



ECT 459

Lecture 3

Sensor Transducers

# Capacitive Sensors

Electric Field

$$C = \epsilon \frac{A}{d}$$

$\epsilon$  = permittivity of dielectric [Farad/meter]

$\epsilon$  of vacuum =  $8.85 \times 10^{-12}$  F/m

A=area [meter<sup>2</sup>]

d=separating distance [meter]

Sensors: (Conducting Materials)

Change  $\epsilon$  to detect foreign materials

In field (position sensor, depth sensor)

Change  $d$  to detect distance (position sensor, gauging).

Change  $A$  to detect rotational angle.

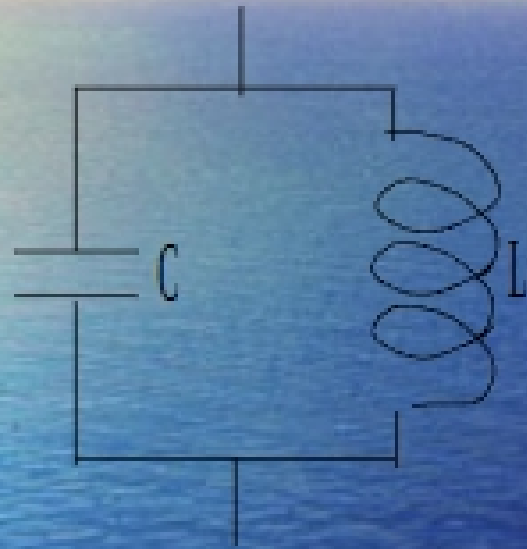
(flat, curved rotating plate)

Capacitance is sensed by a change in capacitive reactance.

$$X_c = \frac{1}{2\pi f C}$$

Note that this is a non-linear relationship.

# Capacitor/Inductor Transducer



$$\text{frequency} = \frac{1}{\sqrt{LC}}$$