

**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	2
Teaching Assistant	Eman Mohamed Hammad Ahmed	

**Area Of Study :**

This course aims to:   
 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
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

### Books :

Book	Author	Publisher
Experimental Methods for Engineers	Jack Holman	McGraw-Hill

### 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.