Course Syllabus – STBIO 400

Course Information

Course Number: STBIO 400 FA22
Course Name: Fundamentals of Scientific Computing
Term: FA 2022
Start Date: 09/06/2022
End Date: 09/29/2022
Credits: 1.0

Meeting Days / Times

Tuesdays and Thursdays, 8:15-9:45am PT / 11:15am-12:45pm ET
(See Calendar in Canvas for the most up-to-date schedule)

Location

This course will primarily be conducted online via zoom. For those who would like to be in person for group work, the following classrooms are available:

CA: Committee Lecture Hall (Molecular Biology Building)
FL: B158

Course Managers

Role	Last Name	First Name	Email Address
Course Director	Su	Andrew	asu@scripps.edu
TA	Chen	Kai-Yu	kchen@scripps.edu
TA	Gonzalez Cavazos	Carolina	agonzalez@scripps.edu
TA	Nagaraja	Shashank	snagaraja@scripps.edu
TA	Tu	Roger	rogertu@scripps.edu

Course Description

This course exists in two parts (STBIO 400 and STBIO 440). This is the first part, which teaches the fundamentals of scientific computing. Specifically, the curriculum focuses on command line tools and the R programming language. This open-source course

(https://github.com/SuLab/Applied-Bioinformatics/tree/Fall-2020) serves as an introduction to the Computational Biology and Bioinformatics track.

Program Learning Outcomes

By the end of the program, students will have accomplished these objectives:
PLO1: Original Research – graduate students are expected to develop the skills critical for generating high-quality research output. This would include absorbing, recalling, and contextualizing scientific knowledge, evaluating scientific information and data, creating testable hypotheses and investigating hypotheses, mastering scientific tools and techniques, displaying ethical behavior, and receiving and giving feedback.
PLO2: Communication – graduate students are expected to demonstrate the oral, written, and media skills to effectively communicate the impact of a study or a body of work to the greater scientific community and to the public at large using a number of methods.
PLO3: Critical Thinking – graduate students are expected to develop a self-directed process to analyze information, form opinions or judgments, and use this process to improve the quality of their scientific thoughts, navigate problems, and make informed decisions.
PLO4: Intellectual Curiosity – graduate students are expected to acquire the capacity to build their intellectual curiosity and demonstrate problem solving approaches that serve their professional growth and ability to impact a field.
PLO5: Career and Professional Development – graduate students are expected to develop a variety of transferable skillsets throughout their graduate experience, including management and leadership, inclusiveness, resilience, scientific rigor, collaboration, accountability, time management, teamwork, networking, and career planning.

Course Learning Outcomes

Upon completion of this course students will be able to:
CLO1: Learn and utilize the Bash (Unix shell) for file manipulation and navigation of the file system
CLO2: Learn and utilize R code to perform exploratory data analysis of data in files
CLO3: Learn and utilize Jupyter Notebook for R code
CLO4: Learn and utilize Git and GitHub for code versioning (tracking changes of source code)

Background Preparation (Prerequisites)

Students must have a relatively recent laptop running MacOS, Windows 10, or Linux. If students are unable to get access to a laptop or unsure if their laptop is suitable, they should talk to the Course Director prior to registering for the course.

At least two weeks prior to the beginning of the course, the instructors will post information on software that will need to be installed on the student's computer. Since each computer's configuration is different, these installations may be challenging. It is the student's responsibility to make sure their computer is properly configured on the first day of class, and to seek out the course instructors in advance to solve any problems. Students will communicate with instructors, teaching assistants, and each other via Slack.

Course Materials

https://github.com/SuLab/Applied-Bioinformatics/tree/Fall-2020

Expectations and Logistics

Each week will conclude with a homework assignment that will extend the lessons completed in class.

Attendance Statement

Students are expected to attend all classes. Students unable to attend class can seek permission for an excused absence from the course director or teaching assistant. Unapproved absences or late attendance for (3) or more classes may result in a lower grade, or an "incomplete" for the course. If a student has to miss a class, they can arrange to get notes from a fellow student as well as meet with the teaching assistant to obtain the missed material.

Scientific and Professional Ethics

The work you do in this course must be your own. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. You must explicitly acknowledge when your work builds on someone else's ideas, including ideas of classmates, professors, and authors you read. If you ever have questions about drawing the line between others' work and your own, ask the course professor who will give you clear guidance. Exams must be completed independently. Any collaboration on answers to exams, unless expressly permitted, may result in an automatic failing grade and possible expulsion from the Graduate Program.

Technology Requirements and Support

For issues related to Canvas, please contact the Graduate Office by email at: gradprgm@scripps.edu or by phone at: 858-784-8469.

Course Grading

Grading is in accordance with the academic policies of the Skaggs Graduate School. The breakdown of grading is as follows:

- Homework: 60% (30 pts total, 10 pts each)
    - Submit via JupyterHub nbgrader
    - ~8 pts are autograded (code) and ~2 pts are manually graded per assignment
    - ~6 pts per assignment are integrated as part of class time, ~4 pts are on individual time
- Participation: 40% (20 pts total)
    - 2.5 pts per thoughtful question posed in class

Letter Grade	Percent	GPA	Description
A	93-100	4.00	Outstanding achievement. Student performance demonstrates full command of the course subject matter and evinces a high level of originality and/or creativity that far surpasses course expectations.
A-	90-92	3.67	Excellent achievement. Student performance demonstrates thorough knowledge of the course subject matter and exceeds course expectations by completing all requirements in a superior manner.
B+	87-89	3.33	Very good work. Student performance demonstrates above-average comprehension of the course subject matter and exceeds course expectations on all tasks as defined in the course syllabus. There is notable insight and originality.
B	83-86	3.00	Satisfactory work. Student performance meets designated course expectations and demonstrates understanding of the course subject matter at an acceptable level.
B-	80-82	2.67	Marginal work. Student performance demonstrates incomplete understanding of course subject matter. There is limited perception and originality.
C+	77-79	2.33	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
C	73-76	2.00	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
P	73-100	0.00	Satisfactory work. Student performance demonstrated complete and adequate understanding of course subject matter. Course will count toward degree.
F	0-72	0.00	Unacceptable work/Failure. Student performance is unacceptably low level of knowledge and understanding of course subject matter. Course will not count toward degree. Student may continue in program only with permission of the Dean.
I		0.00	Incomplete is assigned when work is of passing quality but is incomplete for a pre-approved reason. Once an incomplete grade is assigned, it remains on student's permanent record until a grade is awarded.
W		0.00	Withdrew from the course with Dean's permission beyond the second week of the term.

- All courses will be recorded and maintained in the student's permanent academic record; only courses that apply towards the degree will appear on the academic transcript. Non-credit or audited courses will not appear on the transcript.
- 4 core courses taken for a letter grade (pass = B- or higher for a core course)

- 2 elective courses taken pass/fail (pass = A, B, C for an elective)

Because students are encouraged to take electives outside their area of expertise, a "C" letter grade is passing.

Course Schedule:

Date	Details
Tue Sep 6, 2022	R for Data Science -- data visualization, manipulation, workflows
Thu Sep 8, 2022	R for Data Science -- data visualization, manipulation, workflows
Tue Sep 13, 2022	R for Data Science -- data visualization, manipulation, workflows
Thu Sep 15, 2022	R for Data Science -- data visualization, manipulation, workflows
Tue Sep 20, 2022	R for Data Science -- data visualization, manipulation, workflows
Thu Sep 22, 2022	R for Data Science -- data visualization, manipulation, workflows
Tue Sep 27, 2022	Bash and command line tools
Thu Sep 29, 2022	Bash and command line tools