Southwest Center for Microsystems Education (SCME)
University of New Mexico

MEMS Introduction Topic

Micro Pressure Sensors & The Wheatstone Bridge Learning Module

This booklet contains five (5) units:
Knowledge Probe (Pre-test)
Wheatstone Bridge Overview
Modeling a Micro Pressure Sensor Activity
Wheatstone Bridge Derivation Activity
Final Assessment

A Learning Module Map is included as a suggested outline on how to use this learning module.

The purpose of this learning module is to allow students the opportunity to explore micro pressure sensors, their applications, development, fabrication, and operation.

Target audiences: High School, Community College, University

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Website: www.scme-nm.org

Learning Module Map for Micro Pressure Sensors and The Wheatstone Bridge Learning Module

Learning Module: Micro Pressure Sensors & The Wheatstone Bridge

Learning Module units (5):

- Knowledge Probe (KP)
- Wheatstone Bridge Overview PK
- Modeling a Micro Pressure Sensor Activity
- WB Derivation Activity
- Assessment

The purpose of this learning module is to allow students the opportunity to explore micro pressure sensors, their applications, development, fabrication, and operation.

Following is a suggested map on how to present this learning module.

IMPORTANT STEPS	KEY POINTS	REASONS
Knowledge Probe (Pretest): Have the participants complete the KP.	This tests the participants' current knowledge of the Wheatstone bridge circuit and its applications in MEMS.	Completion of the KP allows you to compare the before and after assessments in order to determine the learning that took place as a result of this learning module.
Inquiry: Introduce the Modeling a Micro Pressure Sensor Activity.	Show the short Presentation "Modeling a Micro Pressure Sensor"	Before discussing the WB in detail, the participants should see where and how they are used. This presentation introduces applications as well as the Modeling a Micro Pressure Sensor Activity.
Activity: Start the activity "Modeling a Micro Pressure Sensor".	Complete this activity **through** "Making a conductive bridge pattern"	Once the bridge pattern has been constructed onto the diaphragm, it needs about an hour to harden. This is a good time to introduce the WB PK.

Presentation: Present the Wheatstone Bridge Overview PK	Go through the PowerPoint Presentation with the participants.	This presentation shows how a WB works, how the output voltage changes with changes in resistance, and how to analyze the output of a bridge circuit. It also shows how the WB is used in micro pressure sensors.
Activity (con't):* Complete the activity "Modeling a Micro Pressure Sensor"	Test the pressure sensor circuit (WB) for resistance and voltage with different pressures applied. Have the participants complete the post-activity questions.	Participants should see how sensing circuit (WB) reacts to changes in pressure.
Activity 2: Wheatstone Bridge Derivation Activity	There are 3 parts: Derivation Activity Design a WB for a pressure sensor Post-activity questions	The Derivation activity requires participants to use algebra to derive formulas. Design a WB applies the concepts learned from the pressure sensor model activity. The Post-activity question requires algebra and an understanding of how the WB works.
Assessment: Give the participants the assessment.	Evaluation of what the participants have learned about MEMS pressure sensors and the WB.	Compare the results of this assessment with the results of the KP to determine the learning that took place as a result of this learning module.

Adapted from Graupp, P. & Wrona, R. (2006) The TWI Workbook: Essential Skills for Supervisors. New York, NY. Productivity Press.

* A kit that supports this activity can be purchased through scme-nm.org as grant funding allows and while supplies last. The activity also contains a list of supplies and materials that you may acquire separately to create your own version of the pressure sensor model.