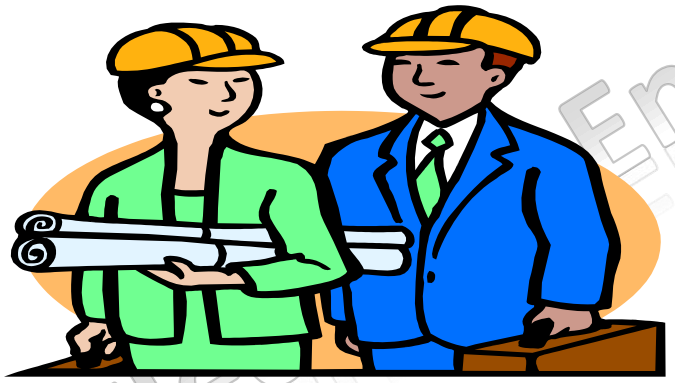
Lecture 4

Electrical Engineering

What is engineering?

What does an engineer do?



What is engineering?

What images come to mind when you hear the words "engineer" or "engineering"?

What is engineering? (cont.)

"The science concerned with putting scientific knowledge to *practical uses*"

(Webster New World Dictionary)

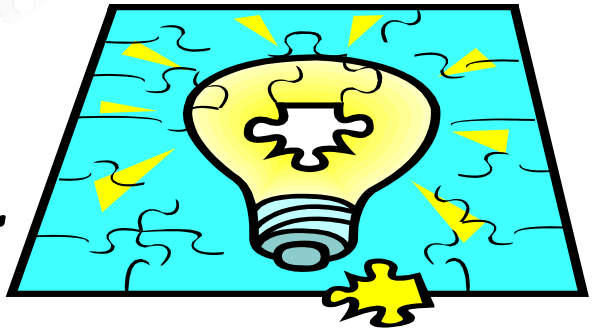
What is engineering? (cont.)

"Engineering is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind"

(Accreditation Board for Engineering and Technology, ABET)

What is engineering? (cont.)

- *Engineering is problem solving.*
- *The field of engineering is dedicated to solving the problems of our ever-changing world.*
- *Their work is the link between a need or problem and a solution.*
- *Engineers focus on making things work more efficiently.*



- *They do this by using advanced mathematics, the sciences and engineering principles.*

What is an engineer?

"A person skilled or occupied in some branches of engineering"

(Webster New World Dictionary)

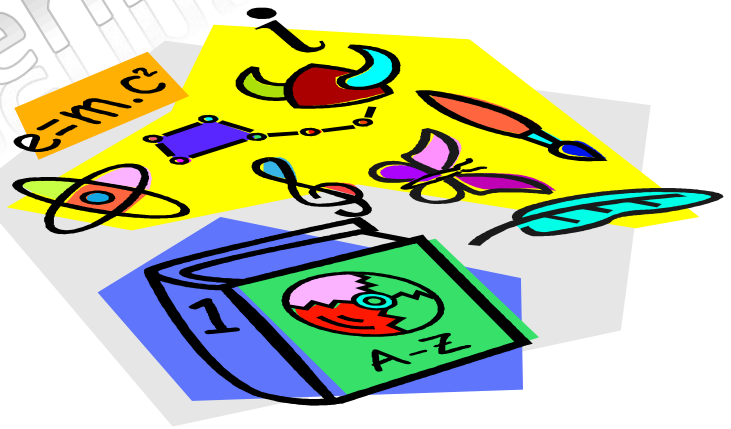
Where does the word "*engineer*" come from?

*From the Latin word "**ingenium**" meaning something like "**ingenuity**"*

(Webster New World Dictionary)

What is science?

"Systematized knowledge derived from observation, study, and experimentation carried on in order to determine the nature or principles of what is being studied"



(Webster New World Dictionary)

What is the difference between an engineer and a scientist?

- A scientist's goal is to learn fundamental truths.
- An engineer's goal is to use those truths to solve practical problems.

In some areas of theoretical engineering, the distinction is very blurry.

What does an engineer do?

- Addresses global problems
- Solves problems

What does an engineer do? (cont.)

For example : ***Food shortage***

This is a worldwide problem, and engineers are working to develop ways to address this issue. Biologists documented the lifecycle of various fruits and vegetables. Using this information, engineers invented ways to genetically engineer certain types of fruits and vegetables. Their efforts increase crop yields so more food is available for people to eat. Engineers also use their knowledge to address other agriculture-related issues like proper irrigation, effective pesticides and efficient farm machinery.

What does an engineer do? (cont.)

- Engineers build things we see
- Engineers build things we don't even notice
- Engineering touches every facet of our lives

What is electrical engineering?

"Engineering connected with the science or use of ***electricity***"

(Webster New World Dictionary)

What does an electrical engineer do?

- Research and development
- Design
- Manufacturing
- Sales
- Management

Adapted from lectures by Dr. M. Sami Fadali

Electrical Engineering Disciplines

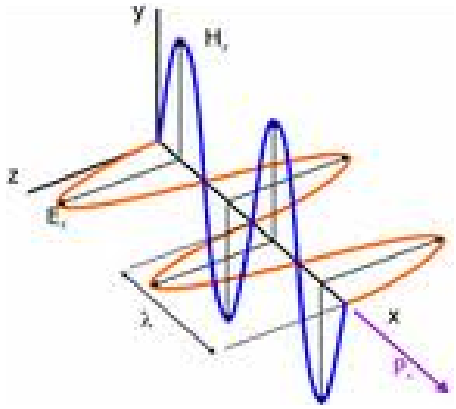
- Analog and Digital Electronics
- Bioelectronics Engineering
- Computer Engineering
- Control Systems
- Digital Signal Processing
- Electronic Circuit Design Engineering
- Energy Conversion
- Image Processing
- Instrumentation Engineering

Electrical Engineering Disciplines (cont.)

- Microelectronic and VLSI Engineering
- Microprocessor Systems Engineering
- Microwave Engineering
- Photonic Engineering
- Power Electronics
- Electromagnetics
- Power Systems
- Solid-state Engineering
- Communications Engineering

Electromagnetics

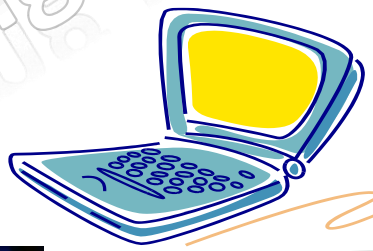
Electromagnetics deals with the transfer of energy by radiation, such as light waves, and radio waves, and the interaction of such radiation with matter.

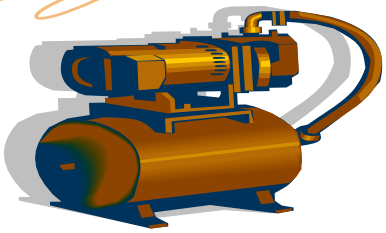


Electromagnetics (cont.)

Some Applications

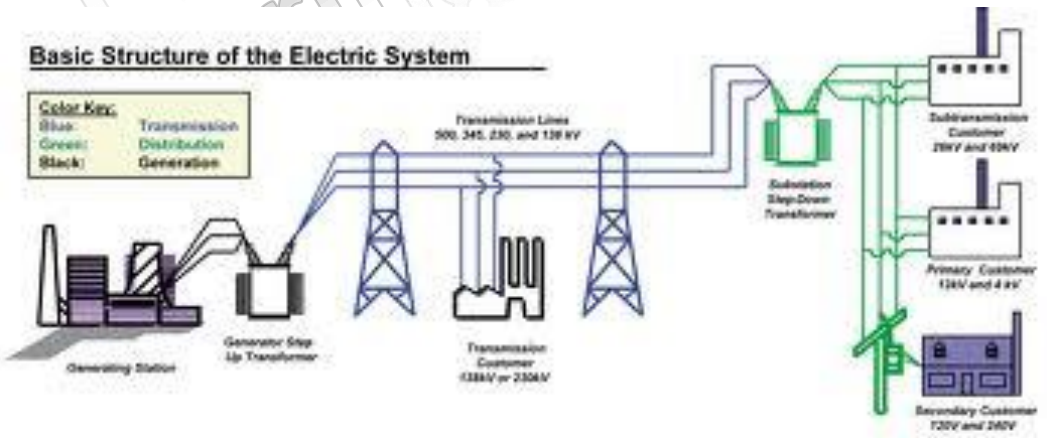
- Radio and TV.
- Cellular telephones.
- Computers.
- Electric Machinery.
- Superconductors





Power Systems Engineering

The power systems field is concerned with the generation, transmission, and distribution of electrical energy.



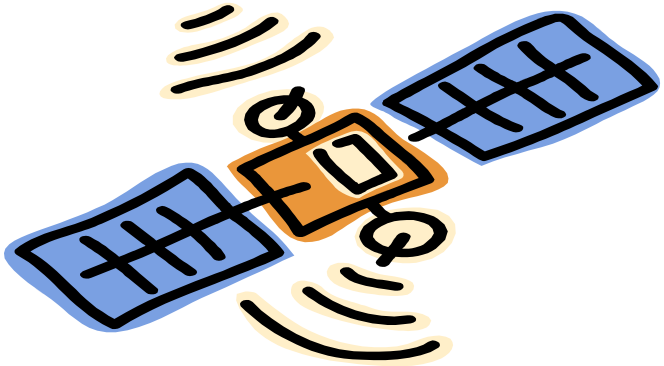
Power Systems Engineering (cont.)

Some Applications

- Large electric generators
- Power plants
- Protection
- Alternative energy

Communications

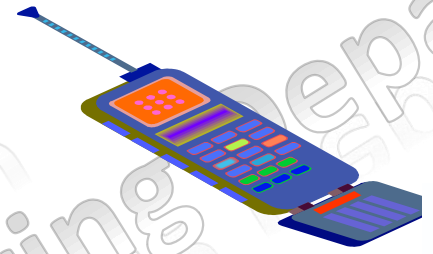
The field of communications encompasses transmission of information by signals through wired and wireless links and networks. The information may be voice, images (still photographs and drawings), video, data, software, or text messages.

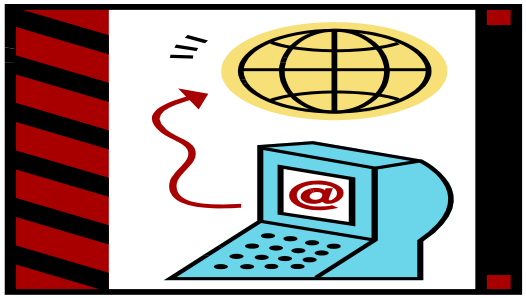


Communications (cont.)

Some Applications

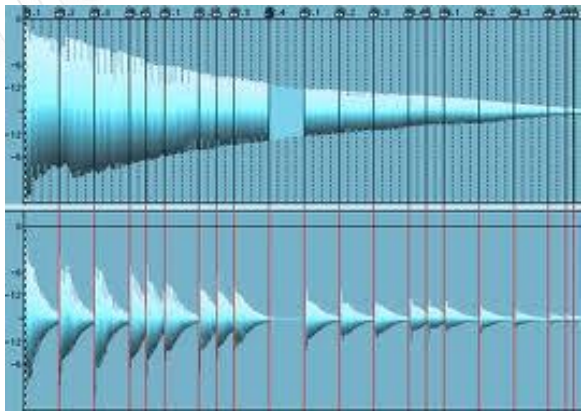
- Cellular phone
- Global Positioning System (GPS)
- Internet
- Satellite data networks





Signal Processing

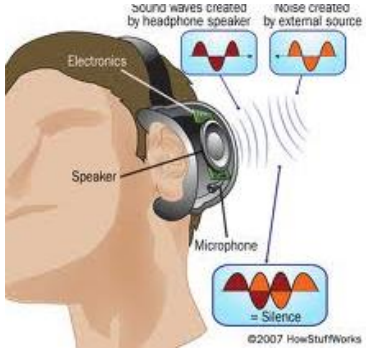
The field of signal processing involves manipulating signals so that they can be transmitted with greater accuracy, speed, reliability, and efficiency.



Signal Processing (cont.)

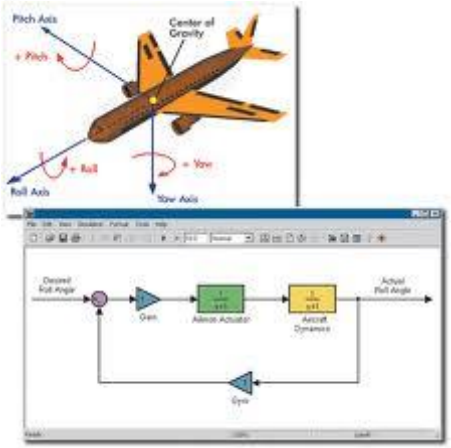
Some Applications

- High Definition Television (HDTV)
- Speech recognition
- Noise cancellation
- Radar, Sonar



Controls

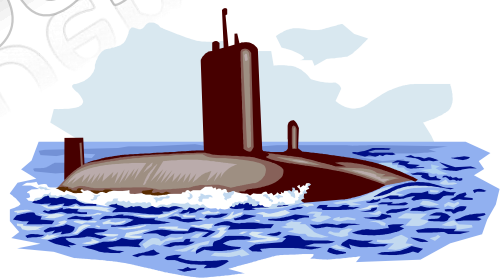
The field of automatic control spans a wide range of technologies, from aerospace to health care. The main goal of automatic control technology is to automatically guide or regulate a system under both steady-state and transient conditions.



Controls (cont.)

Some Applications

- Space shuttle
- Submarine
- Medical robotic systems
- Active suspension system



Choices

As reminder, your *choices* allow you to specialize in one or more areas of Electrical Engineering.