EE C247B – ME C218
Introduction to MEMS Design
Spring 2018

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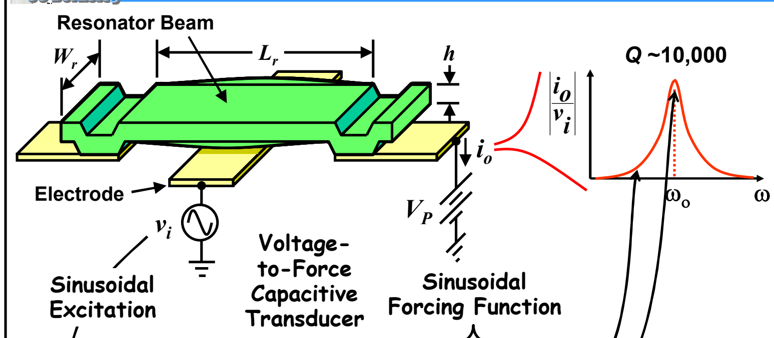
Lecture Module 10: Resonance Frequency

Lecture Outline

- Reading: Senturia, Chpt. 10: §10.5, Chpt. 19
- Lecture Topics:
  - Estimating Resonance Frequency
  - Lumped Mass-Spring Approximation
  - ADXL-50 Resonance Frequency
  - Distributed Mass & Stiffness
  - Folded-Beam Resonator

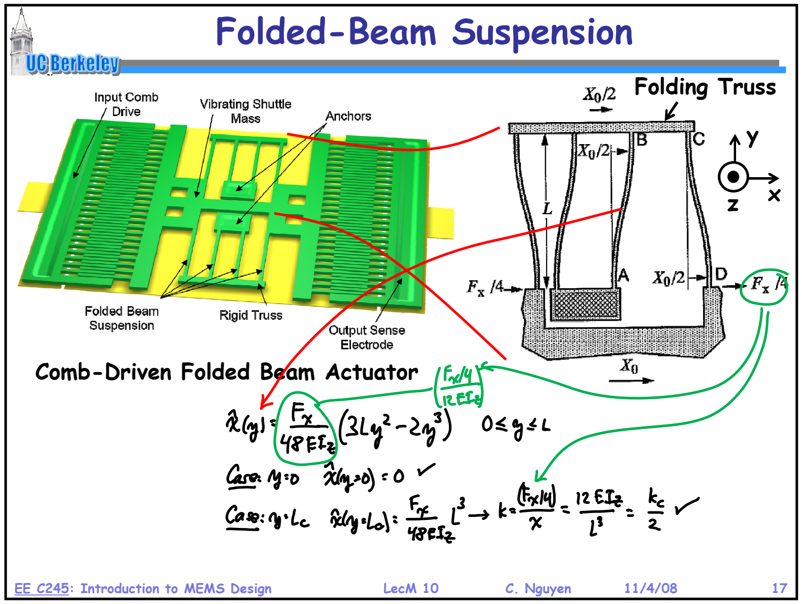
Estimating Resonance Frequency

Clamped-Clamped Beam μResonator



$$v_i = V_i \cos[\omega_o t] \longrightarrow f_i = F_i \cos[\omega_o t]$$

- $\omega \neq \omega_o$: small amplitude
- $\omega = \omega_o$: maximum amplitude → beam reaches its maximum potential and kinetic energies


Folded-Beam Suspension
UC Berkeley
Input Comb Drive
Vibrating Shuttle Mass
Anchors
Folded Beam Suspension
Rigid Truss
Output Sense Electrode
Comb-Driven Folded Beam Actuator
Folding Truss
$X_0/2$
L
B
C
A
D
$F_x/4$
X_0
Y
z
x
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LecM 10
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