

# Transducers and Instrumentation: Theory & Lab

<b>Semester</b>	Jan – April 2023 (14-16 weeks)
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<b>Weekly Schedule</b>	3 hrs of lecture videos 2 hrs of in-person tutorials; 1hr sessions on Monday and Friday of every week 3 hrs of lab per week

## Detailed Course Content

### Introduction to measurement

Measurement, Measuring instrument, Transducer & sensors, Generalized static characteristics of sensors, Generalized dynamic characteristics, Error analysis.

### Basic Instrumentation

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 gauges.

### Measuring pressure, flow, volume

Piezoelectric sensors, differential/absolute 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.

## Course Grading

Assignment	Quiz	Midterm	Final
10%	20%	20%	50%

Assignments are due at 5 PM on the due date and are to be submitted online. Late submissions will result in a loss of 20% of the maximum score for the assignment per day of delay in submission. The final score for the assignment will consider the best 8/9 assignments, which allows students to miss one assignment.

Quizzes will be held during each tutorial session. They will start 5 mins after the scheduled start of the tutorial session. The best 20/25 quizzes will be considered for the final score for the Quiz.

Submission for revaluation of Quizzes/Assignments should be done within 24 hours after receiving the answer sheet.

## Course Textbook

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