Scenario:
You have recently found a position at a company contracted by law enforcement agencies. The law enforcement agency would like your company to design a breath analyzer for field assessment of blood alcohol levels. One key feature of the breath analyzer that the law enforcement agency has required is that the exhalation amount/rate for a person being tested exceed some minimum value. You have been placed on the engineering team that will be working on this aspect of the breath analyzer instrument. Your team has decided that an impeller (looks like a fan blade) will be used in the measurement of the expired air flow through the instrument – when someone blows into the instrument, the impeller will spin. Each member of your team is required to provide a written proposal for a possible solution to the problem and sponsor constraints.

Assume the instrument will be operated by a microcontroller similar to an Arduino, and the impeller size has an ~0.5 inch diameter. Since your company is designing this instrument, you may use basic sensors that are commercially available, but not complete systems from other companies. You may address the specifics of flow rate in general terms, and expect to use another device for calibration of impeller rotation, however, you must describe the data acquired as accurately as possible.

Discuss (thoroughly) the following:
1. Data acquisition of rotation of impeller
   a. Identify and describe at least one method along with a choice of a basic sensor which could be used for measuring the rotational speed of the impeller.
      i. attach a copy of a your selected sensor’s data sheet in an appendix
   b. Identify and describe the major components (e.g., bridge, etc.) required to accomplish the data acquisition.
      i. a drawing or schematic is required (include in main proposal)
   c. Identify and describe the resulting expected output data of the chosen method/basic sensor. Other things to describe include:
      i. an sample plot of expected collected data is required (it can be “fictional data” but must be feasible for or relevant to the sensor chosen)
      ii. the type of sensor output (e.g., voltage, current, etc.)
      iii. the range of the output
      iv. the nature of the signal (e.g., cyclical, constant, x-order response, etc.)
   c. Identify and describe if/how the collected data is stored or used
      i. discuss limitations for each case
2. Data analysis
   a. Identify and describe at least one method (along with data analysis techniques you would employ and considerations/limitations) for measuring the flow rate based on your collected data.
      i. a sample plot may be helpful
   b. Identify and describe at least one method (along with data analysis techniques you would employ and considerations/limitations) for insuring that a minimum amount of air is expelled from a tested person’s lungs.
      i. a sample plot may be helpful
   c. Identify and describe at least one method (along with data analysis techniques you would employ and considerations/limitations) for insuring that the tested person is exhaling and not inhaling.
      i. a sample plot may be helpful

This is an individual assignment and should be approximately 800-1200 words or around 2 pages in length (Calibri/Times New Roman 12pt). When complete, email a pdf of your file to dmoller@latech.edu BEFORE 10am Tuesday 11/17/15.