

Sensors and Instrumentation

1. **Course number and name:** 020CEIES3 Sensors and Instrumentation
2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours per week
3. **Name(s) of instructor(s) or course coordinator(s):** Elie Aouad
4. **Instructional Materials:** Lecture notes, exercises, Lab assignments

Textbook/Reference:

- Georges ASCH et collaborateurs, Les Capteurs en Instrumentation Industrielle, 5ème édition, Dunod, 1999.

5. Specific course information

a. Catalog description:

This course includes a general review of the main characteristics of a sensor (sensitivity, time response delay, measurement errors). Several types of sensors, such as optical sensors, temperature sensors, tachometric sensors, position and displacement sensors, force, weight and torque transducers, are described and studied in details.

b. Prerequisites: Electronics (020ELCES1) or Digital Electronics (020ELNES2).

c. Required for EE and ME students.

6. Educational objectives for the course

a. Specific outcomes of instruction:

A student who successfully fulfills the course requirements will have demonstrated an ability to:

- Select and use a sensor according to its features and the considered application
- Analyze, design and implement analog or digital measurement systems consisting of analog or discrete electronic components, specific electronic circuits, and measuring instruments.

b. PI addressed by the course:

PI	1.3	6.1	6.2	6.3	7.1
Covered	x	x	x	x	x
Assessed	x	x	x	x	x

7. Brief list of topics to be covered

- **Introduction to sensors, measurement process, conditioning circuits, signal processing circuits.** (5 Lectures).
- **Sensors general characteristics: measurement errors, sensitivity, time delay.** (2 Lectures).

- **Optical sensors: photoelectric effect, photoconductivity, photodiode, phototransistor.** (2 Lectures).
- **Temperature sensors: resistive sensors, temperature sensing using diodes or paired transistors, thermocouple.** (3 Lectures).
- **Tachometers: electromagnetic tachometers, optical tachometers.** (2 Lectures).
- **Position and displacement sensors: resistive, inductive and capacitive sensors, digital sensors, optical sensors.** (5 Lectures).
- **Force, weight and torque sensors: piezoelectric sensors, magnetic sensors.** (5 hours).
- **Lab demonstrations.** (3 Lectures).