COURSE: EECS 230.**TITLE:** Electromagnetics I**. PREREQUISITES:** Math 215 & Physics 240.**COREQUISITE:** EECS 215. **REQUIRED**

TEXTBOOK: Fall 2004: Hayt and Buck, *Engineering Electromagnetics*, McGraw-Hill
Winter 2005: F. Ulaby, *Fundamentals of Applied Electromagnetics*, Prentice-Hall, 2004.

CATALOG DESCRIPTION: Vector calculus. Electrostatics. Magetostatics. Time-verying fields: Faraday's Law and displacement current. Maxwell's equations in differential form. Traveling waves and phasors. Uniform plane waves. Reflection and transmission at normal incidence. Transmission lines. Laboratory segment includes experiments with transmission lines, time-domain reflectometry, the use of computer-simulation exercises, classroom demonstrations.

COURSE OBJECTIVES:

1. To provide students with a basic understanding of electrostatics, magnetostatics; wave propagation;
2. To teach students about transmission lines, how to match a load, how to analyze transient response;
3. To teach students fundamentals of time-varying fields, Maxwell's equations and boundary conditions;
4. To teach students how to perform electromagnetic lab experiments and interpret results statistically;
5. To prepare students for follow-up courses in Electromagnetics area of Electrical Engineering program.

COURSE OUTCOMES [Program Outcomes Addressed]

1. Ability to compute reflection coefficients, input impedances, voltage and current waveforms, power distribution, and transient response of a given transmission-line circuit, using Smith chart; [1,11,13]
2. Ability to design a single-stub matching network; [1,2,3,5,13];
3. Ability to compute electrostatic field and electric potential due to point and distributed charges; [1,14]
4. Ability to compute magnetic field induced by current sources, and resulting forces and torques; [1,14]
5. Ability to compute capacitance of planes and cylinders, and inductance of solenoids and coaxs; [1,14]
6. Ability to use electrostatic & magnetostatic boundary conditions to relate fields in adjacent media; [1]

PROGRAM OUTCOMES ADDRESSED: 1,2,3,5,11
PROFESSIONAL COMPONENT ADDRESSED: 13,14
PREPARED BY: Andrew E. Yagle&MM on Dec. 31, 2004

CLASS/LABORATORY SCHEDULE:
LECTURES: 3 per week @ 50 minutes.
LABORATORY: 5 total @ 2 hours.

TOPICS COVERED:

1. Complex numbers and phasors
2. Traveling electromagnetic waves
3. Transmission lines models
4. Smith chart impedance matching
5. Vector calculus (div, curl, grad)
6. Electrostatic fields; Gauss's law
7. Conductors & dielectrics
8. Magnetics; Biot-Savart law
9. Magnetic material properties
10. Inductance & capacitance energy

ASSESSMENT (Course outcomes)

1. 11 problem sets [1,2,3,4,5,6]
2. 5 laboratories [1,2]; students work in pairs; written reports
3. 3 closed-book examinations [1,2,3,4,5,6]

COURSE DESCRIPTION: University of Michigan, College of Engineering, ELECTRICAL ENGINEERING PROGRAM