Physics 630 – Syllabus
Introduction to Scientific Computing
Spring 2012

General Information

Professor: Dr. Josh Gladden
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Office: NCPA 1062
Office Hours: Mon. (1:00 – 2:30) & Thurs. (9:45 – 11:15)
in Lewis 211 or by appointment at NCPA
Website: www.phy.olemiss.edu/~jgladden/sci_comp / (check regularly!)
Lecture: M W 11:00 – 12:15 AM in Lewis 103A (PreMed Lab)
Required Text: *A Primer on Scientific Programming with Python*
by Hans Petter Langtangen (2nd edition, Springer Press, 2011, ISBN: 978-3642183652)

Course Description

This is a course targeted toward Graduate Students in the Physical Sciences (Physics, Chemistry, Biology, Geology, ...) as well as Mathematics. The purpose of the course is to provide these students with a coherent picture of the role of computers in the sciences as well as the practical skills they will need in their graduate studies or professional positions in science. The role of computers in science is, of course, an enormous topic with many highly specialized niches. This course will focus on what one might call a "base level of knowledge" which most scientists will be expected to have. It also will provide a good starting point from which a more advanced course or self-study may follow. After completing the course, students should have developed a set of tools and skills they will immediately find useful in their study and research. Specific topics covered will be: the basics of the Python programming language, scientifically related object oriented programming, numerical differentiation and integration methods, linear and non-linear fitting of models to data, graphical representation of data and models, roots of functions, and numerical precision and error issues, adaptive Runge-Kutta methods and solutions to coupled ordinary differential equations. As time allows, more advanced topics such as parallel computing, and graphical user interface programming will be covered.

Evaluation

Weights
Homework 20%
Project 1 ..... 40%
Project 2 ..... 40%

Homework:
Weekly homework sets will be assigned. Some problems will be solved "by hand" with pencil and paper, however most will be programming assignments. Group work is allowed, but each member of the group should understand each component of the problem.

Projects:
There will be two larger scale projects assigned, one near the mid term and one near the end of the term. These will be more involved projects which bring together many of the topics we have studied. Each student will have an individual topic of their choosing with my approval. I encourage students to choose topics useful to their particular field of study.
There will be no tests or a final exam in this course.