

Faculty of Engineering & Technology
Measurements and Measuring Instruments

Information :

Course Code : MPR 321

Level : Undergraduate

Course Hours : 2.00- Hours

Department : Department of Mechanical Engineering

Instructor Information :

Title	Name	Office hours
Professor	Abdelaziz Morgan Abdelaziz Ahmed	5
Teaching Assistant	Eman Mohamed Hammad Ahmed	2

Area Of Study :

This course aims to: \hat{A}
Enrich the student's basic theoretical knowledge about the measurement systems.
Train students to build and test measuring sensors.

Course outcomes :

a.Knowledge and Understanding: :

- 1 - Explain the static and dynamic performance of a measuring instrument.
- 2 - Describe various measuring instruments of displacement, pressure, temperature and flow rate
- 3 - Explain different techniques employed by different instruments.

b.Intellectual Skills: :

- 1 - Evaluate uncertainty in a measured value for a set of data points.
- 2 - Derive the governing equations measuring instruments.
- 3 - Analyze the various operations of measurement instruments

c.Professional and Practical Skills: :

- 1 - Construct the circuits of various sensors
- 2 - Calibrate different sensors.

d.General and Transferable Skills: :

- 1 - Work coherently and successfully as a part of a team in experiments.
- 2 - Write reports in accordance with the standard scientific guidelines.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Basic concepts of measuring instruments: -static performance; accuracy, precision, sensitivity, resolution, threshold, hysteresis. - Generalized measurement system. -Impedance matching.	3	2	1

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Dynamic performance: Zero order, first order, second order systems.	3	2	1
Analysis of experimental data: Type of errors, error analysis, standard deviation, Chauvenet's criterion for rejecting a reading, method of least squares fitting.	7	6	1
Displacement transducers: LVDT, capacitive transducers, digital transducers.	5	3	2
Pressure measurements: inclined manometers, Burdon tube gauges, dead weight tester, variable reluctance diaphragm, LVDT diaphragm	5	3	2
Flow measurements: -Positive displacement methods; rotary, lobed impeller, Turbine. -Rotameter, magnetic, Pitot tube, hot wire.- Obstruction methods: Nozzle, venturi, orifice.	7	4	3
Temperature measurements: -Mechanical sensors; liquid in glass thermometer. -Electrical sensors; thermocouples, resistance, optical sensors	6	4	2
Force sensors: Load cell, strain gauges	9	6	3

Teaching And Learning Methodologies :

Interactive Lecturing

Problem solving

Mini project

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments, Participation	10.00		Progress marks for Tutorial
Final Exam	40.00	16	Written
Midterm	20.00	10	Written Exam
Midterm	20.00	5	Written Exam
Mini project	5.00		Practical
Quizzes	5.00		Written

Recommended books :

1. Text Book: Holman, J.P., "Experimental Methods for Engineers", McGraw Hill, 2005. 2. Recommended Readings: Doebelin, Ernest O., "Measurements Systems Application and Design", McGraw Hill, 1990. 3. Lecture notes on the course.