# EE C247B – ME C218
# Introduction to MEMS Design
# Spring 2015

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Lecture Module 3: Oxidation & Film Deposition



## Lecture Outline

- Reading: Senturia, Chpt. 3; Jaeger, Chpt. 2, 3, 6
  - Example MEMS fabrication processes
  - Oxidation
  - Film Deposition
    - Evaporation
    - Sputter deposition
    - Chemical vapor deposition (CVD)
    - Plasma enhanced chemical vapor deposition (PECVD)
    - Epitaxy
    - Atomic layer deposition (ALD)
    - Electroplating



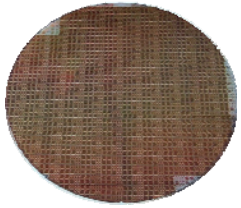
## MEMS Fabrication



## Making Mechanical Devices

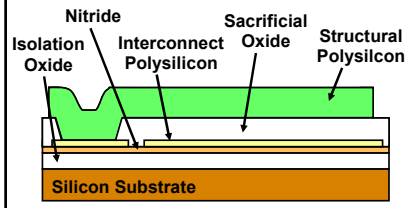
- How best does one make a mechanical product?
- Assembly line production?
  - Pick and place parts
  - Used for many macroscopic mechanical products
  - Robotic automation greatly reduces cost
- *Problem*: difficult to do this with MEMS-scale parts (but not impossible, as we'll soon see …)
- *Solution*: borrow from integrated circuit (IC) transistor technology
  - Use monolithic wafer-level fabrication methods
  - Harness IC's batch methods, where multiple devices are achieved all at once

Automobile Assembly Line

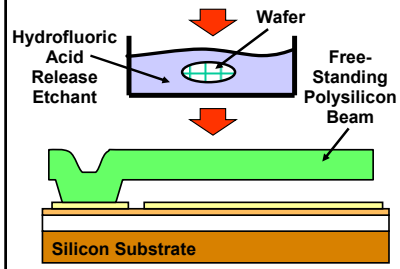


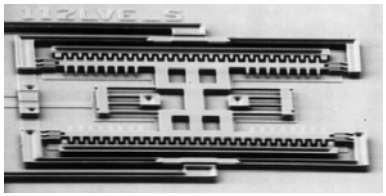
CMOS Integrated Circuit Wafer

## Polysilicon Surface-Micromachining




- Uses IC fabrication instrumentation exclusively
- *Variations*: sacrificial layer thickness, fine- vs. large-grained polysilicon, *in situ* vs. $POCl_3$-doping



300 kHz Folded-Beam Micromechanical Resonator

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