

UNC Charlotte – Lee College of Engineering Senior Design Program

Senior Design Project Description

Company Name	<i>Hunter-Douglas</i>	Date Submitted	<i>03/05/2019</i>
Project Title	<i>Design and Build a Test Fixture to Characterize New Blind Material</i> HD BLIND	Planned Starting Semester	Fall 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	4	Electrical	
Computer	2	Systems	
Other ()			

Company and Project Overview:

Hunter Douglas is the world’s leading manufacturer of window coverings as well as a major manufacturer of architectural products. Our strength is our ability to develop innovative, high quality, proprietary products that can be found in millions of homes and commercial buildings around the globe. We operate as a highly decentralised, global federation of small and medium-sized companies that manufacture and market similar products.

At the Company’s Bessemer City, NC location, thousands of product varieties of high end window treatments are custom manufactured in a large, high volume manufacturing facility. A product example is shown below:



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In this photo, you can see the window treatment material wound around a roller that is mounted into a valance assembly that houses the roller with material in a decorative covering which also serves as a mechanical mounting apparatus. Within this assembly, there is a motor drive and battery pack which will provide powered up/down operation. When new products are introduced, the Engineering department is responsible for characterizing the products and developing configuration information for Sales and Manufacturing purposes.

One of the variables in a product is the length of the shade for the window it is being applied to. These lengths can range from 1 to 16 ft. The longer the length of window, as the shade is rolled up, the diameter of the roller will increase as more shade material is wound around the roll. In addition to window length, the diameter is also determined by how thick the material is. The valance housings come in standard sizes and Engineering needs to determine which valance housings can be used based on material and window length combinations. The project is to develop a dedicated test fixture that can be used to characterize new products, automatically capture data during testing and upload the data into a product configuration tool that the Engineering department maintains.

Project Requirements:

The current testing rig to do this is shown below:



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The new material is loaded onto a roller in the maximum length configuration. When the test is started, the apparatus pulls the shade up and a linear encoder measures length, roller motors record revolutions of the roller and the diameter of the roller is continuously measured as material winds around it. When the test is being conducted, the data points are fed into a computer program that processes the data and develops a $y = mx+b$ formula that is used to interpolate points to be able to determine sizing information for the many possible product combinations via another computer program.

This current fixture is used for several different kinds of tests and Hunter-Douglas wants to develop a new fixture that is dedicated to this particular test. They also want to change the size of the testing apparatus to one that is appropriate to the unit under test. The new fixture will be much narrower (units under test will be 36"), but taller – 16 ft vs. 12 ft. The old fixture is old and the company would like the design of the sensors to be updated with modern equipment. The mechanical frame assembly needs to be redesigned to be more efficient for the lighter loads that are experienced in this particular test.

Expected Deliverables/Results:

- A new modernized testing apparatus that delivers the current functionality, but in a scale appropriate to narrower units under test that extend to 16 ft lengths.
- Unit must be designed so there is no tip hazard.
- All sensors and motor drives to be initiated by a test technician from a PC with a user friendly GUI.
- Data to be collected and post processed to provide the $y=mx+b$ data needed and placed into a



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database that can feed the configuration database.

Disposition of Deliverables at the End of the Project:

Team will demonstrate functionality at the May Expo, then execute a plan with Hunter-Douglas to have the apparatus safely moved to the Bessemer City site.

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

- Interested in Mechanical design, sensors, machine vision and output/interface with WinWedge, Labview or similar user interfaces.