Course Syllabus – STBIO 440

Course Information

Course Number: STBIO 440 FA22
Course Name: Applied Bioinformatics and Computational Biology
Term: FA 2022
Start Date: 10/04/2022
End Date: 12/09/2022
Credits: 2.0

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 second part, which delves deeper into applied bioinformatics with a focus on the RNA-Seq analysis pipeline from pre-processing of raw data to post-processing visualizations of results as publish-ready figures. 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 the fundamentals of RNA-Seq, and its application in the larger biological research schema
CLO2: Apply R in analyses of RNA-Seq data, from raw data to publishable statistics and figures
CLO3: Practice and present on learned R skillset through published data via Capstone project
CLO4: Understand and practice of peer review through self-evaluation and evaluation of peers

Background Preparation (Prerequisites)

STBIO 400 Fundamentals of Scientific Computing, or permission of the Course Director.

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.

Individuals following this course either on their own or for credit should conduct professional

and considerate behavior, likewise for TAs and Instructors. Individuals can typically anticipate feedback within a 48-hour time period during typical business hours.

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 director(s) 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: 50%
  (50 pts total; 10 pts each)
  Homework given for weeks 5-9
- Participation: 20%
  (20 pts total)
  2 pts per thoughtful question asked per class for weeks 5-9
- Capstone Project (Final): 30%
  (30 pts total; 15 pts for content, 10 pts for presentation, 5 pts for peer review)
  The capstone project is an opportunity for students to apply the technical skills they've gained towards reproducing 1-2 figures from published paper with an RNA-Seq focus. Students will work individually on the coding for these figures, then in groups of 3-4 for presenting during the last weeks of 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 Oct 4, 2022	RNA-seq analysis - clustering
Thu Oct 6, 2022	RNA-seq analysis - clustering
Tue Oct 11, 2022	RNA-seq analysis - clustering
Thu Oct 13, 2022	RNA-seq analysis - differential expression analysis
Tue Oct 18, 2022	RNA-seq analysis - differential expression analysis
Thu Oct 20, 2022	RNA-seq analysis - differential expression analysis
Tue Oct 25, 2022	RNA-seq analysis - enrichment and secondary analysis
Thu Oct 27, 2022	RNA-seq analysis - enrichment and secondary analysis
Tue Nov 1, 2022	RNA-seq analysis - enrichment and secondary analysis
Thu Nov 3, 2022	RNA-seq analysis - enrichment and secondary analysis
Tue Nov 8, 2022	RNA-seq analysis - enrichment and secondary analysis
Thu Nov 10, 2022	RNA-seq analysis - enrichment and secondary analysis
Tue Nov 15, 2022	RNA-seq analysis - enrichment and secondary analysis
Thu Nov 17, 2022	RNA-seq analysis - enrichment and secondary analysis
Tue Nov 22, 2022	No Class
Thu Nov 24, 2022	Thanksgiving Holiday (No Class)
Tue Nov 29, 2022	Capstone project presentations
Thu Dec 1, 2022	Capstone project presentations
Tue Dec 6, 2022	Capstone project presentations
Thu Dec 8, 2022	*if necessary* Capstone project presentations