#### **BIOLOGICAL FRAMEWORKS FOR ENGINEERS**

# Session #11 [nm: Micro and Nano Fabrication]

## **General Objectives:**

- ✓ Introduction to microelectronics, microfabrication, and nanotechnology
- ✓ Identify ways that biology can be better understood with small tools

#### Central Framework:

✓ Engineering and physics has enabled tools that are able to manipulate objects at the micro and nanoscale

## Session Outline:

- I. Transistor
  - a. Vacuum tubes
  - b. Solid State Transistor
- II. Integrated Circuits
- III. Moore's Law
- IV. Microelectronic Processes
  - a. Czochralski Process
  - b. Oxide Growth

|    | c. | Lithography                         |
|----|----|-------------------------------------|
|    | d. | Ion Implantation                    |
|    | e. | Thin Film Deposition                |
|    | f. | Chemical Etching                    |
|    | g. | Chemical-Mechanical Polishing (CMP) |
| ٧. |    | Microfabrication                    |
|    | a. | Bulk Micromachining                 |
|    | b. | Surface Micromachining              |
| VI |    | Lithography                         |
|    | a. | Patterning                          |
|    | b. | Positive Resist                     |

c. Negative Resist

| VII.  | Soft Lithography     |
|-------|----------------------|
| a.    | SU-8                 |
| b.    | Polydimethylsiloxane |
| C.    | Apps                 |
|       |                      |
| VIII. | Cell tools           |
|       |                      |
|       |                      |
| IX.   | Nanotechnology       |
| a.    | Nanolithography      |
|       |                      |
| b.    | Molecular Assembly   |
| C.    | Nanomaterials        |