Magnetic sensors

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In this lecture, we will revise the main concepts related to the fundamentals and operation principle of magnetic sensors, devices generally associated with the laws and effects of electromagnetic fields and magnetic materials. In this way, devices based on the laws of magnetic induction and sensors based on materials whose properties change under the effect of a magnetic field will be described. Examples of actual devices will illustrate the description of the different operation principles.

Lecture topics:

1. Introduction and basic principles.
    a. Overview of applications of magnetic sensors.
    b. Magnetic induction.
    c. Magnetic materials for sensors.
2. Sensing principles and examples
    a. Inductive sensors (LVDT, fluxgate).
    b. SQUID sensors (magnetometers).
    c. Hall effect sensors (magnetic compass, encoders).
    d. Magnetoresistance sensors: AMR, GMR, TMR, GMI.
    e. Magnetoelastic sensors (anti shoplifting labels).

Recommended reading:

[1] C. W. de Silva, Sensor systems: fundamentals and applications (CRC press, 2017). ISBN: 9781498716246
[2] J. R. Brauer, Magnetic actuators and sensors (Wiley & Sons, 2006). ISBN: 0-471-73169-2
[3] Magnetic sensors and magnetometers, Ed. Pavel Ripka (Artech House, 2001)- ISBN: 1-58053-057-5