

Data Acquisition for SCME Kits

Andrew G. Bell

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Ivy Tech Community College is Indiana's largest public postsecondary institution and the nation's largest singly accredited statewide community college system. Ivy Tech serves nearly 200,000 students annually and has campuses throughout Indiana.

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over 40 degree programs



Ivy Tech started its associating with SCME in the Fall of 2012 and has been a Co-PI on Southwest Center for Microsystem Education (SCME) NSF ATE Grant.

MEMS Kits Implementation Plan IVY TECH (Fort Wayne & Valparaiso)								
		ENGT 120	METC 111	METC 143	EECT 111	EECT 112	ENGR 251	ENGT 279
1	MEMS: Making Micro Machines Kit	X						
2	Dynamic Cantilever Kit		X	X			X	
3	Crystallography Kit			X				
4	Pressure Sensor Model Kit	X			X	X	X	
5	GeneChip Model Kit	X						
6	MEMS Innovators Kit							X
7	Lift-off Kit			X	X			
8	Pressure Sensor Process Kit				X			
9	LIGA Micromachining Simulation Kit			X				
10	Anisotropic Etch Kit			X	X			
11	Rainbow Wafer Kit	X						

The scope of our effort was to integrate the SCME material into some of our engineering programs courses

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Microcantilever Model Kit

This kit contains most of the materials for the Microcantilever Model Activity in Book 2 of the *Microcantilever Learning Module*. This activity provides participants an opportunity to explore the motion of a cantilever under a varying mass and to determine the relationship that expresses the resonant frequency of a cantilever as a function of mass. This activity simulates the dynamic mode of operation for microcantilevers used in MEMS sensors.

Modeling a Micro Pressure Sensor Kit

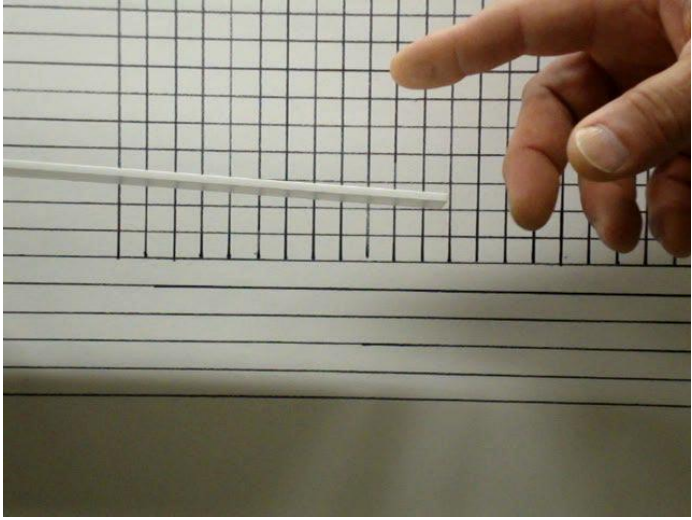
This kit contains most of the materials for the Modeling a Micro Pressure Sensor Activity in the *Micro Pressure Sensors and the Wheatstone Bridge Learning Module*. This activity provides participants an opportunity to study how a micro pressure sensor works and how a change in pressure affects the output of a Wheatstone bridge sensing circuit. Participants build a macro-size pressure sensor model with a Wheatstone bridge sensing circuit using pencil lead (graphite), rubber cement, a balloon (diaphragm), and a paint can (substrate). Participants test the operation of the model by creating calibration curves of the output of the sensing circuit as pressures are applied to the diaphragm.

Crystallography Kit

This kit contains the materials for two activities in the *Crystallography Learning Module*. Through these activities, participants explore the crystal structure of silicon. In *Breaking Water*, participants determine the crystal orientation of two silicon wafers by carefully breaking the wafers and identifying the crystal planes on which the wafers break.

In *An Octahedral Crystal*, participants construct a 3-dimensional representation of a silicon crystal showing the different crystal planes as defined by Miller indices.

www.scme-nm.org



In Fort Wayne we have used three basic kits:



In 2014 we decided to develop supplemental data acquisition electronics for two of the kits.

Reasons

 To improve on data collection of the experiments


 Add more “electronics” to the kit material

Approach

Use LabView and Arduino micro-controllers

Reasons

 Knowledge of LabView can help students get a job

 Arduinos are cheap, popular and very flexible



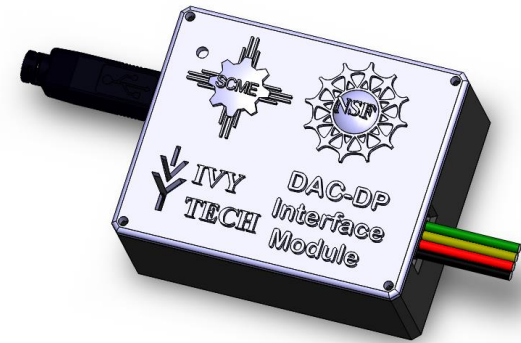
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MEMS: Data Acquisition Kit
This kit is an electronic extension of the SCME pressure sensor model kit. DAC-DP interface module and LabView software allows the SCME pressure sensor model kit to interface to a computer provides a graphical display pressure sensor differential output voltage. Includes - Arduino Uno based DAC-DP interface module, instruction manual, executable LabView Data acquisition software, USB cable, and pressure sensor interface cable.

Student involvement has been key to new kit development



The new DAC-DP Kit for Pressure Sensor Kit

Includes - Arduino Uno based DAC-DP interface module, instruction manual, Executable LabView Data acquisition software, USB cable, and pressure sensor interface cable.

Wheatstone bridge (Serial Interface)

This program will graph the output of a Wheatstone Bridge

Instructions

1. Select the **COM Port** associated with the device.
2. Click the **Run Arrow**.
3. Adjust the **Sample rate** using the control knob

Connection Diagram

This is a simulated wheatstone bridge | This is the basic form of the arduino shield

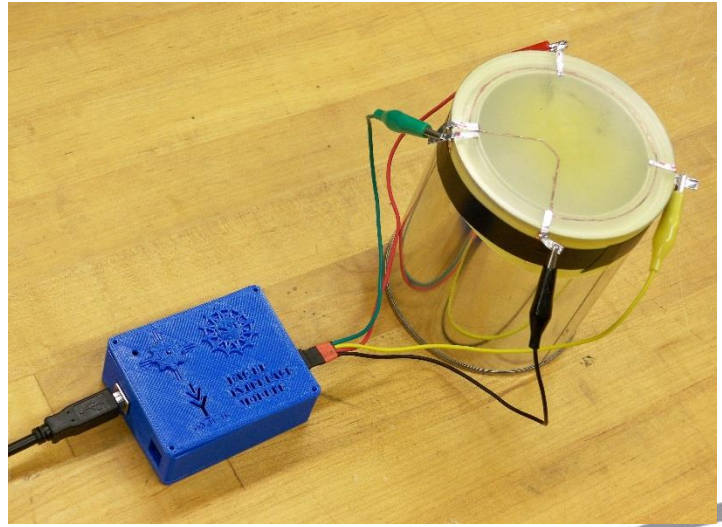
Device Settings

Serial Port: COM26

Sample Rate: 100

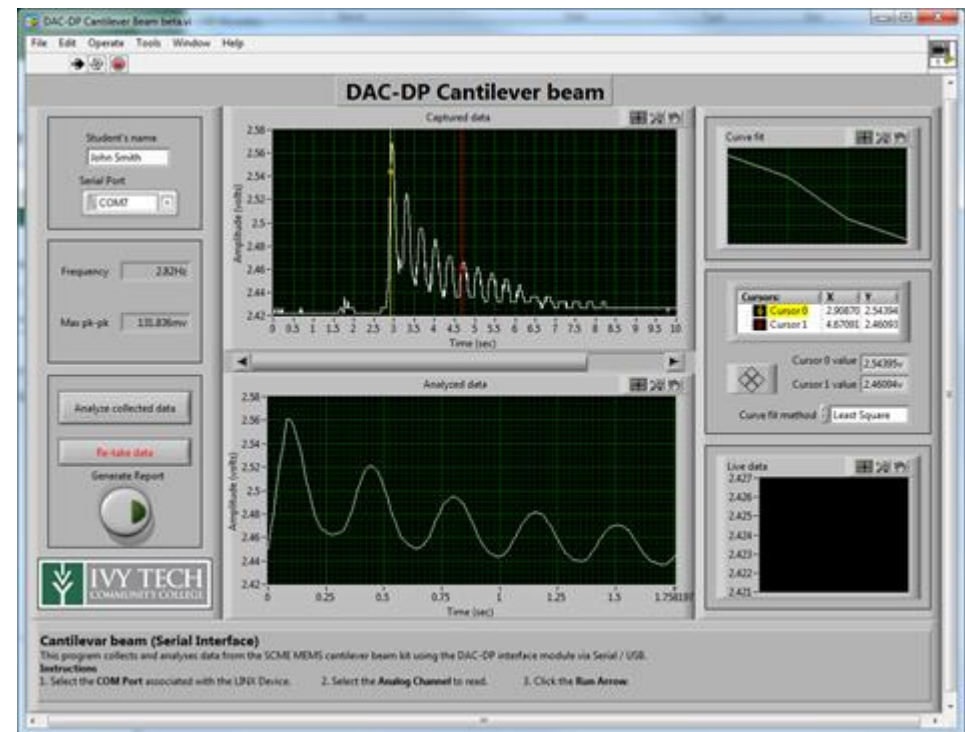
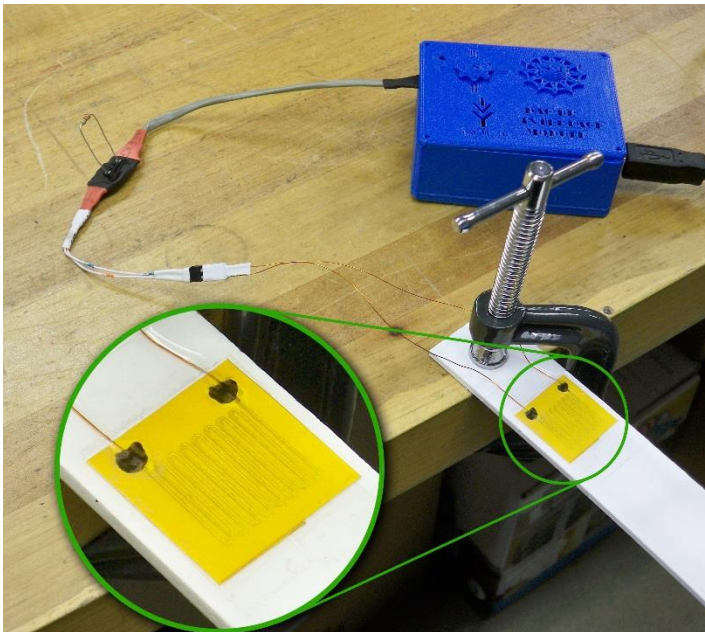
Analog Value

Amplitude vs Sample graph showing a fluctuating signal. Stop button.



The new DAC-DP Kit for Cantilever Kit

Includes - Arduino Uno based DAC-DP interface module, instruction manual, executable LabView Data acquisition software, USB cable, and Cantilever beam Strain gauge interface



How to make a Strain Gauge

