Transducers and Instrumentation:Theory & Lab

Semester: Jan – April 2022

Course Instructor: Sivakumar Balasubramanian (Bioengineering, CMC Vellore)

TA: Monisha Yuvaraj, Charles Jebaraj, Sriramachandran (Bioengineering, CMC Vellore)

Duration: 14-16 weeks, 3hrs of lecture/tutorials per week, 3hrs lab per week

Detailed Course Content

Module Name
Introduction to measurement Measurement; Measuring instrument; Transducer & sensors; Generalized static characteristics of sensors; Generalized dynamic characteristics; Error analysis; Sampling
Analog Signal Processing Operational amplifier; Linear circuits with op-amps; First order and second order filters. System identification.
Measuring movements: linear and rotational Resistive; Inductive; Capacitive; Digital sensors; Camera based tracking; Accelerometer; Gyroscope.
Measuring effort: Force and Torque Strain gauge; Piezoelectric sensors.
Measuring pressure, flow, volume. Different pressure, flow, and volume sensing methods.
Measuring temperature. Thermocouple; Thermistor; Radiation thermometry.
Measuring biopotentials Origins of biopotentials; Review of basic electrochemistry; Electrode half-potentials; Electrical equivalent circuits of electrodes.
Measuring chemicals pH sensor; Oxygen and Cardon dioxide sensors; Glucose sensors.

Course Grading

Assignment: 15%
Quiz: 15%
Midterm: 25%
Final: 50%

Course Textbook

Webster, John G., ed. Medical instrumentation: application and design. John Wiley & Sons, 2017.