Syllabus
ELEC_ENG 3600
Fall Semester 2015
ELECTROMAGNETICS

Instructor: Jie Huang
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Office hours: Thursday 2:30 – 4:30, or by appointment, arrange by email or in class.

Prerequisite: Elec Eng 2120, Elec Eng 2101, Physics 2135, and Math 3304 each with a grade of "C" or better. Passing grade on Elec Eng Advancement Exam II.

Course Objectives: Introduce students to fundamentals of electromagnetics, by learning the following topics (as much as possible and not every topic may be covered), while emphasizing the physical meaning of these concepts and their practical applications.

- Vector Algebra and Coordinate Systems
  - Review of vectors, basic vector algebra and coordinate systems.
- Electro-statics
  - Coulomb’s law
  - Gauss’s law
  - Electric scalar potential
  - Dielectrics
  - Conductors
  - Electric dipole
  - Poisson’s and Laplace’s equations
- Magneto-statics
  - Magnetic sources
  - Magnetic dipole
  - Gauss’s law for magnetism
  - Ampere’s law
- Magnetic properties of materials
- Magnetic boundary conditions, ramifications and applications

- Time-Varying Fields
  - Lorentz force
  - Moving conductor in a static magnetic field
  - Generation of $V_{\text{emf}}$ in a variety of practical cases
  - Lenz’s Law and its ramifications and examples

- Time-Varying Maxwell’s Equation and examples
  - Displacement current density
  - Differential and integral forms of Maxwell’s equations
  - Source-free (homogeneous) vector wave
  - Vector and scalar potential functions and their solutions
  - Time harmonic fields
  - Introduction of wave number, intrinsic impedance, complex dielectric constant, phase and attenuation constants
  - Basic introduction to uniform plane wave, phase velocity, TEM waves

- Reflection, Transmission, and Refraction of Waves at Planar Interfaces
  - Normal incidence on a perfect conductor
  - Normal incidence on a lossless dielectric
  - Multiple dielectric interfaces

- Basics of Transmission lines
  - Introduction to transmission lines
  - Voltage and current characteristics and propagation on a transmission line
  - Reflection coefficient
  - Input impedance

**Textbook:** Engineering Electromagnetics and Waves (2nd Edition)
by Umran S. Inan, Aziz S. Inan, Ryan K. Said
Publisher: Prentice Hall; 2nd edition (December 14, 2014)
ISBN-10: 0132662744

**Grading:** The grade in the class will be based on the following items

| Attendance | 10% |
Homework (5 times) 40%
Mid-term exam (take-home) 20%
Final exam (take-home) 30%

Any student who earns at least 85% of the total points will earn a grade of A in this class. Students who earn at least 75%, 65%, 55% will earn grades of the least B, C, and D, respectively. I may choose to lower some of these thresholds, but I promise not to raise any of them. I reserve the right to decide borderline cases based on class attendance and subjective impressions such as effort and conscientiousness.

**Late work:** Each homework assignment will be announced in class on Tuesday and uploaded on Blackboard of Missouri S&T. You will have one week finish your homework assignment and hand it in during class on next Tuesday. Distance students should email me your scanned solutions before 9:30 AM on the due date. Homework solutions submitted for grading should be legible and neat. For any late homework, its final grade will be counted as $5\sqrt{x}$, where $x$ denotes your actual grade for this assignment. When you are unable to submit an assignment by the due date because of illness or other valid reasons (“Mitigating Circumstances”) you must formally notify me ahead of time. I have the authority to alter submission dates for your assignments, based on the judgement of the reasons presented. The same applies to take-home exams.

**Absences:** Attendance is expected at every class meeting. If you feel you must miss a class, contact me as soon as you know you have to miss the class, and explain your situation. I may allow you to miss one class without penalty.

**Disability Support Services:** If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with me early in the Semester. You will need to request that the Disability Services staff send a letter to me verifying your disability and specifying the accommodation you require. Disability Support Services is located in 204 Norwood Hall. Their phone number is 573-341-4211 and email is dss@mst.edu.

**Emergency Safety Exits:** Egress maps for all areas of instruction on campus are available on the web at [http://registrar.mst.edu/links/egress.html](http://registrar.mst.edu/links/egress.html). Students are encouraged to review this site and be aware of the emergency exit signs near their classrooms.

Fall 2015 calendar can be found at [http://registrar.mst.edu/media/administrative/registrar/documents/calendars/fs15dates.pdf](http://registrar.mst.edu/media/administrative/registrar/documents/calendars/fs15dates.pdf)