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	6
Lecturer	Mohamed Ahmed Mahmoud Abdelwahab	1
Teaching Assistant	Eman Mohamed Hammad Ahmed	2

Area Of Study :

This course aims to:
ÅEnrich the student's basic theoretical knowledge about the measurement systems.
ÅExplain the difference between static and dynamic performance of a measuring instrument.
ÅTrain students to build and test measuring sensors.

Description :

Basic concepts and analysis of experimental data, Electrical measurements and sensing devices, Measurements of pressure and flow rates, Measurements of temperature and thermal transport properties, Measurements of force, torque, strain, displacement, length, and area.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Explain different techniques employed by different instruments.
2 -	Describe various measuring instruments of displacement, pressure, temperature and flow rate.
3 -	Explain the static and dynamic performance of a measuring instrument.
b.Intellectual Skills: :	
1 -	Analyze the various operations of measurement instruments.
2 -	Derive the governing equations measuring instruments.
3 -	Evaluate uncertainty in a measured value for a set of data points.
c.Professional and Practical Skills: :	
1 -	Calibrate different sensors.
2 -	Construct the circuits of various sensors.
d.General and Transferable Skills: :	
1 -	Write reports in accordance with the standard scientific guidelines.
2 -	Work coherently and successfully as a part of a team in experiments.

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
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.	4	3	1
Pressure measurements: inclined manometers, Burdon tube gauges, dead weight tester, variable reluctance diaphragm, LVDT diaphragm	4	3	1
Flow measurements: -Positive displacement methods; rotary, lobed impeller, Turbine. -Rotameter, magnetic, Pitot tube, hot wire.- Obstruction methods: Nozzle, venturi, orifice.	6	4	2
Temperature measurements: -Mechanical sensors; liquid in glass thermometer. -Electrical sensors; thermocouples, resistance, optical sensors	5	4	1
Force sensors: Load cell, strain gauges	9	6	2
Lab: Dynamic performance of first order system using RC circuit - Level measurement using capacitance transducer ï speed measurement using infrared encoder	5		5

Teaching And Learning Methodologies :

Interactive Lecturing
Problem based learning
Discussion
Experimental learning
Project based learning
Research

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignment	5.00	11	
Final Exam	40.00	16	Written
Lab Exper.	10.00	9	Lab. Report
Mid- Exam 1I	15.00	11	Written Exam
Mid- Exam I	15.00	6	Written Exam
Participation	5.00	15	
Project B.L.	5.00	12	Written
Quizzes	5.00	7	Progress marks for Tutorial

Recommended books :
Doebelin, Erest O. ," Measurements Systems Application and Design", McGraw Hill, 1990.