

Engineering Sciences 50  
An Introduction to Electrical Engineering  
Syllabus  
Fall Term 2001-2002

**Prerequisites:**

Basic knowledge of high school physics, linear algebra, and elementary calculus. ES 50 is an introductory level course that is open to freshmen, sophomores, and juniors concentrating in Engineering Sciences as well as students outside of Engineering Sciences with an interest in electrical engineering.

**Course Description:**

Applications of electrical engineering abound in nearly every aspect of today's technological world. This course presents a survey of the field of electrical engineering and is designed to introduce students to the fundamental concepts behind the hardware and software that are ubiquitous in everyday (and not so everyday) electronic devices and systems such as computers, telephones, TVs, high-speed communication networks, video games, CDs, modems, and satellite communications. The course will introduce basic electrical concepts including charge, voltage, current, energy, power, resistance, capacitance, inductance, and Kirchoff's laws. Practical digital and analog electronic systems will also be introduced to illustrate advanced topics that are treated more completely in subsequent electrical engineering courses. These topics include signal processing, semiconductor circuit design, communications, and computer architecture. The material is here presented from both theoretical and application perspectives and is integrated with laboratory experiments requiring the design and construction of electronic circuits and systems, which are intrinsic elements of current technology.

**Faculty:**

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Others TBA

**Lectures:**

Time : T and Th 10-11:30  
Place : 319 Cruft Laboratory

**Laboratory:**

Time : TDB (approximately biweekly)  
Place : Maxwell-Dworkin Basement

**Weekly Discussion Section:**

Time : TBD

Place : TBD

**Web Page:**[www.deas.harvard.edu/courses/es50](http://www.deas.harvard.edu/courses/es50)**Textbook:**

Electrical Engineering: An Introduction, Schwarz and Oldham, Oxford (1993), ISBN 0-19-510585-0

**Homework:**

Problem sets will be assigned weekly on Thursday and will be normally due one week later at the beginning of class. Late assignments will only receive partial credit. Please check the course web site for updates.

**Examinations:**

Two in class quizzes will be scheduled. In addition, there will be the usual 3-hour final examination. Please check the course web site for updates.

**Grading:**

Problem Sets : 25%

Quiz1 : 10%

Quiz2 : 10%

Labs : 15%

Final Exam : 40%

**Major Topics:***Basic Electrical Engineering Concepts – Digital: Part 1*

Boolean Algebra

Truth Table

Product and Sum Canonical Forms

Logic Gates

Decoders and Multiplexors

Latches and Flip-Flops

Counters

Adders and ALU

*Basic Electrical Engineering Concepts – Analog: Part 2*

Charge, Voltage, and Current

Resistance and Ohm's Law

Kirchoff's Voltage Law

Kirchoff's Current Law

Thevenin Equivalent Circuit

Norton Equivalent Circuit

Inductors and Capacitors

Impedance and AC Sinusoidal Signals

*Operational Amplifiers**Semiconductor Devices**Transistors Circuits**Analog-to-Digital and Digital-to-Analog Conversion***Possible Advanced Topics by Guest Lecturers:***Signal Processing**VLSI Design**Computer Systems**Communication*