COURSE DESCRIPTION

EE 40. Introduction to Solid-State Sensors and Actuators. *9 units (3-0-6); third term. Prerequisites: APh/EE 9 ab and EE 20 ab.* This course provides an introduction to various sensors and actuators. The fundamental principles of the devices will be emphasized, together with their electrical implementation, such as biasing and signal processing circuits. Devices that will be discussed include optical sensors, solar cells, CCDs, CMOS imager, temperature sensors, magnetic sensors, mechanical sensors, acoustic sensors (microphones), speakers, electrical generators, motors, etc. Instructor: Tai.

Textbooks:

"Class notes", prepared by the instructor, YC Tai

Additional references:

1. R.S. Muller and T.I. Kamins, "Device Electronics for Integrated Circuits," newest version.
2. S.M. Sze, "Physics of Semiconductor Devices," newest version.
3. S.M. Sze, "Semiconductor Sensors," newest edition, John Wiley & Sons.
4. L. Ristic, "Sensor Technology and Devices," 1994, Artech House, Inc.
5. R. Seippel, "Transducers, Sensors and Detectors," 1983, Reston Publishing Company.
6. "Microsensors," Eddited by RS. Muller, R. Howe, etc. 1991 IEEE Press.
7. A.S. Grove, "Physics and Technology of Semiconductor Devices," John Wiley & Sons.
8. R.S. Muller and T.I. Kamins, "Device Electronics for Integrated Circuits," newest version.
9. H.F. Wolf, "Semiconductors," John Wiley & Sons Inc.
10. R.A. Smith, "Semiconductors," newest version.

General prerequisites:

Fundamental physics, semiconductors and electronics.

Principal topics covered:

Optical sensors: photoconductors, diode, transistors, CCD
Temperature sensors: thermistor, diode, thermal couple (thermoelectricity)
Magnetic sensors: Hall sensor, Flux-gate sensor, SQUID
Mechanical sensors: strain gauge, pressure sensor, accelerometer, gyroscope
Acoustic sensors: microphones, piezoelectric sensors
Chemical sensor: gas sensors, pH-sensor
Electrical actuators: electrostatics/magnetostatics
Piezoelectric actuators: inch-worn

Contribution of course to meeting the
Professional component ((a) – (c)):

      (b) Engineering

Laboratory projects (if applicable):

      none

Contribution of course to meeting Graduation requirement:

      This course is required for all EE majors to graduate.

Relationship of course to program
Objective ((a) – (k)):

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(a)an ability to apply knowledge of mathematics, science, and engineering
(c)an ability to design a system, component, or process to meet desired
needs within realistic constraints such as economic, environmental,
social, political, ethical, health and safety, manufacturability , and
sustainability
(e) an ability to identify, formulate, and solve engineering problems

(i)a recognition of the need for, and an ability to engage in life-long
learning
(0) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering
tools necessary for engineering practice.
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Prepared by:
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