

## BIOLOGICAL FRAMEWORKS FOR ENGINEERS

### Session #12 [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:

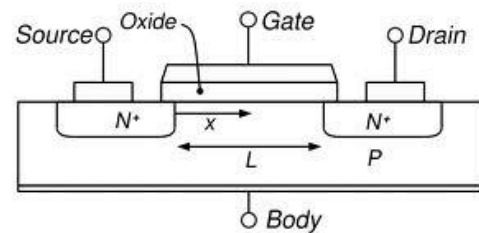
- ✓ Engineering and physics has enabled tools that are able to manipulate objects at the micro and nanoscale

#### Session Outline:

#### I. Transistor

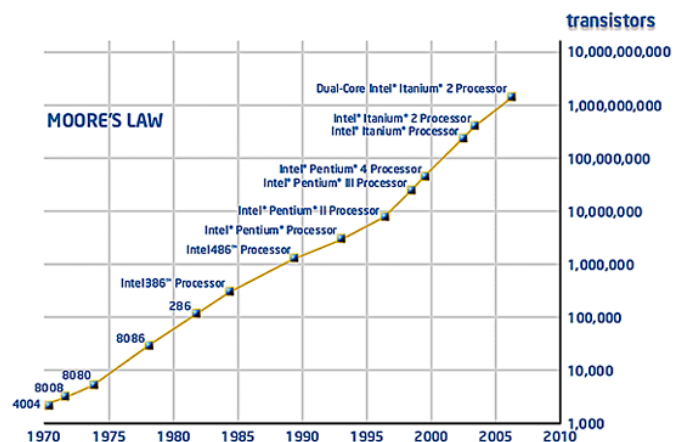
##### a. Vacuum tubes

##### 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)

V. Microfabrication

a. Bulk Micromachining

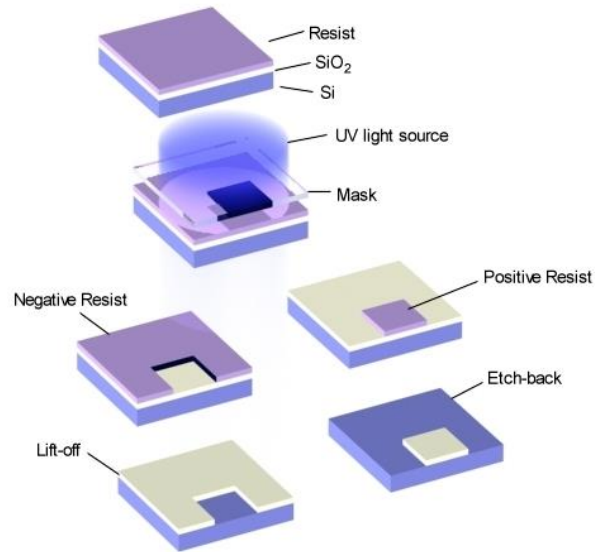
b. Surface Micromachining

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