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

Introduction to Transducers Learning Module

This booklet contains four units:
Pre-test (Knowledge Probe)
Introduction to Transducers Primary Knowledge (PK) unit
Activity – What are Transducers?
Final Assessment

This learning module is one of three SCME modules that discuss the types of components found in microelectromechanical systems (MEMS). This module covers "transducers" – what they are, how they work and how they are used in both macro and micro-sized systems. An activity provides further exploration into specific transducers and how they are used in everyday devices. Two related learning modules cover MEMS sensors and actuators.

Target audiences: High School, Community College, University

Website: www.scme-nm.org

Introduction to Transducers
Knowledge Probe
Participant Guide

Introduction

This learning module is one of three SCME modules that discuss the types of components found in microelectromechanical systems (MEMS). This module covers "transducers" – what they are, how they work and how they are used in both macro and micro-sized systems. An activity provides further exploration into specific transducers and how they are used in everyday devices. Two related learning modules cover MEMS sensors and actuators.

The purpose of this assessment is to determine your current understanding of transducers. This knowledge leads to an understanding of applications and functions of transducers in microsystems applications.

1. A thermocouple is a device that converts heat energy into electrical energy. A thermocouple is a(n) _____.
   a. sensor
   b. transducer
   c. actuator
   d. transducer and actuator

2. Which of the following BEST describes a transducer? A device that
   a. senses a change in its input and produces a readable output.
   b. quantifies a change between an input and output.
   c. converts one form of energy to another form of energy.
   d. converts a change on the input into a proportional movement.

3. An electric motor converts electrical energy into rotary motion. An electric motor is a(n)
   a. sensor
   b. transducer
   c. actuator
   d. sensor and transducer
   e. transducer and actuator

4. Which of the following BEST describes an electrochemical transducer?
   a. Converts the energy from a chemical change or reaction to electrical energy.
   b. Converts electrical energy into chemical energy seen either as a change or a reaction.
   c. Converts motion or convection within a chemical into electrical energy.
   d. Converts electrical energy into motion or convection within a chemical.

5. Strain gauges, galvanometers, and generators are all what type of transducer?
   a. Electrostatic
   b. Electromechanical
   c. Thermoelectric
   d. Electromagnetic

6. Which of the following devices is an electrostatic transducer?
   a. Cathode ray tube (CRT)
   b. Incandescent light bulb
   c. Comb drive
   d. Hydrophone

7. Quartz crystal is a device that converts
   a. mechanical stress into electrical energy
   b. electrical energy into motion or movement
   c. mechanical stress into heat
   d. heat into motion or movement

8. One solution for long-lasting batteries in the micro-scale is to build a battery that consists of a
   a. two-dimensional array of stacked, paper-thin flat electrodes.
   b. two-dimensional array of low aspect ratio stacked carbon posts.
   c. three-dimensional array of low aspect ratio carbon posts.
   d. three-dimensional array of high aspect ratio carbon posts.