UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Senior Design Project Description

Company Name	*Carrier UTC*	**Date Submitted**	*10/18/2018*
Project Title	*Analysis of Water Cooled Chiller Test Data for Engineering insights using the SAS System* **(CARR_SAS)**	**Planned Starting Semester**	*Spring 2019*

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical		Electrical	
Computer		Systems	4
Other ( )			

Company and Project Overview:

Carrier is a world leader in heating, air-conditioning and refrigeration solutions.
Built on Willis Carrier's invention of modern air conditioning in 1902, Carrier is a world leader in heating, air-conditioning and refrigeration solutions.

In this project, students will analyze the infrastructure used in the Carrier Air Cooled Chiller Lab and characterize the variation inherent in the measurements and results obtained while testing in the lab.

The Air Cooled Chiller Lab in the Carrier Charlotte Factory is used to gather data used to analyze new product designs as well as provide data to customers and regulatory organizations on the performance of the system.

The lab infrastructure is complex and is comprised of six elements: the equipment under test, the sensor complement to gather data, the data acquisition system, the infrastructure used to control operating conditions, the test plan specification and the test technicians/engineers.

This project will conduct an analysis of the data produced by this test operation to determine if useful engineering or operations information can be "mined" from the data available.

Project Requirements:

Carrier tests are run for engineering development, engineering design verification and for

customer certification testing. During the testing operation, Carrier collects a very large set of data covering technical performance data, model information, building and personnel conditions and product configuration data. Each test is run for a specific purpose (such as verification of design specifications, qualification of a manufacturing process and customer acceptance tests) and over time, a great deal of data has been collected. To date, the test data has only been analyzed test by test. That is, the results of the test are used and evaluated only for the specific purpose of that single test. There has not been an analysis of all of the test data together, looking for information that could be useful. Carrier is interested to see if there are engineering, operations or marketing insights that can be gleaned by systematic analysis of the entire data set available. Examples could be trends in performance over time, variations in results based on who the test technician is, result trends based on when the test was run, results over time that are relatively better or worse than specification performance averages, etc. The project team will use the SAS software tool to analyze this data to determine useful information that can be provided to the Engineering, Operations and Marketing organizations.

Expected Deliverables/Results:

- SAS will be used as analysis tool
- Team will receive training at Carrier to understand how the data was taken and the relevant terminology
- Team will analyze the Carrier test data to determine if there is useful information that can be presented to the engineering department for action or further investigation.
- The analysis will be wide ranging and can include parameters such as trends over time, result differences based on personnel, differences in actual performance against specification tolerance by model configurations and other insights found in the data when considered over a long period of time.
- Data analysis is expected to be iterative. As insights are uncovered, it is expected to lead to new areas of inquiry.
- End result will be a report to Carrier which documents the areas of inquiry and recommendations for actions based on the findings. Data may uncover recommendations for changes in test protocol and if this occurs, second semester test and verification may be done on protocol changes.

Disposition of Deliverables at the End of the Project:

Deliver results to Supporters at the end of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- SEGR 4141 Engineering Experimental Design
- Operational fluency in SAS