Measurement Systems Project – Sensor Calibration

1. Project Brief:

In the rapidly evolving landscape of industrial engineering, sensors play a pivotal role in data acquisition and control systems. Ensuring the accuracy and reliability of these sensors is imperative for the overall efficiency and safety of industrial processes. This assignment focuses on a specific sensor type commonly utilized in industrial settings.

As the engineering team assigned to this project, your primary goal is to test and calibrate a specific sensor to be used in an industrial process. This assignment is designed to enhance your skills in sensor evaluation, calibration techniques, and data analysis, which are crucial for maintaining precision and reliability in industrial sensor systems.

2. Tasks

Your responsibilities within this project include:

1. Sensor Identification:
    - Provide detailed information about the assigned sensor, including its type, model, and intended industrial applications.
2. Testing Procedures:
    - Develop a comprehensive testing plan that covers various aspects of the sensor's performance.
    - Identify key parameters to be measured and establish baseline values e.g. linearity, range, etc.
3. Calibration Techniques:
    - Investigate and implement appropriate calibration techniques for the assigned sensor.
4. Data Collection and Analysis:
    - Implement a data collection during the testing and calibration processes using LabVIEW and National Instruments DAQ hardware which presents the user with readable data in the correct format (i.e. temperature rather than voltage)
5. Documentation:
    - Create a comprehensive report summarizing findings, challenges faced, and recommendations for sensor optimization.
6. Presentation:
    - Present the findings, highlighting any significant observations, challenges, and proposed solutions.

3. Resources:

You are encouraged to use the following resources:

- Online databases (Scopus/Web of Science/Google Scholar) and electronic journals accessible through the library portals.
- Lab-related technical material, e.g. equipment manuals, notes, etc. Physical or on-line resources of the university libraries may be useful.
- Online resources, including ChatGPT. When gathering information on the web, remember that a lot of the information you may find could be misleading or just plain wrong. Unless you already understand the topic well, it is difficult to judge the quality of the information offered. It is an important skill to be able to critically evaluate documents found on web sites.

4. Report:

The report should be presented at a high technical level contain the following:

1. Introduction
2. Materials and Methods including:
    a. The sensor specifications
    b. The testing procedure
3. Results
    a. Including range, benchmarking against the calibrated sensor, and linearity of the sensors response
4. Discussion
5. Conclusions

5. Presentation:

You should prepare and deliver an 15-minute presentation to be delivered as team. The presentation should be jointly presented, with each member taking roughly equal presentation durations. There will be roughly 5 minutes for Q+A after the presentation.

The presentation should:

1. Describe the principle of operation of the sensor.
2. Give an overview of the testing and calibration procedure including a brief description of LabVIEW code used for acquisition.
3. Present the results of the calibration.
4. Analyse the results as appropriate.
5. Include a discussion of the results

6. Marking Criteria

Here is the marking scheme, indicating where you should put the effort:

- 40% Technical Content (accuracy, relevance of facts, completeness)
- 40% Style (quality of explanations, clarity of writing, consistency of the technical level)
- 20% Presentation (organization of material, references)

7. Project Deadlines:

Both the project report and presentation must be uploaded to Moodle.

Presentation of the projects is scheduled for your lab session in Week 12 – a detailed schedule will be circulated closer the time. The presentation should be submitted before scheduled Week 12 lab.

The project report should be uploaded to Moodle in the submission area before Wednesday 13th December at 2359hrs.