Phys 177: Computational Methods in Physical Sciences
Syllabus - Spring 2016

Contact Info:
Instructor: Laura Sales
Office: Piece 2112B, phone: (951) 827-7037
Lectures: Tue/Thu 5:10-6:30pm, room: TBD
Office hours: Tue/Thu 2:30-3:30 or by appointment.

Emails:
Emails will be checked and replied at least twice a week around office hours. Please include 'PHYS177' in the subject.

Text Book:

- Computational Physics by Mark Newman

Course Grading:

- There will be homework and/or lab assignments that should be submitted weekly to your own Github repository (see instructions below). They will account for 40% of your final grade.
- After the first five weeks, there will be a mid-term exam to monitor your progress in programming and problem-solving skills. It will account for 20% of your final grade.
- The remaining 40% of the grade will correspond to the development and presentation of a Final Project where you will have the chance to explore in more depth a specific topic of your interest.
- Attendance to lectures is not mandatory although highly recommended.
- There is no final exam for this class.

Grades will approximately correspond to: 90% – 100% = A; 80% – 89.99% = B; 70 – 79.99% = C, 60 – 69.99% = D; below 60% = F.

Collaboration Policy

Working in groups is encouraged but each member should submit their own homework and assignments. You might also be asked to explain or slightly modify your programs "on-the-fly" to demonstrate understanding and authorship of the homework/lab assignment. Your performance during this random quizzes will be reflected on the grade of the particular homework/assignment/final project. The work submitted must be your own. Cheating will not be tolerated.

Programming Language

The course will be taught in Python, a powerful, novel and comprehensive high-level programming language. Both, analysis and plotting will be done in Python.
However, homework, assignments and the Final Project can be done in any language of preference.

Submission of homework, lab assignments and Final Project

All homework and lab assignment will be done electronically via a "Github" repository (https://github.com). Please open an account and make a specific folder with a name of your choice. Email the specific address of your repository privately to your instructor no later than Friday Apr. 1st 10pm. Within your repository, make individual folders for each week's homework and assignment with the following format: week??, where "??" corresponds to the number of the week. So, "week01" for the first week, "week02" for the second,…. "week10" for the last. You will also create a "FinalProject_surname" folder, where "surname" should be replaced by your own surname. For example, "FinalProject_smith" for a hypothetical student of surname "Smith". Within each weekly folder, include all the material requested by homework/assignments. Names should follow the convention: "ex1.py" (or whatever extension you need) for exercise 1, "ex2a.py" for exercise 2a, etc. Please also include data files, and plots generated/required by the programs.

Weekly homework/assignments can be submitted until Monday 11pm of each week. Later submissions will carry a -20% penalty per day. If the task consist on the writing of a specific algorithm, it should always be able to compile. A submitted program that does not compile will be considered as NOT submitted.

Tentative Topics and references (C = Computational Physics)

- Introduction to analysis and visualization with Python (Ch. 2C, 3C)
- Numerical Integration (Ch. 5C)
- Modeling of data [Moments of a distribution, differences between distributions, linear correlation, likelihood analysis, fitting data, smoothing, etc]
- Solution of Linear Algebraic Eq. (Ch. 6C)
- Solution of Non-linear algebraic Eq. (Ch. 6C)
- Eigen values & Eigen vectors. Matrix inversion (Ch. 6C)
- Fourier Transform and Spectral methods (Ch. 7C)
- Ordinary differential equations (Ch. 8C)
- Random numbers & Monte Carlo (Ch. 10C)