PHY4905: Physical Modeling and Simulation

Fall 2019

Instructor: Professor Laura Blecha

Instructor Contact Information

Email: lblecha@ufl.edu
Office Phone: 352-392-4948
Office: NPB 2174
Website: http://www.phys.ufl.edu/~lblecha
Office Hours: to be determined after first class meeting; also by email appointment

Class Meeting Times & Location

Class will be held in the Norman computer lab classrooms https://labs.at.ufl.edu/computer-labs/norman/. We will be in one of two identical classrooms in Norman according to the schedule below.

Tuesdays: 11:45 am – 1:40 pm; Norman G514i
Thursdays: 11:45 am – 12:35 pm; Norman G512

Both computer labs have identical Mac desktop computers. You do not need to be familiar with Macs or have access to a Mac computer outside of class in order to take this course. Access to a computer outside of class (with any operating system, including Windows and Linux) will be helpful for working on homework assignments, but you may also use any of the computer labs on campus.

Course Description and Objectives

PHY4095: Physical Modeling and Simulation is an introduction to computational methods and modeling 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 (ISBN: 978-1480145511)
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.

Additional notes: 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 professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at
https://gatorevals.aa.ufl.edu/public-results/.

Accessibility

I am committed to supporting the learning process for all students. If you need a special accommodation due to a disability and/or are having difficulties in the course, please let me know if you feel comfortable doing so. 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.

Tentative Weekly Agenda

(Subject to change at instructor's discretion.)

Week of	Tentative Topic
Aug 20	Introduction to Python
Aug 27	More Python; Version Control
Sept 3	Basics of Scientific Computing
Sept 10	Differentiation; Integration
Sept 17	Integration
Sept 24	Monte Carlo Methods
Oct 1	Monte Carlo Methods (continued)
Oct 8	Linear Algebra
Oct 15	Guest Lecture; Root Finding
Oct 22	ODEs
Oct 29	Fourier transforms
Nov 5	Collaborative Code Development
Nov 12	Fitting & Smoothing
Nov 19	Overflow; Final Projects
Nov 26	Final Projects; Thanksgiving
Dec 3	Final Presentations