GOALS OF AN ENGINEERING EDUCATION

- Engineering programs must demonstrate to ABET that their graduates have:

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs

(d) an ability to function on multi-disciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context

(i) a recognition of the need for, and an ability to engage in, life-long learning

(j) a knowledge of contemporary issues

(k) **an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice**

THE MOST USEFUL EE COURSES

- Employers expect that any BSEE will be able to execute board-level circuit design
- According to an unscientific survey of EE graduates from UT-Dallas and Texas A&M, the most useful courses for an EE working in board-level circuit design are:
  - ▷ Analog circuits, especially amplifier theory
  - ▷ Semiconductor devices
  - ▷ Digital circuits
  - ▷ VLSI circuit design
  - ▷ Communications
  - ▷ Emag

WHY EMAG IS USEFUL (AND WHAT YOU SHOULD LEARN)

- Understanding of electromagnetic radiation and near-field effects
  - ▷ Antennas and propagation
  - ▷ Effects of some circuit modules on other modules
    - ○ Near-field effects: Capacitive and inductive coupling
  - ▷ FCC Class B regulations on electromagnetic compatibility
    - ○ A product cannot be shipped or advertised to consumers unless it meets the FCC Class B regulations on spectral power density versus frequency
  - ▷ IEEE C95.1 regulations on safe levels of electromagnetic power for human exposure
- Understanding of transmission-line effects in circuits
  - ▷ Signal propagation velocity (leads to skew)
  - ▷ Reflections (due to impedance mismatch)
  - ▷ Distortion
- Other analog effects in computer and communication systems

WHAT YOU NEED TO KNOW TO SUCCEED IN EMAG

- Physics 2
  - ▷ Ability to apply basic formulas of electrostatics and magnetostatics
- Advanced engineering math
  - ▷ Ability to manipulate complex numbers
    - ○ Complex conjugate, modulus, phase, arithmetic operations
  - ▷ Ability to apply definitions of gradient, divergence, and curl
  - ▷ Conceptual understanding of line and surface integrals
- Circuits
  - ▷ Voltage, current and power for a circuit element with complex impedance
  - ▷ Basic circuit concepts (Thévenin and Norton equivalent circuits, principle of superposition, voltage divider, current divider, etc.)

Emag is hard if you fall short in one of these background areas, and may be impossible if you fall short in more than one

STUDY SKILLS FOR EMAG

- Lectures and lecture/study notes
  - ▷ **Attend and take notes!**
  - ▷ Re-copy your notes ASAP after class & add material from readings
- Homework
  - ▷ Do it yourself — don't look up the answers!
    - ○ The homework is preparation for the exams
- Office hours
  - ▷ Come to office hours — you've paid for them!
  - ▷ It's better to ask during office hours than to miss a question on an exam
- Other study techniques
  - ▷ Index cards/formula sheets for important concepts and formulas
  - ▷ Study groups: Make sure that you don't all arrive at the same wrong answer
  - ▷ Tutorials: SWE and TSPE

EE 4301 TOPICS

- Review of essential skills
  - ▷ Complex numbers
  - ▷ Vector calculus
- Fields and materials
- Maxwell's equations in integral form
- Maxwell's equations in differential form
  - ▷ Potential functions
  - ▷ Energy storage
- Uniform plane waves and power flow
- Field and field line essentials for digital electronics
- Transmission line essentials
- Antenna essentials

EE 4301 INFORMATION

- Textbook: N. N. Rao, *Fundamentals of Electromagnetics for Electrical and Computer Engineering*
- Exam schedule:
  - ▷ Midterm 1: Friday, February 19, 2010
  - ▷ Midterm 2: Friday, March 12, 2010
  - ▷ Midterm 3: Friday, April 16, 2010
  - ▷ Final: Wednesday, May 12, 2010 at 8:00 AM
- Grading:

$$\begin{aligned}\text{course \% grade} = {} & .10(\text{homework and notes \%}) \\ & + .20(\text{midterm 1 \%}) \\ & + .20(\text{midterm 2 \%}) \\ & + .20(\text{midterm 3 \%}) \\ & + .30(\text{final exam \%})\end{aligned}$$

- Syllabus: http://www.utdallas.edu/∼cantrell/ee4301/EE4301-Syllabus-10S.pdf
- Web site: http://www.utdallas.edu/∼cantrell/ee4301/