

Low Noise Signal Transduction and Digitization System
Undergraduate Senior Capstone Design Project

[ELE480:Fall 2009 – ELE481:Spring 2010]

Company Overview:

NABsys is a life sciences company working at the intersection of physics, biology, and computer science to revolutionize medicine through clinical-grade whole-genome DNA sequencing. NABsys is in the process of developing an electronic DNA sequencing platform that will revolutionize the genomics industry. Located in Providence, RI, NABsys has nine full time employees (seven of these hold doctoral degrees) and a two part time employees. The team at NABsys is working at the forefront of genomic and electronic technologies and provides a unique environment for growth. Each employee is an expert in their respective field.

Project Description:

The general overview of the project at NABsys can be described as the design, assembly and testing of a low noise signal transduction and digitization system for use in DNA sequencing experimentation.

The system will consist of both passive and active electronic elements combined with analog and digital electrical signals. The transduced signal will then be processed and analyzed in NI LabVIEW software and MATLAB.

The project will begin with the team studying to understand analog electronics and the origins of signal noise. The education will then proceed to the learning about different methods of evaluating the noise of a system and electronic techniques to improving the signal to noise ratio.

Additional knowledge that will be assimilated in the process includes, but is not limited to:

1. Commercially available data acquisition and digitization equipment.
2. OPAMP design.
3. COMSOL, Solidworks, Matlab and MathCAD design and programming.
4. PCB Circuit design.
5. Advanced soldering and circuit assembly techniques.

In general, this project will be designed similar to a conventional graduate level laboratory group. The project adviser will be Dr. Leo Petrossian and he will provide recommended reading and guidance and facilitate access to the majority of tools, software and equipment required for the project. The team will have milestones and deliverables that they will need to reach and will be expected not to fall behind schedule. The schedule will be set by the project adviser based on

the expectation of performance comparable to that of entry level Masters students. Team members need to be self motivated, reliable and intelligent. They are NOT expected to know everything about engineering prior to beginning but are expected to learn, adapt and improve their skills throughout the course of this two semester design project.

Desired Skills:

1. Electrical engineering or biomedical engineering background preferred. Any and all emphasis will provide some advantages and points of strength in the project.

2. Understanding of programming theory and fundamental experience is desirable. Previous experience with any of the fore mentioned software leads to a good start.

3. Above all, team members must be: competent, reliable, intelligent and logical. Must know how to work with others, delegate work and do their share. **THIS REQUIREMENT SUPERCEDES ALL OTHERS!** This, of course, applies to all teams and all projects.

After two sessions at NABsys, the project adviser will choose a student to lead the student team and who will be expected to manage the team on a direct basis.

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