

Course Syllabus

1. Course number and name: **020CEIES3 – Sensors and Instrumentation**
2. Credits and contact hours: **2 credits, 35 contact hours**
3. Instructor's or course coordinator's name: **Elie AOUAD**
4. Textbooks: Georges ASCH et collaborateurs, *Les Capteurs en Instrumentation Industrielle*, 5^{ème} édition, Dunod, 1999
 - a. other supplemental materials: Notes, exercises, Lab assignments
5. Specific course information
 - a. brief description of the content of the course (catalog description)

A sensor is, by definition, a system that converts a signal that is generally non-electric in nature (temperature, luminous flux, velocity, position, displacement, force, weight, torque, etc.) into an electrical signal that is easily processed. Sensors are generally used in monitoring, measurement or control systems. The course begins with a general review of the main characteristics of a sensor (sensitivity, time response delay, measurement errors). Then, several types of sensors, such as optical sensors, temperature sensors, tachometric sensors, position and displacement sensors, and force, weight and torque sensors, are described and studied individually in detail.
 - b. prerequisites or co-requisites: **020ETCES1 – Electrotechnics and 020ELNES2 – Digital Electronics**
 - c. Required/Elective/Selected Elective: **Required for EE – Industrial Systems option and Selected Elective for EE – Electromechanical option**
6. Specific goals for the course
 - a. specific outcomes of instruction

The students will be able 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. KPIs addressed by the course.

KPI	a1	a2	b1	b2	b3	e3	k2
Covered	x	x	x	x	x		x

Assessed	x	x	x	x	x	x	x
Give Feedback		x	x	x		x	x

7. Brief list of topics to be covered and approximate lecture hours :

- ✓ Introduction to sensors, measurement process, conditioning circuits, signal processing circuits (6.25 hours)
- ✓ Sensors general characteristics: measurement errors, sensitivity, time delay (2.5 hours)
- ✓ Exercices (2.5 hours)
- ✓ Optical sensors: photoelectric effect, photoconductivity, photodiode, phototransistor (2.5 hours)
- ✓ Temperature sensors: resistive sensors, temperature sensing using diodes or paired transistors, thermocouple (3.75 hours)
- ✓ Tachometers: electromagnetic tachometers, optical tachometers (2.5 hours)
- ✓ Position and displacement sensors: resistive, inductive and capacitive sensors, digital sensors, optical sensors (6.75 hours)
- ✓ Force, weight and torque sensors: piezoelectric sensors, magnetic sensors (5 hours)
- ✓ Lab demonstrations and assignments (3.75 hours)