COURSE: EECS 330. **TITLE:** Electromagnetics II. **PREREQUISITES:** EECS 230. **ELECTIVE**

TEXTBOOK: F. Ulaby, *Fundamentals of Applied Electromagnetics*, Prentice-Hall, 2004

CATALOG DESCRIPTION: Time-varying electromagnetic fields and Maxwell's equations. Plane-wave propagation, reflection, and transmission. Geometric optics. Radiation and antennas. System applications of electromagnetic waves. Laboratory segment consists of experiments involving microwave and optical measurements and the design of practical systems.

COURSE OBJECTIVES:

1. To teach students the basics of propagating electromagnetic waves from Maxwell's equations;
2. To teach students how to solve basic problems in electromagnetic wave propagation using Maxwell's equations and boundary conditions;
3. To teach students how to solve basic problems in wave guidance and radiation;
4. To teach students experimental knowledge of electric and magnetic forces on charged or current carrying systems, and applications such as optical imagery and Doppler radar.

COURSE OUTCOMES [Program Outcomes Addressed]

1. Ability to use Maxwell's equations to compute E & H fields from charge and current densities; [1,14]
2. Ability to write out time-dependent equations for electromagnetic waves in dielectric media; [1,14]
3. Ability to compute power densities for reflected and transmitted plane waves at interfaces; [1,14]
4. Ability to compute focal length of a lens from surface radii of curvature and refractive index; [1,14]
5. Ability to compute location and magnification of optical images formed by a simple lens; [1,14]
6. Ability to compute emission and radiation patterns for arrays of dipole antennae; [1,14]
7. Ability to analyze simple waveguides; [1,14]
8. Ability to describe a communications system and evaluate system issues such as power budget. [11]

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

CLASS/LABORATORY SCHEDULE:
LECTURES: 3 per week @ 50 minutes.
LABORATORY: 4 total @ 2 hours.
RECITATION: 1 biweekly @ 1 hour

TOPICS COVERED:

1. Faraday's and Ampere's laws
2. Lenz's law, induction, motors, generators, transformers
3. Maxwell's equations
4. Boundary conditions
5. Plane waves, polarization, propagation in lossy media
6. Snell's law, Brewster angle, oblique incidence
7. Radiation, antenna arrays
8. Satellite communication, radar, and waveguides

ASSESSMENT (Course outcomes)

1. 12 problem sets [1,2,3,4,5,6]
2. 4 laboratories [3-6]; students work in pairs; written reports
3. Final project [3-6]; students work in groups of 3 or 4
4. 3 closed-book exams [1-6]

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