

Project Title: **Force Sensor for “Grippers”**

Team Members: Daniel Beachy (ECE)  
Josh Buckland (ME)  
Jeremiah Krider (ME)  
Joseph Smith (ECE)  
Andrew Whiteman (ECE)

Faculty Advisors: Dr. Zhuming Bi (ME)  
Dr. Yanfei Liu (ECE)

Area: **Multidisciplinary**

Sponsored By: **PHD Inc.**

PHD Inc. is based in Fort Wayne, IN specializing in actuator and gripper products for industrial automation. PHD requires assistance in designing a sensor that can be placed in a gripper jaw to measure applied gripping force during operation. When the sensor is applied, the measurement will be utilized by the customer’s programmable logic controller (PLC). PHD would like the sensor design to be scalable to fit the GRH, GRK, and GRR families of grippers. The range of measured force is between 12 and 800 pounds. The sensor must be scalable to accommodate varying gripper sizes and forces, and should also be calibratable for the weight of the customer’s tooling. The accuracy of the measurement must be within 5% of the applied force. The mechanical interface and electrical force sensing system must withstand or be easily serviceable to withstand 10 million gripping cycles without mechanical fatigue-failure, and measurement degradation. This sensor when coupled with one of the grippers will give PHD’s customers more control over automated handling processes for their products.

This project will utilize a sealable mechanical interface which is capable of transmitting the full rated load of the gripper jaw to the specialized tooling, in addition it also retains enough rigidity to minimize the deflection of the gripper jaw and its contact with specialized tooling. Measured data from the sensor will be transferred as an electrical output which can be either a variable voltage output between 0 and 10 volts or a variable current output between four and twenty milliamps.