Physics 305 : Computational Physics
Syllabus Fall 2013

Instructor: Asst. Prof. Brant Robertson
Room/Time: Steward 208 Computer Lab, TTh 11am-12:15pm
Office: Steward N312 (the N is important!)
Office Hours: T 10-11am in Steward 208
Email: ua.physics305@gmail.com
Web: D2L

Course Summary

This course will introduce students to the use of computers as a tool for solving physics problems. The course will teach you both abstract aspects such as numerical methods, algorithms, and optimizations, and practical aspects such as C and UNIX.

For a career in physics or related field, the ability to perform scientific computations is a prime skill used on a daily basis. Often, the complexity of real physical systems is too large to model accurately using analytical techniques. We resort to computation to model complex systems, obtain precise calculations of mathematical functions, and to employ algorithms too computationally challenging to be performed by hand.

And it's fun!

Required Textbook

Kernighan, B., and Ritchie, D. "The C Programming Language", 2nd Edition. Prentice Hall.

Recommended Textbooks

Knuth, D. "The Art of Computer Programming", Volumes 1-4A, Addison-Wesley.
Press, W., et al. "Numerical Recipes in C", 2nd Edition, Cambridge University Press.

Prerequisites

Physics 142 or Physics 152
Math 129
Math 254 (Concurrent registration)

Grading

Homework 70%
Midterm Exam 10%
Final Exam 20%

Homework Policy

Homeworks will be in the form of computer programs that you write and submit online via an appropriate D2L dropbox. Each assignment will have a due date and time clearly specified, typically at the start of class on the day the homework is due. Homework received after the due date and time will be considered late. This rule is absolute. Do not expect to be able to arrive late to class and turn in (or submit online) your homework for credit. If in doubt, feel free to submit your homework early via the appropriate D2L dropbox. Homework submitted via email will not be accepted (and no credit given, i.e., a "0").

Everyone's submitted code must be unique, and will be checked against other student's submissions to ensure the assignment has been completed correctly.

Exam Policy

The midterm exam is tentatively scheduled for Tuesday, October 15, 2013 at 11am.

The final exam is Wednesday, December 18, 2013 at 1-3pm in Steward 208.

The midterm will cover the first half of the course. The final exam will cover the entire course. Exams cannot be made up if they are missed. If a midterm is missed but there is an excuse by the Dean of Students or an equivalent authority as approved by the course instructor, then course grade will be determined by rescaling the other course grading components to sum to 100%. However, missing both exams will result in an E for the course. Test taking arrangements can be made with the DRC if necessary.

Steward 208 Computer Lab

The central computer for this class is nimoy.as.arizona.edu. All students will be provided computer accounts to log into on nimoy via any machine in the Steward computer room (SO 208). Students who wish to remotely log in and work should use ssh to log into nimoy. If your computer does not have an ssh client, you may download one for free by going to https://sitelicense.arizona.edu.

You may use the computers in Room 208 to do your assignments whenever they are available, but this is not required. If you have a Macintosh or Linux- based computer you may be able to do much of the assignments on your own computer, but you are responsible for ensuring that it compiles and runs on nimoy.

All assignments must be turned in using the provided dropboxes on the D2L site.

Attendance

You will not be graded on attendance. Note however that homeworks will be assigned during lectures. Students are responsible for all material covered during lecture except as explicitly noted by the instructor, including schedule changes.

Students with excessive absences may be administratively dropped. For students who wish to drop or withdraw are ultimately responsible for ending their enrollment in the course. We respect the University of Arizona Calendar of Religious Holidays, and absences related to religious non-work days:

http://www.registrar.arizona.edu/religiousholidays/calendar.htm

Classroom Etiquette

Please arrive on time; it is disruptive to have students entering class after lecture has begun. Please turn off all cellphones and other mobile devices during class, no texting, and do not tweet, IM, etc. Also, during classroom discussions, please be civil and respectful of others. Do not use the computers for on-line activity that is not germane to the course (no facebook, reddit, 4chan, etc.). Repeated transgressions of etiquette will be grounds for dismissal from the course.

Students with Disabilities

If you anticipate barriers related to the format or requirements of this course, please meet with me so that we can discuss ways to ensure your full participation in the course. If you determine that disability-related accommodations are necessary, please register with Disability Resources (621-3268; drc.arizona.edu) and notify me of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations.

Tentative Schedule (Subject to change)

Tuesday,	**August 27**	Syllabus, Class overview, C Assessment
Thursday,	**August 29**	C: Basic Programming, Compiling
Tuesday,	**September 3**	C: Structures and Pointers
Thursday,	**September 5**	Interactive Data Language: Basics
Tuesday,	**September 10**	Interactive Data Language: Figures
Thursday,	**September 12**	Root Finding 1
Tuesday,	**September 17**	Root Finding 2
Thursday,	**September 19**	Integration 1
Tuesday,	**September 24**	Integration 2
Thursday,	**September 26**	Ordinary Differential Equations 1
Tuesday,	**October 1**	Ordinary Differential Equations 2
Thursday,	**October 3**	Ordinary Differential Equations 3
Tuesday,	**October 8**	Ordinary Differential Equations 4
Thursday,	**October 10**	Review
Tuesday,	**October 15**	Midterm
Thursday,	**October 17**	Orbital Dynamics 1
Tuesday,	**October 22**	Orbital Dynamics 2
Thursday,	**October 24**	Orbital Dynamics 3
Tuesday,	**October 29**	Orbital Dynamics 4
Thursday,	**October 31**	Driven Systems and Chaos 1
Tuesday,	**November 5**	Driven Systems and Chaos 2
Thursday,	**November 7**	Driven Systems and Chaos 3
Tuesday,	**November 12**	Driven Systems and Chaos 4
Thursday,	**November 14**	Data Analysis 1
Tuesday,	**November 19**	Data Analysis 2
Thursday,	**November 21**	Data Analysis 3
Tuesday,	**November 26**	Data Analysis 4
Thursday,	**November 28**	Algorithms 1
Tuesday,	**December 3**	Algorithms 2
Thursday,	**December 5**	Algorithms 3
Tuesday,	**December 10**	Review