



CIVIL ENGINEERING LABORATORY PROGRAM



Civil engineers design, test, and build the roads, bridges, and buildings we travel on and work in every day. The objective of most civil engineering curriculum is to provide a deep understanding of material properties and their capabilities and how they influence the construction of larger and better built structures. This civil engineering program provides commonly used sensors and accessories and an Instructor’s Guide for a variety of experiments. These experiments include demonstrating the different modes of a structure, measuring the characteristics of materials, and dampening techniques. This program also includes an industry expert lecture and technical poster.

INCLUDED PRODUCTS		
Description	Model	QTY
Impact Hammer 500 lbf, 10 mV/lb	086C03	1
Accelerometer 100 mV/g, 0.5 to 3 kHz	333B30	2
Force Sensor 1000 lb comp., 500 lb tension, 5 mV/lb	208C04	2
Accelerometer 500 mV/g, 0.5 to 3 kHz	333B40	2
Seismic Accelerometer 1 V/g, 0.06 to 450 Hz	393B04	1
Cable - 10 ft. (BNC to BNC)	002T10	2
Cable - 10 ft. (10-32 to BNC)	002C10	14

OPTIONAL PRODUCTS	
Description	Model
Handheld Shaker	394C06
Smart Shaker	K2007E01
Force Sensor 10 lb comp., 10 lb tension, 500 mV/lb	208C01
Digiducer	333D01
4 -Channel Signal Conditioner	482C15
1-Channel Battery Powered Signal Conditioner	480E09
1-Channel Battery Powered Signal Conditioner	480E09

All sensor kits and optional products are new and within specification.

LEARNING OBJECTIVES

#1 - STRUCTURAL ANALYSIS AND SENSITIVITY

Learn how to properly use an impact hammer for impulse force excitation, measurement of acceleration responses, and how to determine which accelerometer sensitivity is needed for good data collection.

#2 - BRIDGE ANALYSIS

Learn about the modes of structures including natural frequencies and mode shapes.

#3 - FLOOR CONSTRUCTION

Learn about the construction of flooring systems in relation to large appliances, such as a washing machine.

#4 - DYNAMIC PROPERTIES OF CONCRETE

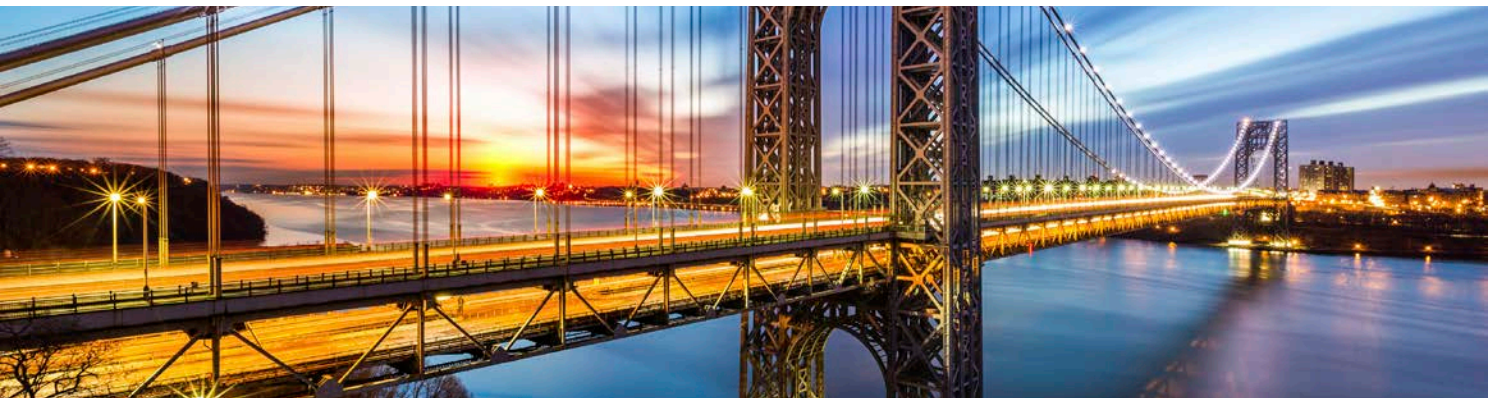
Learn about how the dynamic properties of concrete change with different formulations.

#5 - DAMAGE DETECTION AND STRUCTURAL HEALTH MONITORING

Learn about structural health monitoring using surface acceleration on bridge-like structures.

#6 - TUNED MASS DAMPERS

Learn about tuned mass dampers and how they are implemented in high-rise buildings.



ADDITIONAL UNIVERSITY PROGRAM BENEFITS

- Sensor samples (non-functioning) as available
 - Discounted PCB® seminar registration fees for professors and students
 - “White Papers for Sensors” program for professors and students
 - “Share your experiments” (photos and step-by-step) for discounts against future sensor purchases
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INDUSTRY EXPERT PRESENTATIONS

- Acoustics - Overview of how and why to measure sound, source-path-receiver theory, coherent and incoherent sources, and microphone sensor options.
 - Pressure - Overview of sensor design, key specifications, common applications, mounting, and pressure sensor options.
 - Vibration - Overview of piezoelectric theory, common terminology, accelerometer construction, mounting, and accelerometer sensor options.
 - Force & Industrial Strain - Overview of sensor construction, key specifications, operational basics, mounting, and force & strain sensor options.
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REFERENCE POSTER FOR LAB DISPLAY

- Acoustics
- Pressure
- Vibration
- Force & Industrial Strain



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MTS Sensors, a division of MTS Systems Corporation (NASDAQ: MTSC), vastly expanded its range of products and solutions after MTS acquired PCB Piezotronics, Inc. in July, 2016. PCB Piezotronics, Inc. is a wholly owned subsidiary of MTS Systems Corp.; IMI Sensors and Larson Davis are divisions of PCB Piezotronics, Inc.; Accumetrics, Inc. and The Modal Shop, Inc. are subsidiaries of PCB Piezotronics, Inc.