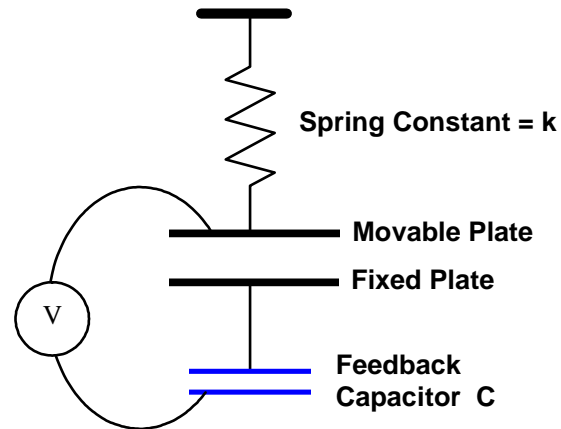


- 1) As we discussed in class, the maximum stable displacement for a parallel-plate electrostatic gap-closing actuator is $1/3$ of the initial gap spacing. It has been shown that the stable displacement can be extended by adding a feedback capacitor in series with the actuator, as shown by the schematic below:



- Assume the parallel plate actuator has an area of A and a gap spacing of g . The feedback capacitor has a capacitance of C . When a voltage V is applied to the actuator and the capacitor connected in series, what is the voltage drop across the parallel plate actuator?
- Derive the expression for electrostatic force.
- Derive the stability condition (pull-in). Show that the pull-in displacement depends on the value of the feedback capacitance.
- If we like to eliminate pull-in completely, what capacitance value (measured in terms of the capacitance value of the parallel plate actuator) should we use?