

ECEn 550 / ME 550, Fall 2008

Homework #7

Due Dec. 11, 5:00 pm

From the text Foundation of MEMS, do the following problems:

13.1, 13.3, 13.5

For problem 13.1, assume that the channel has a square cross-section, and use equation (13.3) even though w/h is not large.

For problem 13.3, assume the flow speed is the same as that calculated in problem 13.1.

14.2, 14.9, 14.10

For problem 14.2, just find the length and width for a silicon and a gold cantilever (not polyimide). Assume the thickness is $0.5 \mu\text{m}$ in both cases.

For problem 14.9, note that the equation in the paper referenced has an error in it. The term that looks like $(L_1^3 - L_2^3)$ should be $(L_1 - L_2)^3$.

For problem 14.10, just use dimensions somewhere in the range given in the case study, and compare to the range of resonant frequencies given there also.

A. Find a reference for an electrophoretic separation device in your favorite lab-on-a-chip journal (a good one is called Lab On a Chip). Cite the reference and using the conditions described in the paper (channel geometries, applied voltages) estimate the fluid flow in the channels during separation.