PHZ5155C/PHY4095: Physical Modeling and Simulation

Fall 2018
Instructor: Professor Laura Blecha

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Course Description and Objectives

PHZ 5155C is an introduction to computational methods, modeling, and simulation in physics. Basic numerical methods used in computational physics are introduced, including derivatives, integration, solutions to differential equations, linear algebra, fitting methods, and Monte Carlo methods, with applications to a variety of physics topics. The main goal of this course is to empower students in using numerical techniques to solve scientific problems.

Textbook and Online Resources

Recommended textbook: “Computational Physics” by Newman
Includes a helpful website with exercises and code examples:
http://www-personal.umich.edu/~mejn/cp

Other resources:

- Official Python documentation: https://docs.python.org
- “Think Python: How to Think Like a Computer Scientist” Available for free online: http://greenteapress.com/wp/think-python-2e/
- William H. Press, Saul A. Teukolsky, William T. Vetterling, Brian P. Flannery ”Numerical Recipes 3rd Edition: The Art of Scientific Computing”, 3rd edition, Cambridge University Press 2007. Then 2nd edition of this book is available for free online: http://apps.nrbook.com/c/index.html
- Michael T. Heath ”Scientific Computing”, 2nd edition, McGraw-Hill 2002. The content of this book is available for free online as a course presentation: http://web.engr.illinois.edu/~heath/scicomp/notes/

Assignments

There will be homeworks due approximately every week. They will be uploaded to your BitBucket site. Unexcused late assignments will be accepted with 20% grade loss per day, for maximum of 5 days late. Exceptions include documented medical or other extenuating circumstances.

Note, your homework will be automatically pulled down at the due date/time. If you submit late homework, it is up to you to inform me that you have pushed a late assignment to your BitBucket site so that I can manually pull it down.

There will be a number of projects in the class as well. For these, late assignments are not allowed without a documented medical or other extenuating circumstance.

Grading

Homeworks: 75%, Projects: 25%. Code will typically be worth 15 points with rubrics pre-defined. The strictest grade policy that I will adopt will follow:

Letter	% Points	GPA	Letter	% Points	GPA	Letter	% Points	GPA
A	93-100	4.0	B-	80-82	2.67	D+	67-69	1.33
A-	90-92	3.67	C+	77-79	2.33	D	63-66	1.0
B+	87-89	3.33	C	73-76	2.0	D-	60-62	0.67
B	83-86	3.0	C-	70-72	1.67	E	0-60	0

UF grade policies may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Attendance

Requirements for class attendance and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Honor Code

Formal Language: UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: ‘On my honor, I have neither given nor received unauthorized aid in doing this assignment.’ The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions

or concerns, please consult with the instructor or TAs in this class."

My Language: Collaboration is an important aspect of science, and you will likely learn as much from one another as you will from me. Hence, you are encouraged to work together and consult one another as you work on your assignments. You may additionally consult the internet as well as any books necessary to complete your assignments. You must, however, turn in your own individual homework, and this must be written on your own. Copying and pasting is not permitted.

You may not obtain materials from students who have taken this course in previous years, nor may you distribute your current materials to students not currently enrolled in this class. Please consult me if you have any questions.

Evaluations

"Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results."

Accessibility

I am committed to supporting the learning process for all students. Please contact me as soon as possible if you are having difficulties in the course. If you need a special accommodation due to a disability, please let me know. Students with disabilities requesting accommodations should additionally register with the Disability Resource Center (352-392-8565), http://www.dso.ufl.edu/drc by providing appropriate documentation. Once registered, students will receive an accommodation letter which should be presented to the instructor when requesting accommodation.

Learning Environment

I embrace the diversity of age, background, ethnicity, gender identity and expression, national origin, religious affiliation, sexual orientation and other visible and non visible categories that you bring with you to our shared study of physics. We will all be working closely together throughout the semester, and I expect that all students will contribute to a respectful, welcoming, and inclusive environment. This includes showing respect for all questions asked by members of the class.

You are encouraged to bring a laptop to class every day, and be prepared to move seats to sit in groups when required.

HPC Account

To access the high-performance computing (HPC) servers ("HiPerGator") we will use during the course to run calculations, you must have a UF HPC account on HiPerGator. If you dont already have a HiPerGator account, request one here: https://www.rc.ufl.edu/access/account-request/. It could take up to several days for your request to be approved, so please do this at your earliest opportunity. Enter my name as the faculty sponsor, and enter "phz5155" in the "Comments" field. If your GatorLinkID is anything other than the prefix to your email (i.e., username@ufl.edu), please let me know ASAP so I can add you to the roster of approved IDs.

Tentative Weekly Agenda

(Subject to change at instructor's discretion.)

Week of	Tentative Topic
Aug 22	Introduction to Unix and HPC
Aug 28	HiPerGator Orientation; Beginning Python
Sept 4	More Python; Version Control / Git
Sept 11	Grids & Convergence; Differentiation
Sept 18	Interpolation; Integration
Sept 25	Linear Algebra
Oct 2	Root Finding
Oct 9	Monte Carlo Methods
Oct 16	Guest Lecture
Oct 23	ODEs
Oct 30	Fourier transforms
Nov 6	Pull Requests; Distributed Code Development
Nov 13	Fitting & Smoothing
Nov 20	Final Projects; Thanksgiving
Nov 27	Overflow; Final Projects
Dec 4	Final Presentations