

Senior design project proposal – contact Dr. Marek if interested <marek_ka@mercer.edu>

Purpose: A vibration shaker (Figure 1) is currently housed in the Mechanical Engineering lab. It includes the shaker itself, a signal generator, and an amplifier. While these are all sufficient to produce vibration in the shaker, there is no means by which to determine the vibration amplitude, nor the forces involved (or even the input power). The client wishes to have a piece of instrumentation that can be attached to the shaker output (via the built-in threads, ¼-20?) which will record some of this information.

Objective: Design and build a sensor/data acquisition system which can be mounted to the output side of a vibration shaker. The sensor section should be small, and the data should, at a minimum, be stored to a standard data device (e.g. USB flash drive) for access later; ideally, some information would be shown live.

Group composition: At least one mechanical and one electrical/computer student should be in the group.

Requirements:

- Design and build the device using at least a load cell, accelerometer (or some means of directly measuring displacement), and processing unit.
- Determine a design range for force, displacement, and frequency. Choose components accordingly.
- Build mounting apparatus as needed to keep sensors on end of shaker, and any casing required for the processing unit.
- Calculations/measurements made by the processing unit should include, at a minimum, force, displacement, and transmitted power.

Additional “stretch” goals:

- Measure voltage and current being supplied to the shaker, to determine its efficiency.
- Build a display into the processing unit to show force, displacement, and/or power (RMS and/or amplitude), as well as frequency.



Figure 1: Shaker with cantilever rod assembly attached to output