CSc 30100 – Scientific Programming
Fall 2018
Professor Erik K. Grimmelmann, Ph.D.

Syllabus v1.0

Overview

This course provides a theoretical and hands-on introduction to the issues in scientific programming.

Prerequisites

You are expected to have a basic knowledge of computer science including a working knowledge of Python.

The formal prerequisites are

- CSc 21700: Probability and Statistics for Computer Science
- CSc 22000: Algorithms
- Math 20300: Calculus III
- Math 34600: Elements of Linear Algebra

If you have not taken (and done well in) all of these courses (or their equivalents), please check with me prior to continuing in the course.

Class Meetings

We will meet **Tuesdays and Thursdays**

- **Section M 11:00 am to 12:15 pm in NAC 5/124**.
- **Section P 2:00 pm to 3:15 pm in Shepard S-379**.

Please note that per the City College calendar, no classes for this course are scheduled on September 11 and 18 or on November 22.

Please **arrive promptly**. Arriving late is better than not arriving at all, but please allow adequate time to get to campus, especially if you come by public transit.

Please **pay attention** in class. No texting or doing anything else on-line during class. If a personal emergency arises, please set out of the room to deal with it.

Attendance in class is required. If you have an unavoidable conflict (e.g., a job interview) or are ill, please let me know via email, preferably in advance. If you're sick with a cold or the flu, stay home and recover. Consistent unexcused absences are not okay.

Readings

The required textbook is

Burden, Richard L., Faires, J. Douglas, and Burden, Annette M., *Numerical Analysis, 10 Edition,* Cengage Learning, 2016, ISBN 13: 978-1-305-25366-7
or
Burden, Richard L. and Faires, J. Douglas, *Numerical Analysis, 9th Edition,* Cengage Learning, 2011, ISBN 13: 978-0-538-7335-19

Either edition will do.

Programming

All programming in the course will be in Python and its relevant add-ins and libraries (such as NumPy, MatPlotLib, and Pandas). You are free to work in any environment that supports Python (e.g., Windows, Max, Unix, Linux). We'll be using Jupyter notebooks throughout the course.

Blackboard

We will be using Blackboard as our online environment. Once you're enrolled in the course and the course has started, you should have access to the Blackboard course site. We will use the course site for

- This syllabus
- Links to reference materials
- Announcements
- Posting and submission of assignments
- Classroom presentations (typically within a few days of the class session.
- Datasets
- Sample code
- Assignment grades

Course grades will not be posted on Blackboard but rather on CUNYfirst.

Course Policies

Except where I tell you otherwise, you are free to collaborate freely with each other and to consult any sources you wish to in your work for this class.

I expect you to act professionally and respectfully to your classmates (and our occasional guests) at all times. Harassment will not be tolerated.

If for any reason your preferred name is not the one that appears on the course roster, please let me know how you would like to be addressed. I am not good at remembering names so I will asking you to submit headshots on Blackboard. These headshots will be for my use only; submitting a headshot is optional.

Grades

Your grades will be based on the following factors:

- Class attendance 10%
- Class participation 10%
- Individual programming exercises 20%
- TBD 20%
- Individual projects 20%

Integrity

Just to refresh your memory, here's the City College statement on academic integrity:

> Academic integrity is an essential part of the pursuit of truth, and of your education. We are all are all responsible for maintaining academic integrity at City College – it is the rock on which the value of your degree is built.
>
> If you cheat on a test or plagiarize by using someone else's work or ideas, you defeat the purpose of your education. In addition, academic dishonesty is prohibited in the City University of New York, and is punishable by failing grades, suspension and expulsion.

Here's a link to a list of City College and CUNY policies (and links to them), https://www.ccny.cuny.edu/about/policies

If you use code from any source other than your own imagination for any coding assignment, be sure to list the source(s).

Your feedback

I welcome your feedback at all points in the course. If something is unclear, please speak up. If you find an error in my lectures, code examples, assignments, or in anything else, please let me know.

My Contract Information

The best (and fastest) way to reach me is via email at egrimmelmann@ccny.cuny.edu.

Office Hours

My office hours will be held from 12:45 pm to 1:45 pm on Tuesdays.

Office hours will be held in NAC 8/207, the conference room directly across the hall from the Computer Science department office. This room assignment will be confirmed.

In special cases, I can arrange to meet you at another time. Occasionally I will have a conflict with the standard time for office hours; when this is the case I will let you know in advance.

Course Topics (tentative as we may not get through all of them)

CS & Math Reviews

- Big O notation
- Sets & numbers
- Algebraic structures
- Taylor series
- Calculus
- Linear algebra

Floating-point

- Theory
- IEEE-754 standard
- IBM standard

Computational Issues

- Sums
- Cancellation
- Errors

Problem Solving

- Equations of one variable
- Interpolation and polynomial approximations
- Differentiation
- Integration
- Initial-value problems for ordinary differential equations
- Direct methods for solving linear systems
- Iterative techniques in matrix algebra
- Approximation theory
- Approximating eigenvalues
- Solving nonlinear systems of equations
- Boundary values problems for ordinary differential equations
- Solving partial differential equations