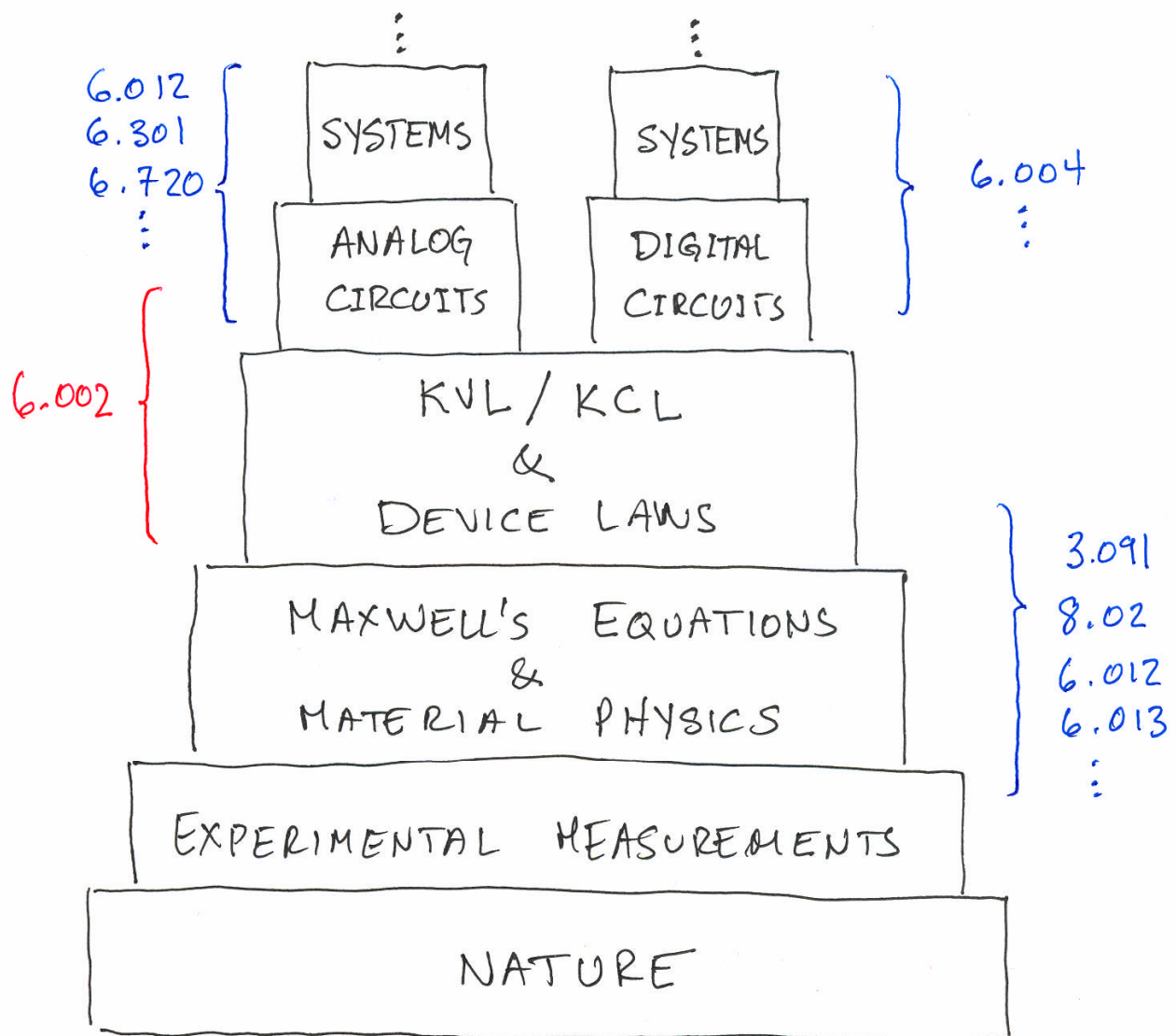


6.002 - Lecture 1

Introductions:

- 6.002
- Electronic Devices
- Circuit Analysis

Engineering is the purposeful use of science.
Science is the study of natural phenomena.
Mathematics is the common language. } 18.03
:

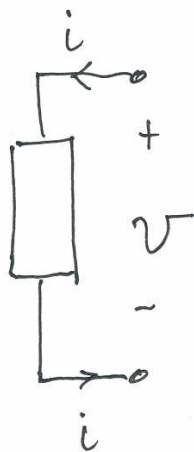


6.002 will cover:

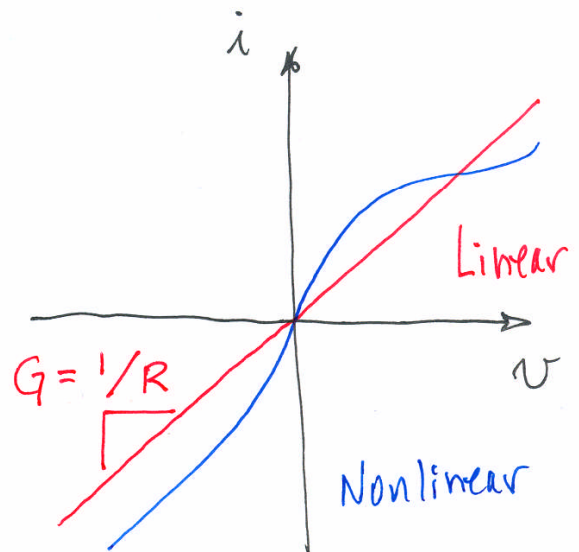
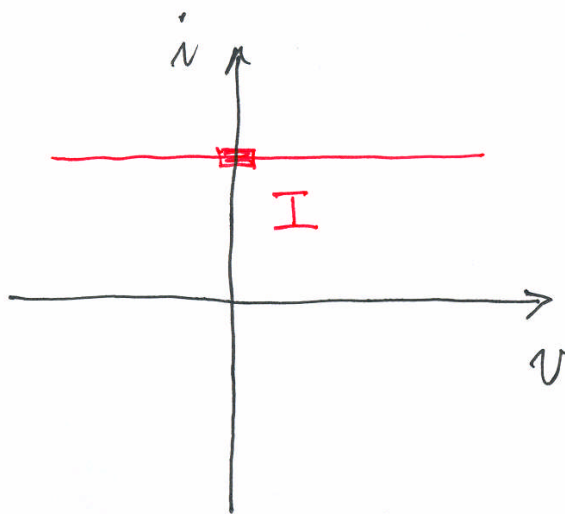
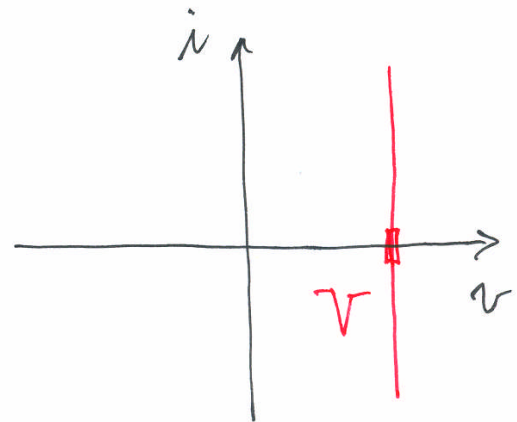
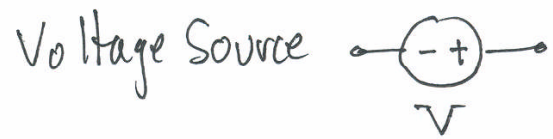
- electronic devices, their lumped-parameter models, and their interactions;
- the analysis and design of electronic circuits;
- the concepts of modeling and abstraction;
- examples of analog and digital circuits and systems;
- the real world via laboratory experience; and
- practical examples of mathematics.

Electronic Devices

Two-Terminal Device



$$\text{Power } P_a \\ = v i$$

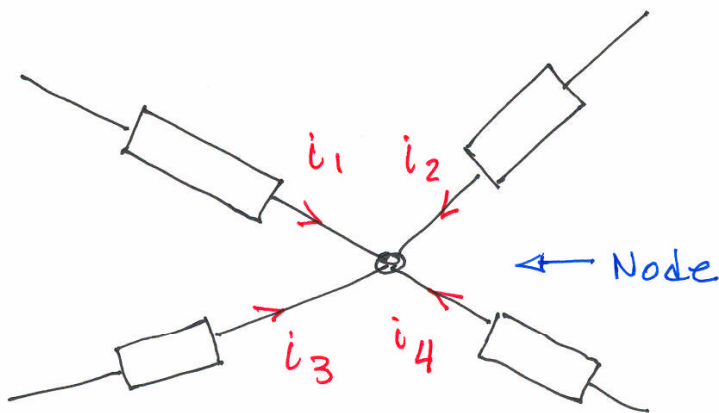


Kirchhoff's Current Law (KCL)

$$\sum \left[\begin{array}{l} \text{Branch Currents} \\ \text{Into A Node} \end{array} \right] = 0$$

Branches

At A Node

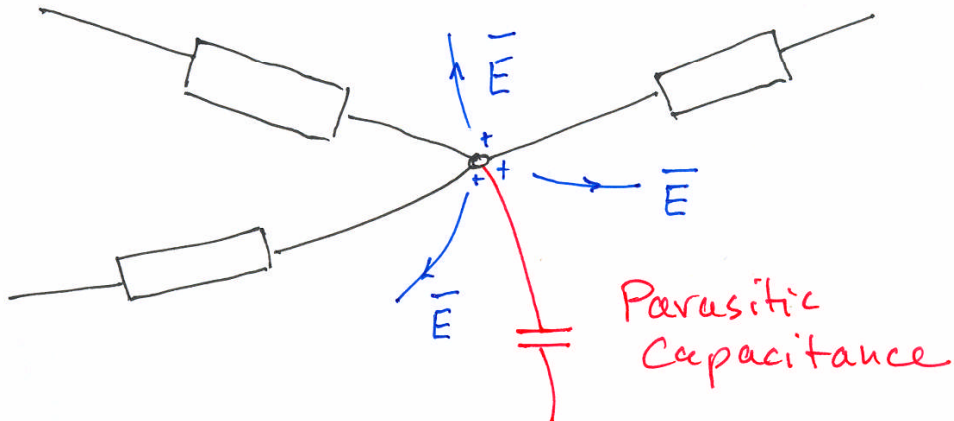


KCL



$$i_1 + i_2 + i_3 + i_4 = 0$$

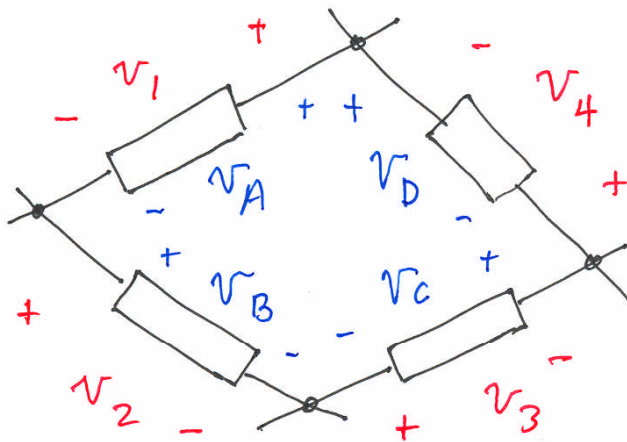
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Kirchhoff's Voltage Law (KVL)

$$\sum [\text{Branch Voltages}] = 0$$

Branches
Around A Loop

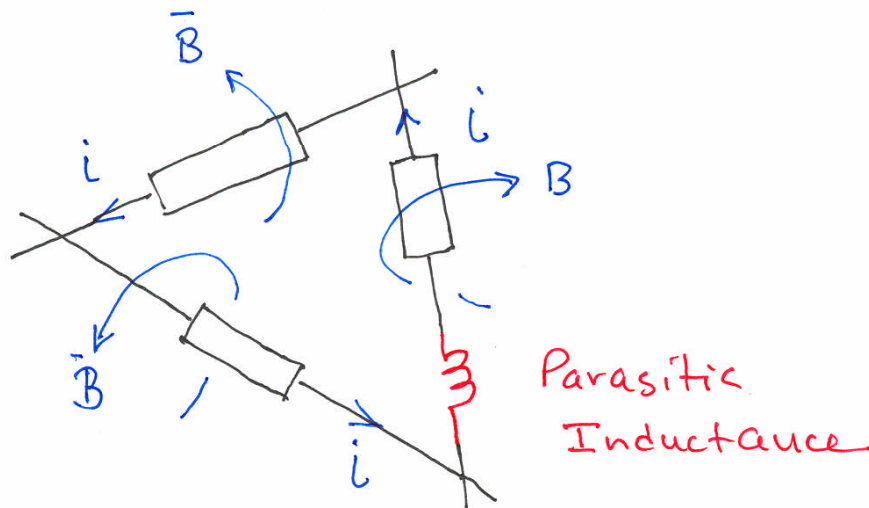


KVL

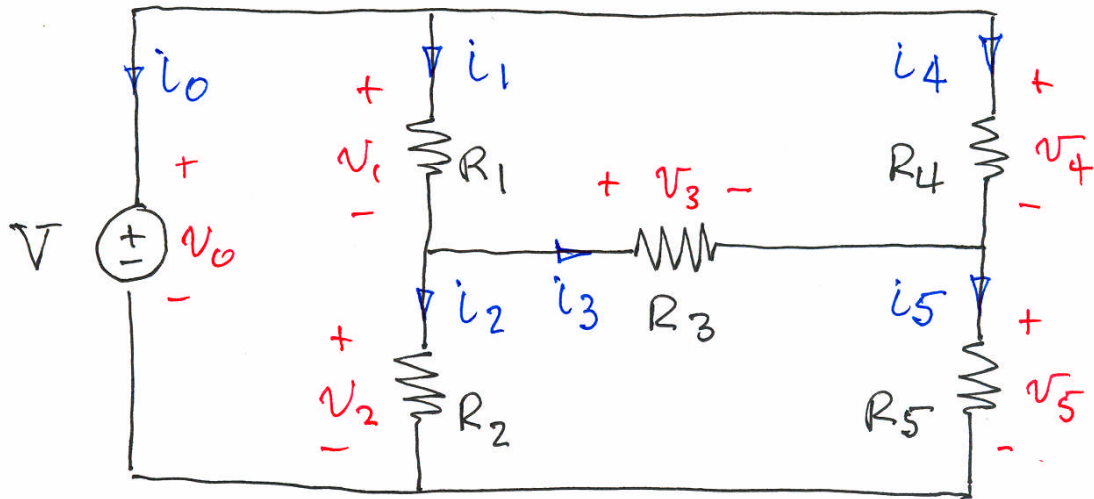


$$v_1 + v_2 + v_3 + v_4 = 0$$

$$v_A + v_B = v_C + v_D$$



Circuit Analysis Example



Device Laws

$$\begin{aligned} v_0 &= V \\ v_1 &= R_1 i_1 \\ v_2 &= R_2 i_2 \\ v_3 &= R_3 i_3 \\ v_4 &= R_4 i_4 \\ v_5 &= R_5 i_5 \end{aligned}$$

KCL

$$\begin{aligned} i_0 + i_1 + i_4 &= 0 \\ -i_1 + i_2 + i_3 &= 0 \\ -i_3 - i_4 + i_5 &= 0 \\ -i_0 - i_2 - i_5 &= 0 \end{aligned}$$

Redundant

KVL

$$\begin{aligned} v_0 &= v_1 + v_2 \\ v_1 + v_3 &= v_4 \\ v_3 + v_5 &= v_2 \end{aligned}$$

$$v_0 = v_4 + v_5$$

Redundant

12 Equations

Algebra

12 Unknowns