Introduction

1.1 Purpose

The primary goal of the laboratory and recitation assignments is to give students practical, hands-on exposure to some of the most common computational methods used by engineers. In accomplishing this, we employ short- and medium-scale problems from the major fields of engineering that Duke has to offer in the hopes that students will be able to better choose which engineering discipline(s) to pursue during their undergraduate career. Furthermore, we extend computational methods outside the computer itself using analog and digital inputs and outputs, reinforcing the real-world importance of computers and computational methods with respect to engineering.

1.2 Grand Challenges

EGR 53 will also be looking at the 14 "Grand Challenges for Engineering" presented by the National Academy of Engineering. The Grand Challenges are presented at the website

`http://www.engineeringchallenges.org/`

One of them, "Engineer the tools of scientific discovery," is a large part of what this course is all about. Computational methods can be used to collect, analyze, and present data from various experiments in order to get a better sense of how the universe works. The inclusion of data acquisition techniques in this class allows us to use a wide array of sensors for gathering that data rather than being limited to "cooked" data sets.

Another of the Grand Challenges, the quest to "Advance personalized learning," relates to looking at the different ways people can learn information for themselves. While there will be several opportunities for students to be taught as a group, we will be providing different resources for individual students to expand the breadth and depth of learning on their own. This includes making sure all class assignments are posted on the web, providing a discussion forum for students and class staff to talk about different aspects of the course, and creating a wiki-based interactive knowledge database. Also, we will present and explore different approaches to solving various problems in the knowledge that different students perceive computational methods in different ways.

For the remaining 12 Grand Challenges, we will link specific assignments to the relevant field or fields that may support it. For example, a problem on optimizing the dimensions of a water channel will relate to both the challenge to "Provide access to clean water" as well as the challenge to "Restore and improve urban infrastructure." Laboratory assignments introducing students to sensors and sensor technology relate to the challenge to "Prevent nuclear terror," in that accurate, rapid, and long-distance detection of fissile material is a key element of such prevention.

1.3 Equipment for Recitations and Laboratories

The recitations will be held in the public computer cluster in Teer 106 while the labs will be in the EGR 53 lab in FCIEMAS B209. The Teer lab is equipped with several computers running Linux as well as two laser printers on the ePrint system. The B209 lab is equipped with computer systems running the Windows operating system. Half of these machines have a National Instruments data acquisition card and relevant software installed. These systems can take data from a variety of electrical sources and will be used to perform various experiments involving measurement and analysis.

To complete assignments outside of class, you will have 24/7 access to several public computer clusters - these are listed on OIT's web site at `http://oit.duke.edu/comp-print/labs`. You can also do work on personal computers with internet connections - information on working from your own computer will be discussed in class and during lab.

1.4 Office Hours / TA Support

As much of the work for this course will be done outside of formal class hours, each teaching assistant will be assigned office hours in the public computer cluster in Teer Library to help students with their programming, analysis, and reports. These office hours should be used to get help about general concepts and about particular aspects of an assignment which you have worked on but run up against some form of roadblock. Office hours should not be seen as a means to shortcut the learning process and get "easy" answers - the TAs will be specifically asked to help students *through* the thinking process and not just give out the end result.

Office hours will be posted as early as possible during the semester, and there will be several blocks of time where multiple TAs will be in the lab. If you have questions and cannot make a particular set of office hours, you can also contact either your lab or recitation TAs for help - generally, however, it is best to ask questions face-to-face either during office hours or during any extra time that may exist during a particular lab or recitation. The instructors will also set up times for meetings.

1.5 Report Format

For this course, work will be documented and presented using a written report of some kind. You will receive the specific formatting requirements and skeleton files for each assignment. Generally, you will be asked to write programs and present the results of those programs in a compact format - including a brief problem statement, data and graphs produced to answer the particular problem, your answer, and any required justification. Note that the title block and community standard will be included on each report. Also, regardless of what kind of assignment you are submitting, always use your **lab** section in the title block. When assigned, you will also include your lab subsection. This is primarily to make sure the appropriate teaching assistant receives and grades your work during the semester.

For this course, you must include copies of *all* codes used to solve the problems as well as any required graphs and tables. Often, these items will go into an appendix to the report. While the main focus of this course is teaching people computational methods, it is also important that people learn how to properly document, interpret, and present the results of those methods. This includes not only generating valid results but also producing a professional document free from formatting, grammar, and spelling mistakes.

1.6 Ownership of Work

All the work you do for this class needs to be properly documented and owned. For the lab and recitation reports, this is most easily done with a title block at the top of the assignment. For all MATLAB functions and scripts you create for graded assignments in this course, you must include a title block as well. For programs you write yourself, you need to use the following header:

```
% [Function or Script Name]
% [Your Name]
% [Date Written]

% I have neither given nor received improper assistance in the
% completion of this assignment.  I understand that a violation of the
% statement can result in failure of this assignment, failure of this
% course, and/or suspension from Duke University.
% I have thus adhered to the Duke Community Standard in
% completing this assignment
% Signed: [Your acpub login ID]
```

If you are given a piece of code to modify the following header must be used:

```
% [Function or Script Name]
% [Your Name]
% [Date Modified]
% Based on: [Original Script or Function]
% Written by: [Original Author]

% I have neither given nor received improper assistance in the
% completion of this assignment.  I understand that a violation of the
% statement can result in failure of this assignment, failure of this
% course, and/or suspension from Duke University.
% I have thus adhered to the Duke Community Standard in
% completing this assignment
% Signed: [Your acpub login ID]
```

An example header might look like the following:

```
% sample.m
% Jane Doe
% January 18, 2009

% I have neither given nor received improper assistance in the
% completion of this assignment.  I understand that a violation of the
% statement can result in failure of this assignment, failure of this
% course, and/or suspension from Duke University.
% I have thus adhered to the Duke Community Standard in
% completing this assignment
% Signed: jjd9
```

You will also need to include your Net ID in the title of every graph you submit for a grade. This again is so that you are claiming ownership of your own work.