ENGR 065 Circuit Theory

Lecture 1: Electrical Engineering Overview and International System of Units

Topics

1. The overview of electrical systems
2. International system of units (SI)

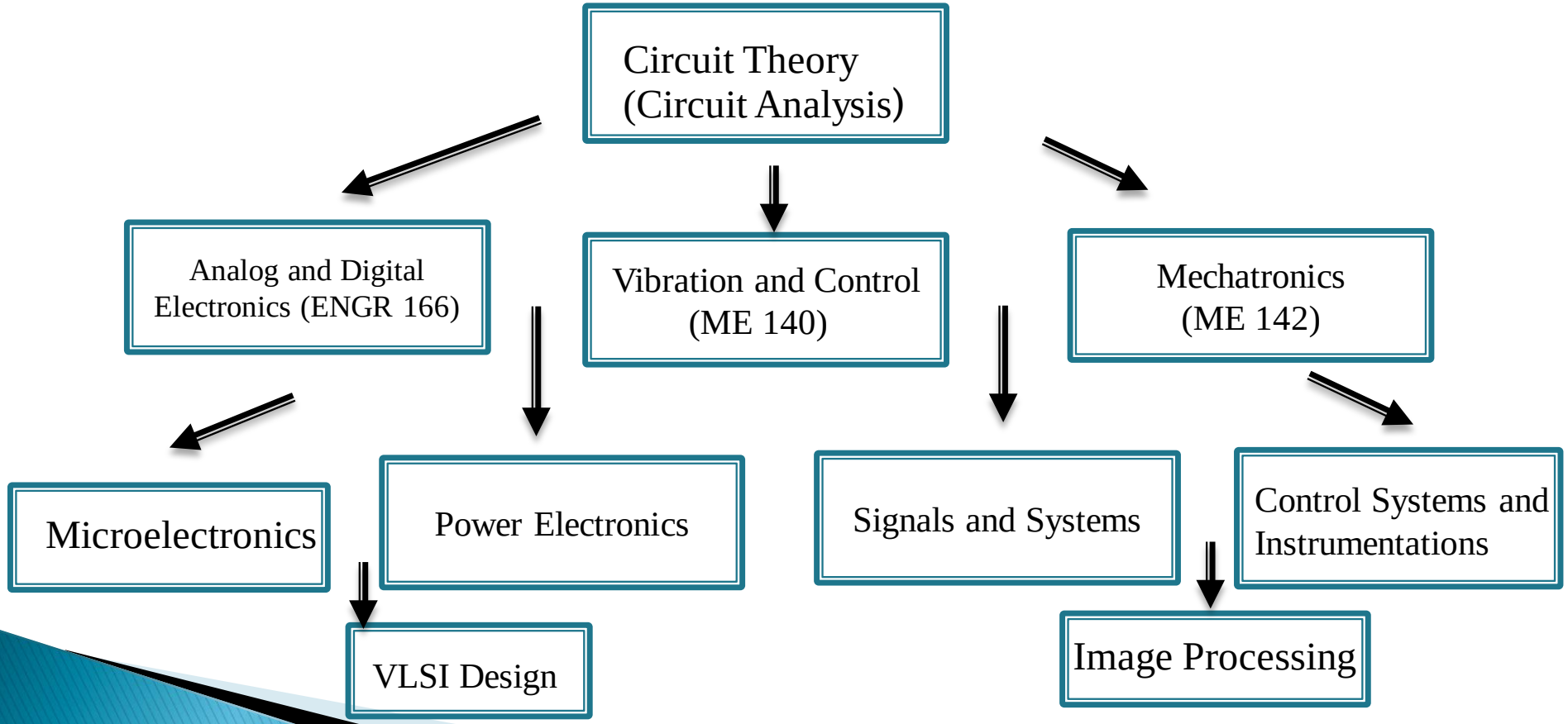
- Covered in Sections 1.1, 1.2, and 1.3

Why Do We Learn Circuit Theory?

- Electrical devices and systems have become a part of our life. This course will provide you with basic knowledge and skills to analyze, design, and develop these electrical devices and systems.
- The course is designed to introduce the fundamental principles (three laws) and the technical skills of how to apply these principles to circuit analysis. The primary techniques are:
  1. Series and parallel combinations or simplifications
  2. Kirchhoff's current and voltage laws, and Ohm's law
  3. The node-voltage and mesh-current method
  4. The source transformation
  5. The Thévenin and Norton equivalents
  6. The superposition (linear circuits)

Why Do We Learn Circuit Theory?

- The circuit theory is a fundamental and core course of related higher division courses.



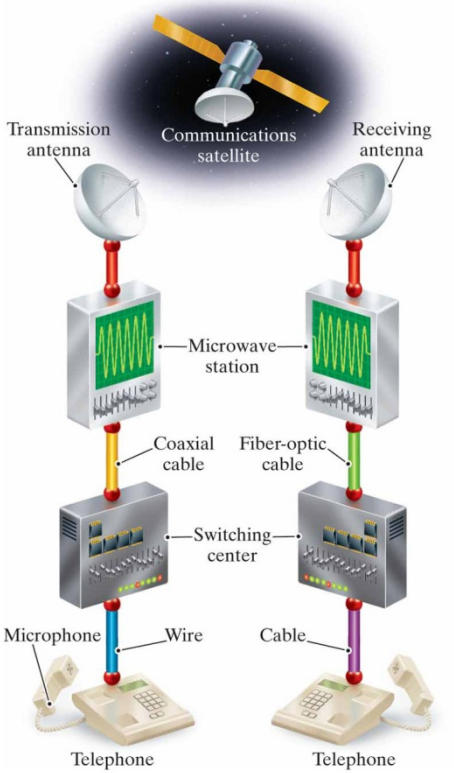
Overview of Electrical Engineering

The five major electrical systems are:

- Communication systems
- Computer systems
- Control systems
- Power systems
- Signal processing systems

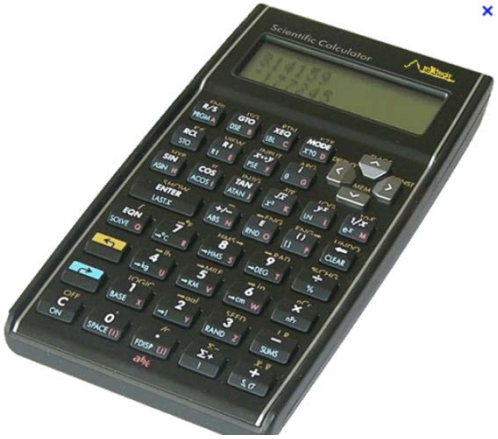
Communication Systems

1. Communication systems generate, transmit, and distribute information.



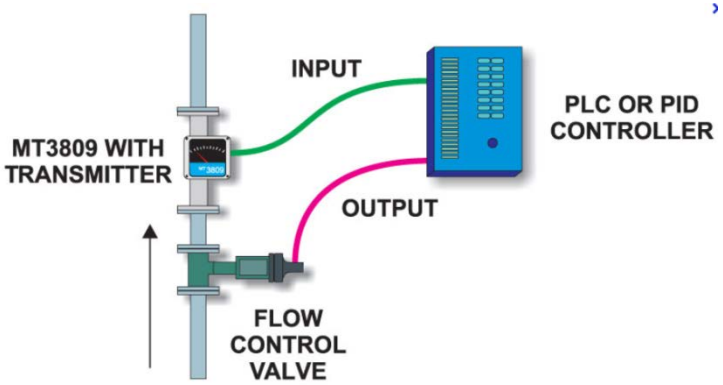
Computer Systems

2. Computer systems process information from word processing to mathematical solutions.



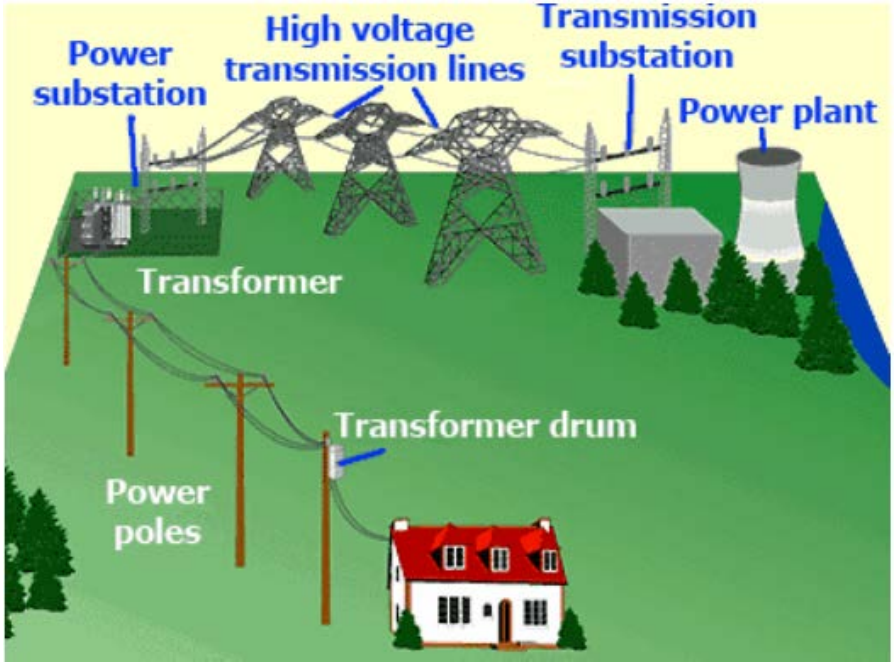
Control Systems

3. Control systems are used to regulate processes.



Power Systems

4. Power systems generate and distribute electric power.



Signal Processing Systems

5. Signal processing systems use electrical signals to represent information.

International System of Units

TABLE 1.1 The International System of Units (SI)

Quantity	Basic Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	degree kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

International System of Units

TABLE 1.2 Derived Units in SI

Quantity	Unit Name (Symbol)	Formula
Frequency	hertz (Hz)	s^{-1}
Force	newton (N)	$kg \cdot m/s^2$
Energy or work	joule (J)	$N \cdot m$
Power	watt (W)	J/s
Electric charge	coulomb (C)	$A \cdot s$
Electric potential	volt (V)	J/C
Electric resistance	ohm (Ω)	V/A
Electric conductance	siemens (S)	A/V
Electric capacitance	farad (F)	C/V
Magnetic flux	weber (Wb)	$V \cdot s$
Inductance	henry (H)	Wb/A

International System of Units

TABLE 1.3 Standardized Prefixes to Signify Powers of 10

Prefix	Symbol	Power
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
nano	n	10^{-9}
micro	μ	10^{-6}
milli	m	10^{-3}
centi	c	10^{-2}
deci	d	10^{-1}
deka	da	10
hecto	h	10^{2}
kilo	k	10^{3}
mega	M	10^{6}
giga	G	10^{9}
tera	T	10^{12}

Summary

- Introduced some examples of electrical systems.
- Went through international system of units.

In next lecture, we will discuss

- Voltage, current, power, and energy
- Ideal basic circuit elements
- The passive sign convention
- Reference polarities/directions