UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Senior Design Project Information

Company Name	*IWCS supporting UNC Charlotte MEGR Project*	**Date Submitted**	*11/30/2018*
Project Title	*Fiber Optic Strain Gauge using Pseudorandom Code Interrogation* **(IWCS_FIBER)**	**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	4	Electrical	1
Computer		Systems	
Other ( )			

Company and Project Overview:

The IWCS International Cable & Connectivity Symposium is the premier venue for new technologies in wire, cable and connectivity products, processes and applications. The IWCS Symposium Committee generates an extremely high caliber program for each year's conference, with over 100 papers and presentations in 20 compelling sessions over three full days. See the full history of the IWCS at www.iwcs.org/about.

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At the Symposium, a variety of strong Professional Development Courses provide great learning opportunities from renowned industry experts. The Executive Track features speakers and topics of interest to general and commercial management, with a focus on supply chain issues. The Supplier Exhibition introduces the latest products and services from the important suppliers to our industry. The annual Plenary luncheon features a Keynote Speaker providing insight on a topical issue. The Plenary is also a time to honor the best paper and the best presentation from the previous year, **as well as recognition to university students who have received various scholarships with the ambition to join our industry in the near future.**

The annual IWCS Symposium is being held in Charlotte in October 2019. As part of the Symposium, they are funding UNC Charlotte students to undertake this project and come to the Symposium to present the results of their work on the Project. This is an excellent opportunity to get professional speaking experience and show a national audience the quality of UNC Charlotte Lee College of Engineering students.

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Project Requirements:

Fiber optic strain gauges are designed for use in environments where typical strain gauges are difficult to use due to electrical interference, space requirements or long term stability is required. They can also provide significant improvement in sensitivity (~10^3). A single mode fiber optic under tension undergoes a change in length (strain) which increases the time for an optical light wave to travel end to end. If this fiber is paired with a reference (unstrained) fiber and each is supplied with the same light source, there is a delay in the light from the fiber under tension as compared to the reference signal. This delay can be measured if the light signal is modulated with a pseudo random code (random square wave modulation). By providing a selectable delay to the reference signal, the modulated signals can be aligned and the delay in the strained fiber measured. This delay is proportional to the strain on the fiber, thus allowing a precise measurement of the strain in any object attached to the measurement fiber. Within limits, the minimum measurable strain is proportional to the modulation frequency.

Required components are:

1. Two narrowband solid state lasers (1.310 or 1.550 μm).
2. Two lengths of single mode fiber optic cable (10m each).
3. Two narrowband solid state receivers (1.310 or 1.550 μm).

4. Pseudorandom code generator.
5. Tuneable delay line.
6. PC with LabView
7. Two DC power supplies.

Expected Deliverables/Results:

Deliverables include:

- Functioning fiber optic strain gage
- Electrical Schematics for strain gage.
- LAbView code

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

- Interest in the wire and cable industry, with potential ambition to join the industry
- This project is sponsored by IWCS with the express understanding that the student team will come to the Symposium and present their results. Therefore, ALL TEAM MEMBERS MUST TRAVEL TO THE 2019 IWCS CONVENTION FOR THE UNC CHARLOTTE STUDENT PRESENTATION OF RESULTS TO DATE AND PLANS FOR THE CONCLUSION OF THIS PROJECT. ANY TEAM MEMBER THAT DOES NOT ATTEND WILL RECEIVE AN F FOR THE SECOND SEMESTER.
- Familiarity with LabVIEW.
- Interest in metrology technology.
- Familiarity with fiber optic technology.
- Familiarity with basic electronic technology.