

PHY 277: Computation for Physics and Astronomy Majors

Time and Location: Class will meet in MATHEMATICS S235S MWF 8:25-9:20am.

Instructor: Prof. Cyrus Dreyer (cyrus.dreyer@stonybrook.edu)

Office: Physics B-141

Office hours: Tentatively MW 9:20-10:20am in S235S

TA: Victoria Lloyd (victoria.lloyd@stonybrook.edu)

Office Hours: TBD

Scope of the Course

This course is designed to prepare sophomore Physics and Astronomy majors for the realities of modern scientific computing. The desktop computer running linux (or some form of Unix operating system) has become ubiquitous in the fields of physics and astronomy for a variety of purposes: numerically solving problems that cannot be easily solved analytically, analyzing or acquiring data from experiments and observations, writing papers or reports, or presenting results. This course will help you to attain a minimal level of scientific computing literacy that you need to function on a daily basis in this field. The course will focus on developing the skills needed carry out core tasks on modern computers running linux (or Unix) operating systems. The course will cover the following core topics:

- Carrying out core tasks on Linux or Unix-based operating systems
- Writing and compiling programs in the FORTRAN 2008 language
- Writing programs in python
- Elementary numerical methods
- An introduction to the LaTeX typesetting system
- An introduction plotting using matplotlib

What to Expect

This course will require you to carry out numerous programming or other computing tasks on linux machines. This can be done on the computers in Math S235S (the MATHLAB), or by logging in remotely using your own computer. Details on how to do this will be provided during the first week of class. *Please let the instructor know as soon as possible if you are having trouble remotely accessing the MATHLAB server or have other questions or concerns about your setup.*

Lectures will either fill the whole class period or begin with around 30 minutes of lecture followed by an in-class exercise for the last 20 minutes (students may use their own laptop or the computers in the classroom for the exercises). Exercises are due by the end of class and graded for completion. Homework assignments will be assigned weekly. Lecture slides and homework assignments will be provided, and assignments will be submitted via Brightspace.

Textbook:

There will be no required textbook for this class. If you would like an additional reference, see: *Fortran 95/2003 for Scientists and Engineers*, (or the Fortran 90/95 edition), Stephan J. Chapman, and *Programing for Computations-Python* (<https://link.springer.com/book/10.1007/978-3-030-16877-3>)

Course Grading

This course requires important continuous work and dedication. There will be two midterms and a final project. The grading policy will be:

- Homework assignments: 30 %
- In-class exercises: 10 % (lowest 4 scores will be dropped)
- In-class Midterm 1 (Tentatively week of March 10): 20 %
- In-class Midterm 2 (Tentatively week of April 21): 20 %
- Final project (Due May 21): 20 %

The homework assignments will be posted and turned in via brightspace. They will involve writing and turning in programs, plots, etc. The in-class exercises are described above. The midterms will be during class and involve written questions. The final project will involve solving a physics/math problem computationally. A list of suggested projects will be provided. **The course grades are curved.**

Teaching Assistant

The course T.A. will hold office hours in order to assist you with problems that you may encounter in carrying out your assignments.

Attendance

As per the University policy outlined in the Undergraduate Student Bulletin, students are expected to regularly attend all classes. If an absence occurs causing you to miss an exam or homework assignment due to a legitimate reason (illness, medical issue, death of a family member, jury duty, military service) please provide full documentation of the reason to the Office of the Dean of Students (222 Students Activities Center, 631-632-7320) and ask them to contact your instructors.

Important University Policies:

- **Student Accessibility Support Center (SASC) Statement:** If you have a physical, psychological, medical or learning disability that may impact your course work, please contact the Student Accessibility Support Center (SASC), ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their

needs with their professors and the staff at the Student Accessibility Support Center (SASC). For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>

- **Critical Incident Management Statement:** Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.
- **Academic Integrity Statement:** Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

SPECIAL NOTE REGARDING PLAGIARISM AND DISHONESTY: All instances of suspected plagiarism or academic dishonesty will be brought before the Academic Judiciary Committee. All parties suspected (both the copier and the person who produced the original work) will be held accountable for any instance of plagiarism or dishonesty. You are responsible for protecting the security of your programming assignments by making sure that your directories are not world readable. If you are unsure how to secure your home directory see the instructor immediately.

Important Course Policies:

- **Student Responsibilities.** You will be expected to abide by all University regulations, procedures, requirements, and deadlines as described in the *Undergraduate Student Bulletin*.
- **Attendance.** As per the University policy outlined in the *Undergraduate Student Bulletin*, students are expected to regularly attend lectures and to participate in the classroom experience.
- **Assignments.** All work on class assignments is to be carried out **completely** independently. **DO NOT ASK OTHER STUDENTS FOR HELP OR ASK THEM TO DEBUG YOUR CODE.** Ask the instructor or the TA for help if you need assistance. There will be no collaborative work on assignments at any time. Computer programs developed for this course should be developed exclusively by you alone. Late assignments will not be accepted.

- **Copying of Code.** Never, **EVER**, copy code from any source for use in your homework assignments unless an assignment explicitly states that you can do so. This includes sources such as web sites, books, and others. Any instances of suspected copying of code for assignments will be referred to the Academic Judiciary Committee in accordance with University Policies.
- **Computer Use.** All use of University owned computers and networks must be in accordance with the University Information Technology Policy.
- **Classroom Behavior and Conduct**
You are expected to conduct yourself in accordance with the minimal undergraduate student responsibilities described in the Undergraduate Student Bulletin including:
 - You are expected to arrive for class promptly.
 - Avoid behavior that is disruptive to the classroom especially the use of cell phones.
 - Be familiar with material presented in previous lectures.