

## DOE for a Portable Mechanical Oscillators with DAQ

### Objective:

To design and build a test apparatus with a data acquisition (DAQ) system for acceleration, velocity, and displacement measurements of mechanical oscillator, that will be implemented into ME 293 Lab.

### Sponsor:

Civil and Mechanical Engineering Department, PFW

### Description and Requirements:

The test apparatus and DAQ system must be able to demonstrate the concepts of free vibration/natural frequency, forced vibration/resonance, and damping effects and perform vibration measurements of a lumped parameter oscillator (e.g., spring-mass-damper system) mounted on a portable bench.

### System Requirements

- The system's natural frequency must be adjustable in the range of 100 Hz – 200 Hz\*
- The system's damping factor must be adjustable in the range of 0.01 – 2\* through friction
- The system must to be manually reconfigurable (through simple steps) between 1-DOF and 2-DOF
- The system must have a driving mechanism that excites, with a variable frequency, the system with both 1-DOF or 2-DOF configuration;
- Vibrations of the system are to be independently measured by accelerometers and a laser displacement sensor for comparison (sensors, a DAQ system, and a laptop with LabVIEW will be provided); DAQ procedures and necessary LabVIEW module must be devised
- Accelerometers and laser sensors should be easily mountable
- The stand must be sturdy as it has moving objects at high speeds, and some vibration absorbing capability
- The whole system must be transportable by two persons
- Must be safe
- There may be more requirements by faculty advisor

\* Not concrete at this point

### Budget

\$2,000