

Course Syllabus – STBIO 440

Course Information

Course Number: STBIO 440 FA20

Course Name: Applied Bioinformatics and Computational Biology

Term: FA 2020

Start Date: 10/06/2020

End Date: 12/11/2020

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

Online via Zoom

Course Managers

Role	Last Name	First Name	Email Address
Instructor	UI-Hasan	Sabah	sulhasan@scripps.edu
Instructor	Su	Andrew	asu@scripps.edu
TA	Diao	Huitian	hdiao@scripps.edu
TA	Gangavarapu	Karthik	gkarthik@scripps.edu
TA	Shang-Fu	Chen	sfchen@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: Possess strong communication skills

PLO2: Critique peer-reviewed publications

PLO3: Understand approaches and methodologies needed for complex scientific questions

PLO4: Knowledgeable of a wide array of technical research skills used in computational biology and bioinformatics

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 6, 2020	Week 5a: R cnt'd (UI-Hasan/Su)
Thu Oct 8, 2020	Week 5b: R cnt'd + RNASeq and Capstone Intros (UI-Hasan/Su)
Tue Oct 13, 2020	Week 6a: RNA-Seq Data (UI-Hasan/Su)
Thu Oct 15, 2020	Week 6b: RNA-Seq Data Pre-processing (UI-Hasan/Su)
Tue Oct 20, 2020	Week 7a: RNA-Seq Data Pre-Processing cnt'd (UI-Hasan/Su)
Thu Oct 22, 2020	Week 7b: RNA-Seq Data Pre-Processing cnt'd (UI-Hasan/Su)
Tue Oct 27, 2020	Week 8a: RNA-Seq Data Post-Processing (UI-Hasan/Su)
Thu Oct 29, 2020	Week 8b: RNA-Seq Data Post-Processing + DESeq2 (UI-Hasan/Su)
Tue Nov 3, 2020	Week 9a: R Packages (UI-Hasan/Su)
Thu Nov 5, 2020	Week 9b: Git and HPC (UI-Hasan/Su)
Tue Nov 10, 2020	Week 10a: Capstone Project Workshop (UI-Hasan/Su)
Thu Nov 12, 2020	Week 10b: Capstone Project Workshop (UI-Hasan/Su)
Tue Nov 17, 2020	Week 11a: Bioinformatics Workflows (Invited Talks)
Thu Nov 19, 2020	Week 11b: Bioinformatics Workflow Q&A (TSRI Panel)
Tue Nov 24, 2020	No Class
Thu Nov 26, 2020	Thanksgiving Holiday (No Class)
Fri Nov 27, 2020	Thanksgiving Holiday (No Class)
Tue Dec 1, 2020	Week 12a: Capstone Project Presentations (Class)
Thu Dec 3, 2020	Week 12b: Capstone Project Presentations (Class)
Tue Dec 8, 2020	*if necessary* Week 13a: Week 12a: Capstone Project Presentations (Class)
Thu Dec 10, 2020	*if necessary* Week 13b: Week 12a: Capstone Project Presentations (Class)