Introduction To ECSE 335 Microelectronics

Learning Outcomes

Some Questions You May Be Wondering

- What is the point of this course?
- Why is microelectronics important to you?
- What is the most important design principle an engineer will need throughout their career.
  - This principle was discovered by a electronics engineer.

What is the Point of this Course?

- Firstly, electronics is the only subject in the undergraduate EE program that deals with the design of real (nonlinear) systems.
  - While we will often resort to linear system theory, as it is easier to use, it is through the appropriate linearization of the nonlinear system that allows us to do this.
- Secondly, EC I and II contain a large design component subject to various performance constraints.
  - Very different from circuit analysis.
  - Concerned about making robust and repeatable designs.

Why is Microelectronics Important to You?

- Microelectronics is the enabler of all "smart" systems and devices.
- Electronics provide the flexibility of the system to adapt to new working conditions.
  - Electronic memory and programming is key to this ability.
  - Sensing and actuating is another important attribute of a smart system.

If I was to ask the class:

What is the greatest engineering discovery?

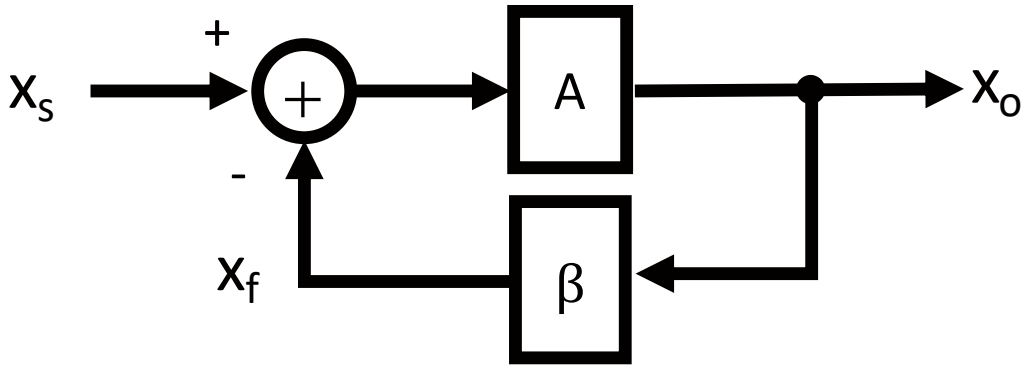
The Greatest Engineering Discovery Is .....

Keep in mind that we are thinking about what an engineer discovered (rather than invented).

The Greatest Engineering Discovery Is .....

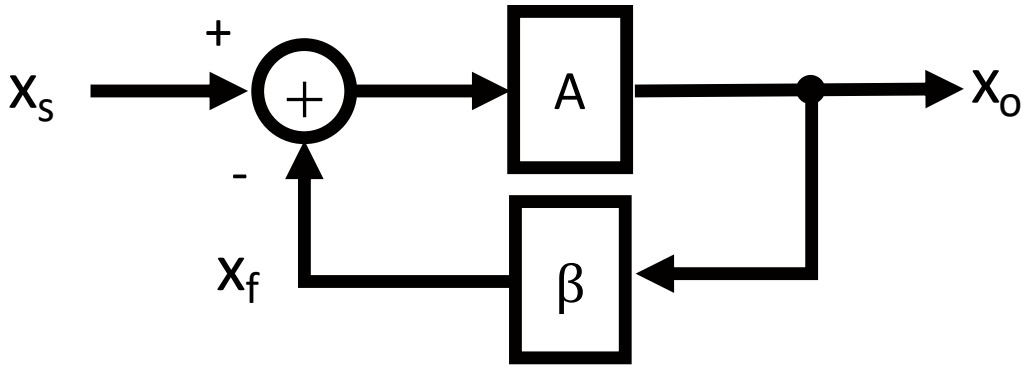
Negative Feedback

Negative Feedback



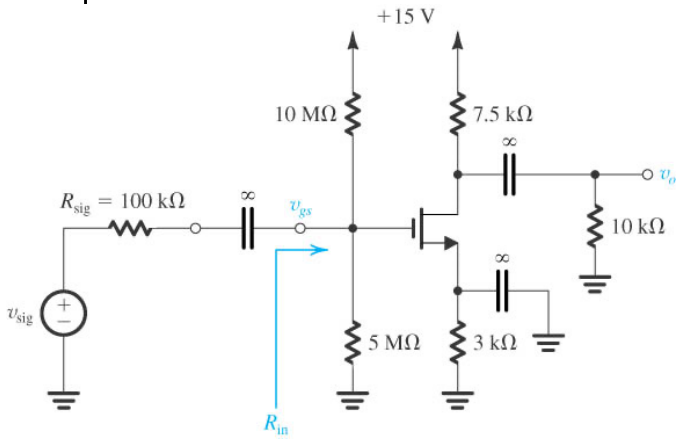
- Negative feedback is a method in which to assemble components of a system in a robust and predictable manner.
  - Its application is found in **all** high-volume engineering systems in one form or another.

The Beauty of Negative Feedback

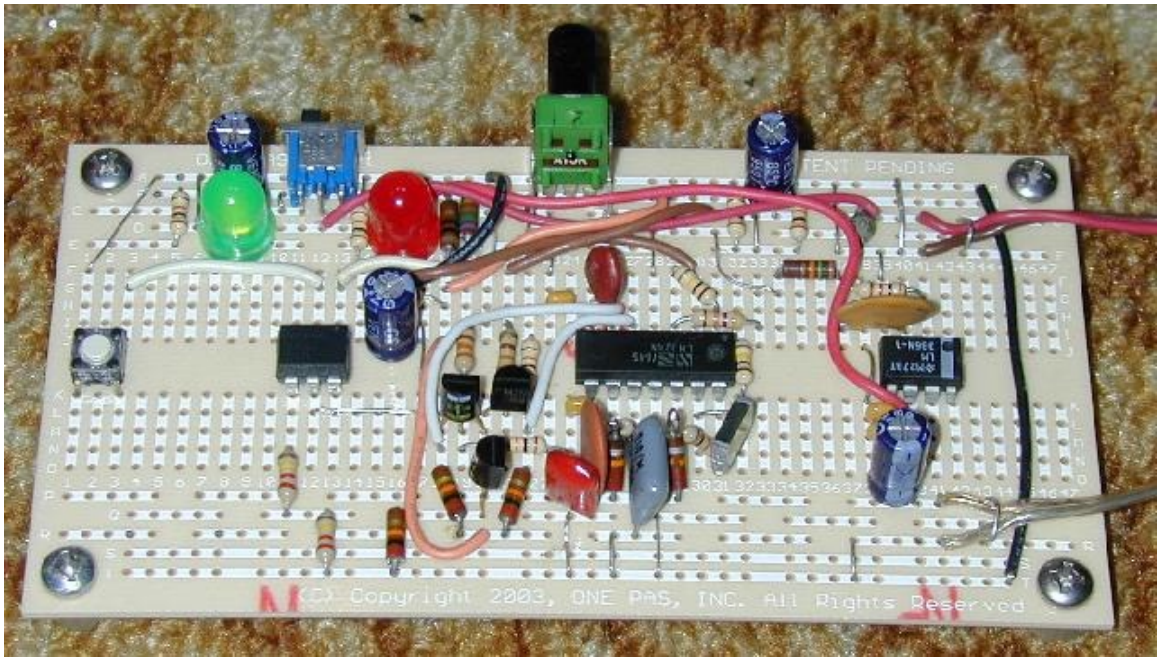


- Unlike a Physicist or Chemist, we don't have to know ***why*** something works the way it does, rather we just have know ***how*** to assemble the parts to get the results we want.

What You Learned In EC I



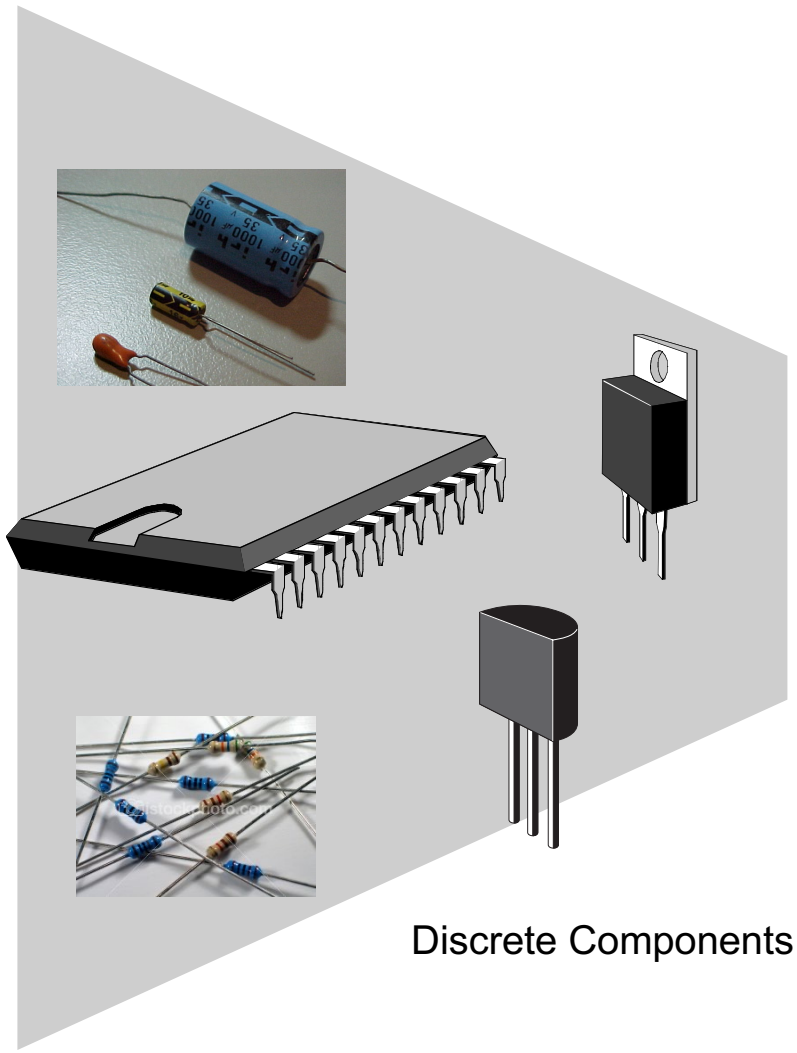
Single-Stage Amplifier



Prototype Setup

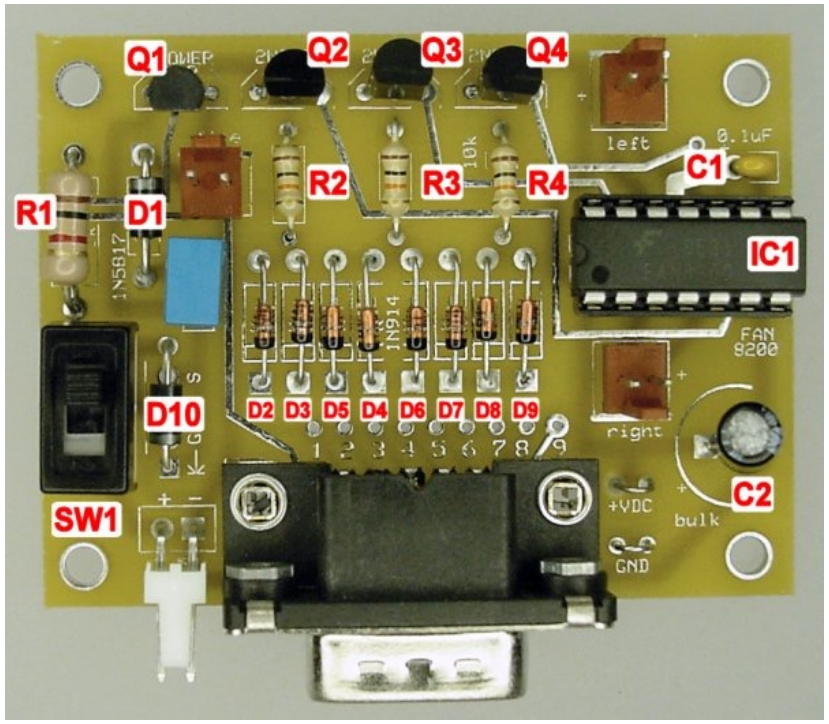
- Constructing discrete electronic circuits using diodes and transistors with resistor biasing techniques; some biasing methods used negative feedback.

Discrete Component Design Using PCB



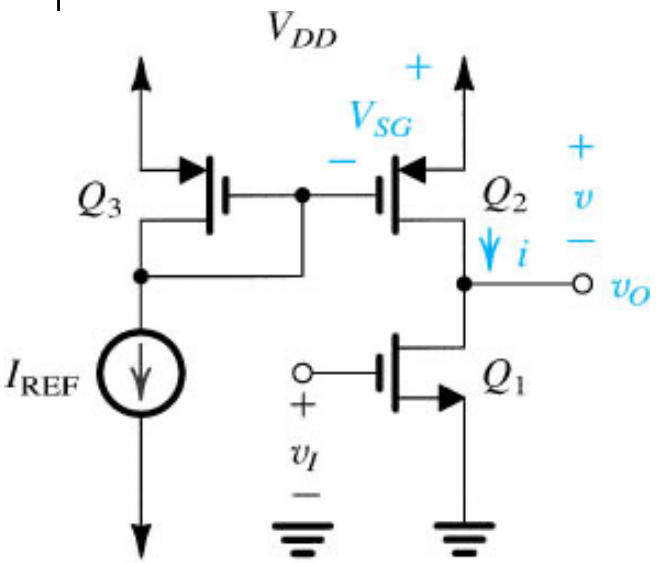
Discrete Components

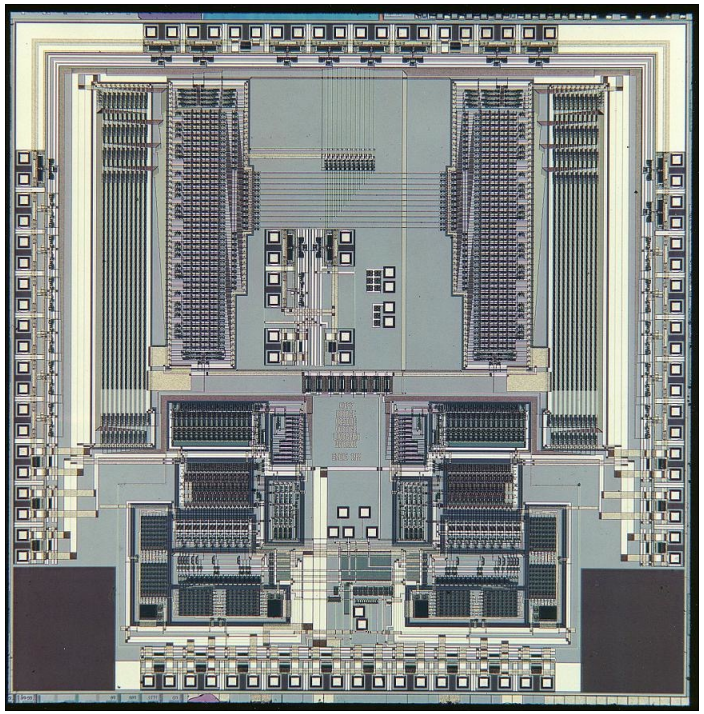
PCB provides interconnect

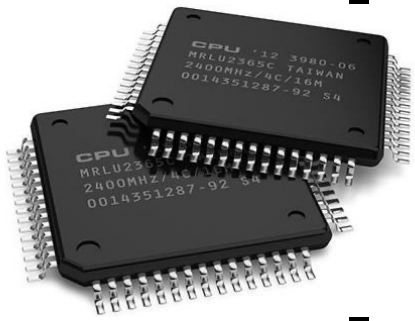


Printed Circuit Board
(PCB)

What You Will Learn In EC II







- Micro/nano-electronics result in smaller-sized circuits; more energy efficient.
- Constructing fully-monolithic circuits using transistors only (some IC design involves R's, C's and L's, but these are expense).
- Feedback design principles for robust circuit design.

Let the micro/nanoelectronics journey begin.