Welcome to the Scientific and Engineering Programming Class. This class follows a set of lecture notes that are also offered through the web. For this course not only the lecture notes are offered through the web but lab and project reports, and tests will also be web based.

The objective of this lesson is to explain the contents of the course and the expectations that are placed to measure performance in this class.

1.1 Computational Science and Engineering

Many experiments that have traditionally been performed in a laboratory are being augmented or replaced by computational simulations blending science and engineering with computational mathematics, computing, and visualization.

A computational scientist or engineer applies computational technology in innovative and essential ways to advance the respective discipline. Computational scientists and engineers work to obtain a better understanding of some phenomena through a judicious match of the scientific problem, the mathematical model that describes it, the numerical technique employed in its solution, the computer language and the computer architecture used in its implementation, and the assessment of each of these steps through visualization.

There are five identifiable stages in the computer solution of a problem. These will be the guiding principle of the presentation.

1.2 Course Description

Computer implementation of models and numerical methods used in solving science and engineering problems. C++ programming on UNIX is emphasized. Other computational and visualization tools are introduced. Network access to scientific libraries and data is used to augment the computational environment. Prerequisite: Calculus I. Prior programming experience helpful but not required

1.2.1 Course Outline

- Systems Issues
  - Unix Commands
  - Text editing
  - Internet usage
  - Home page development
- Structured Programming in C++
  - Program Structure
  - Basic Data types
  - File I/O
  - Functions and Passing of Function Argument
  - Conditional and case statements
  - Looping constructs
  - Array types and constructs
  - Brief introduction to pointers
- Scientific visualization
- Other programming paradigms
  - Matrix type and computation