670 SYLLABUS Spring 2014 (3 credit hours)
Tu/Th 9.30-10.45am

COURSE: **Electromagnetic Theory I**
ALL course information is posted on BlackBoard

TEXT/Materials: Lecture notes and homework are posted on blackboard

CLASS MEETINGS: Lecture Section 1: **Tu/Th 9.30-10.45am**, Tourette 227

Instructor: Michel van Veenendaal, Tourette 223; 815-753-0667
Office Hours: **Tuesday/Thursday 10.45-12.15PM,** or by appointment.
Email: veenendaal@niu.edu
Web page: See blackboard

SCHEDULE OF TESTS:

MIDTERM **Tuesday 3/4, 9.30-10.45am**
FINAL **Thursday 5/8, 10-11.50am** (be aware of potential exam conflicts)

GRADING:

- Homeworks 40% (there will be four graded homeworks, datesTBD).
- Midterm 30%
- Final 30%

The final grades are curved. Therefore, the final grade depends on the distribution of the grades. Typical relationships between the weighted tests/final and the grades are

A	> 85±5
B	70±5 - 85±5
C	55±5 - 70±5
D	TBD

Note that these ranges are indicative and that the instructor remains the right to change the values depending on the performance of the students and the difficulties of the exams.

MINIMUM REQUIREMENTS TO PASS THE COURSE:

- An aggregate numerical value of at least 50% of the total points is required to pass the course, with no component (homework, midterm, final) worse than 25%.

HOMEWORK ASSIGNMENTS:

- 4 sets, with clearly defined due dates/times.

- Late turn in of homework permissible only under unusual circumstances.

COURSE DESCRIPTION:

This course aims at providing a rigorous foundation for advanced classical electrodynamics and some of its applications. The course discusses spinors, the use of Green's functions, the interplay between quantum mechanics and E&M, the origin of Maxwell's equations, electrodynamics in a medium, sources and scattering.

Prerequisites: previous course(s) on electricity and magnetism at the level of D.J. Griffiths, Introduction to Electrodynamics, 3rd edition, Prentice-Hall, 1999

Required textbook: The class will be taught on lecture notes which are available on blackboard.

Optional Readings.
For a deeper understanding, you may also want to consult these:
J.D. Jackson, Classical Electrodynamics
L.D. Landau and E.M. Lifshitz, The Classical Theory of Fields

SYLLABUS:

5 Relativistic quantum mechanics
    5.1 Relativity
    5.2 Klein-Gordon equation
    5.3 Space-time
    5.4 Dirac equation
    5.5 Plane-wave solutions
6 Maxwell's equations
    6.1 Electromagnetic field in Dirac equation
    6.2 Maxwell's equations
    6.3 Gauss's law
    6.4 Ampere's circuital law
    6.5 Faraday's law
    6.6 Gauss's law for magnetism
    6.7 Energy density in electromagnetic fields
7 Electrodynamics in a medium
    7.1 Maxwell's equations in matter
    7.2 Optical properties of matter
    7.3 Magnetization in matter: Bound currents
8 Sources 118
    8.1 Electric dipole radiation
    8.2 Multipole expansion
    8.3 Magnetic dipole and electric quadrupole
9 Scattering
    9.1 Dipole scattering
    9.2 Scattering by a small dielectric sphere
    9.3 Scattering from a large spherical particle

COURSE POLICIES INCLUDE:

1. Be respectful of each other (this applies to Instructors, TA's and students). Some specifics include:

    a. No cell phone/ electronic device usage in class (except calculators). Cell/ smart phones must be turned off or silenced and placed in backpacks, etc. (not in pockets or on desks). Violators may be required to turn in their devices to the Instructor for the remainder of the class period.
    b. If you need to leave class early, let your Instructor/ TA know

2. Laptops/ notebooks may be used for lecture materials and taking notes only.

3. Be aware of the policies and procedures regarding your rights as well as responsibilities that are published in the NIU Student Code of Conduct. It is available on line at http://www.stuaff.niu.edu/judicial/24430jo(body).pdf .

4. The instructor and the university reserve the right to modify, amend, or change the course syllabus (course requirements, grading policy, etc.) as the curriculum and/or program require.

5. Americans with Disabilities Statement (available at: http://niu.edu/disability/accessibility_statement/index.shtml)

6. For academic integrity, see http://www.niu.edu/isye/graduate/integrity.shtml