4571, daniel.emmons@afit.edu

Course Description:

A course in classical electromagnetic radiation. Treats wave propagation in space and in material media, reflection and refraction, and radiating systems.

Credits	4.0
Prerequisites	none

Student Learning Objectives:

- Calculate potentials and electric and magnetic fields due to static charges and steady currents.
- Determine the motion of a charged particle from forces due to static electric and magnetic fields.
- Solve time dependent Maxwell's equations.
- Calculate properties and parameters related to wave propagation in vacuum and matter such as dispersion relations, absorption, reflection, and energy transported.
- Calculate the electromagnetic fields produced by radiation sources.

Required Books and Resource Materials:

Mark A. Heald and Jerry B. Marion, *Classical Electromagnetic Radiation*, 3rd edition (Dover 2012)

Recommended/Optional Books and Resource Materials:

- John David Jackson, *Classical Electrodynamics*, 3rd edition (Wiley 1999)
- David J. Griffiths, *Introduction to Electrodynamics*, 4th edition (Pearson 2013)
- H. M. Schey, *Div Grad Curl and All That*, 4th edition, (W. W. Norton and Company 2005)

Grading Scheme/Policy:

Homework = 30%
Midterm = 30%
Final = 40%

A = Above 95%
A- = 90-95%
B+ = 85-90%
B = 80-85%
B- = 75-80%
C = 60-75%

*Cutoffs for each letter grade may be reduced but will not be raised

Policies:

1. **Attendance:** Attendance at all class sessions and exams is mandatory for military and civilians assigned to AFIT as full-time students except for extenuating circumstances. Scheduled classes and exams are defined by the instructor and they are documented in the course schedule. Part-time students are expected to attend scheduled classes, and absences should be explained to the instructor. The student should provide advance notice, if possible. (References: Student Handbook, Graduate School Catalog)

2. **Academic Integrity:** All students must adhere to the highest standards of academic integrity. Students are prohibited from engaging in plagiarism, cheating, misrepresentation, or any other act constituting a lack of academic integrity. Failure on the part of any individual to practice academic integrity is not condoned and will not be tolerated. Individuals who violate this policy are subject to adverse administrative action

including disenrollment from school and disciplinary action. Individuals subject to the Uniform Code of Military Justice may be prosecuted under it. Violations by government civilian employees may result in administrative disciplinary action without regard to otherwise applicable criminal or civil sanctions for violations of related laws. (References: Student Handbook, ENOI 36 – 107, *Academic Integrity*)

3. **Academic Grievance:** AFIT and the Graduate School of Engineering and Management affirm the right of each student to resolve grievances with the Institution. Students are guaranteed the right of fair hearing and appeal in all matters of judgment of academic performance. Procedures are detailed in ENOI 36 – 138, *Student Academic Performance Appeals*.

4. **Testing Policy:** Tests will be individual efforts and collaboration is prohibited.

5. **Late Assignments and Make-Ups:** Late assignments will receive a 10% reduction in the total possible score each school day after the due date.

6. **Homework:** A solutions manual is available online and collaboration on the homework is encouraged. However, you should attempt to solve the problems *on your own* before looking up a solution or working with a group. Additionally, copying solutions word-for-word is prohibited and each student must provide an individual write-up.

Syllabus Schedule:

Course assignments, due dates and other requirements may be subject to change.

CLASS WEEK	TOPIC	ASSIGNMENTS
1	Units, vector calculus, electric fields and dielectric materials	Schey II-8, Schey III-5a, 1.5, 1.12
2	Magnetic fields and materials, boundary conditions, multipole expansion	1.17, 1.30, 1.35 no dielectric lens, 2.1, 2.2
3	Laplace's equation	3.1, 3.2, 3.7
4	Poisson's equation, Green's functions, charge conservation, induction, Maxwell's equations	1-D Green's function problem, 4.2, 4.6, 4.10
5	Electromagnetic energy, Maxwell stress tensor, electromagnetic waves	4.19, 5.2, 5.3 (a+b only)
6	Poynting vector, electromagnetic waves in conductors, waves at boundaries	5.7 (a+b only), 5.11, 6.3, 6.15
7	Transmission lines, waveguides, optical fibers, retarded potentials and fields	7.9, 7.12, 7.14
8	radiation from accelerated charges, dipole radiation	8.8, 9.9
9	Scattering, dispersion, conductivity, waves in plasmas	10.20, 10.25
10	Relativity and electrodynamics	

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.