Syllabus
EPP 622 /LFSC 696 Bioinformatics Applications, Fall 2018
University of Tennessee, Knoxville

Course sections: EPP 622-52271, LFSC 696-52521
Meeting Time: MW 2:30-4:25
Meeting Place: Plant Biotechnology Building, Room 160
Course Credit Hours: 3
Couse website: https://github.com/mestato/epp622/wiki

Intructor
Meg Staton   Email: mstaton1@utk.edu
Assistant Professor   Office: PBB 154
Entomology and Plant Pathology   Office hours: MW 4:25-5:00 and by appointment

The instructor reserves the right to revise, alter or amend this syllabus as necessary. Students will be notified by email of any such changes.

Teaching Assistant
Nourolah Soltani, Graduate Research Assistant   Email: nsoltan1@vols.utk.edu

I. Course Description
Fundamental bioinformatics concepts, principles and techniques with a focus on the application of bioinformatics to problems in agriculture. Laboratory practical will be taught within a LINUX computational environment where students will gain basic skills in bash and python scripting and construct open-source software workflows to analyze genomic data.

II. Value Proposition
The discipline of bioinformatics is one of the most effective and promising tools for generating biological research discoveries, but it requires robust training in order to apply the principles correctly. This course will provide students with bioinformatic skills for processing and understanding of large datasets such as genome and transcriptome sequences, gene and protein expression measurements, and heritable genomic variations. These skills will enhance student's research efficiency and scope and, long-term, will position students to be more effective and competitive in the technology-driven biomedical and agricultural science industries.

III. Student Learning Outcomes/Objectives
    A. Students will be able to apply basic bioinformatic theory and tools to analyze biological datasets
    B. Students will be able to effectively communicate and critically assess the application of bioinformatic tools to a variety of biological problems
    C. Students will have basic competence in the UNIX shell, python scripting, and usage of bioinformatic tools from the command line

IV. Learning Environment
Class meets MW 2:30-4:25 and will consist of a lecture/discussion followed by computer laboratory exercises.

A classroom is a collaborative environment, and both the instructor and the students have a shared responsibility to ensure a successful learning experience. **Students should be prepared for all classes, be respectful of others, actively contribute to the learning activities in class and abide by the [UT Honor Code](). ** I will be prepared for all classes, evaluate learners fairly and equally, be respectful of all students, create and facilitate meaningful learning activities and follow University codes of conduct.

V. Course Communication
Outside of class and the website, the instructor will utilize email to communicate course information, such as additional readings, changes to the syllabus, answering questions relevant to all students, etc. All students are responsible for checking their university email accounts and reading all emails regarding the class. Students can contact the instructor at any point in the semester through email, by visiting during office hours, or by scheduling an appointment.

For technical issues, contact the OIT HelpDesk via phone (865) 974-9900 or online at http://help.utk.edu/. For Advanced Computing Facility (ACF)-specific technical issues, visit their website (https://www.jics.utk.edu/acf) or contact the help desk at help@jics.utk.edu.

VI. Texts/Resources/Materials
The course website will be used to distribute reading materials, links to references, lecture slides, and laboratory exercises (https://github.com/mestato/epp622/wiki). There is not a required textbook to purchase. Readings and books that can provide background about the material or additional information will be posted to the course website.

VII. Required Equipment
Students are required to bring their own laptops (and power cord if needed) to class.

VIII. Course Evaluation
The final grade for each student will be on an A-F scale:
       A   93-100 points
       B+   88-92 points
       B   80-87 points
       C+   77-79
       C   70-76
       F   below 70

Points will be accrued through laboratory homework assignments, three tests and a final project. The final grade will be weighted as follows

Lab Homework	40%
Shell Test	10%
Test 1	15%
Test 2	15%
Final Project	20%

Lab Homework Grading – Laboratory homework assignments will be distributed during each labortory class period (see schedule below). Submissions will be accepted for full credit until midnight on the due date. Assignments turned in up to 1 week late will receive a 20% grade reduction. Assignments turned in more than 1 week late will receive a 0. The lowest lab grade for the semester will be dropped.

Shell Test – A uniquely formatted one-on-one test with the instructor. You will have a 5 minute time slot, and during this time you will be asked to demonstrate your ability to use the command line. Examples will be given in class so that you can practice and be fully prepared. Commands to know will include navigating through the filesystem, creating/modifying/deleting files, and performing basic search functions.

Tests - Tests will be given in class and consist of short answer questions (answers as a phrase up to a few sentences) and will review material covered in both lecture and laboratory exercises.

Final Project – Each student will prepare a final project. This project requires that the student identify a bioinformatics research goal and appropriate dataset, execute the project, and prepare a written report with supporting data, analysis methods, code and other documentation. Each student will give a final oral presentation of 15 minutes or prepare a blackboard wiki page on their work. Final project grades are based on a 100 point scale:
- One page project proposal – 10 points
- Final oral presentation – 10 points
- Final written report – 30 points
- Code and methodology documentation ("lab notebook") – 30 points
- Grade from peers – 10 points
- Providing feedback for other student's projects – 10 points

IX. Attendance
Attendance is the responsibility of each student. Presence during lecture and lab is essential for a students to achieve success in the class, but it will not be formally recorded or graded. Absences due to special circumstances should be discussed with the instructor prior to the absence via email or in person. Missed tests may not be made up unless the instructor has previously discussed the absense with the student and made those arrangements.

X. How to Be Successful in This Course
- <u>Pay attention to the course website – visit frequently</u>! Exercises, slides, readings, homeworks, and updates to the syllabus will all appear at this site.
- <u>Do the exercises during the week they are assigned</u>. Many of the concepts and practical exercises build on the material covered in prior lessons, so it is essential to try to attend all classes and to keep up with the subject matter. Getting behind can cause major setbacks for the rest of the semester.

- Get help early with problems. Your success at learning the material is the goal of the class. The instructor is available to help during lab hours, office hours and by appointment. If something is not making sense or you are unable to complete a lab exercise, seek help immediately through email and/or in-person meetings. This will prevent you from falling behind during this fast-paced class. Requests for help the night before a test or lab are due are not acceptable and may not be answered.
- Use lab time wisely. The hands-on lab time is your opportunity to explore the assigned exercise homework and ask any questions about it. Don't be afraid to speak up – you are likely not the only person in the class with the same question. If you can complete the lab during the time slot, that means you won't have to worry about turning it in later. If not, try to make sure you have the basic concepts down and a plan for completing the work. This will save you time and frustration later.
- Select a final project that is of a proper scope to accomplish in about 4 weeks and work on it **before** and during dedicated class time. Five class periods are devoted to working on the final project; this time is an opportunity to get help from the instructor on any problems you encounter. The scope of the project should be sufficient to demonstrate mastery of a particular bioinformatic skillset, but should be accomplished in this short time frame. **Starting on the project prior to these classes and then attending the project classes** will ensure that you make regular progress on the project instead of procrastinating, and if roadblocks do arise, you can get help well before the due date.

XI. Course Feedback

A committee of 3 faculty members other than the instructor will be attending some classes and will be surveying the students in person at some point during the semester. You will receive more information about this during class. The instructor will leave the room while students fill out any surveys or answer questions. A final course evaluation will be provided to each student at the end of the course through the Student Assessment of Instruction System (SAIS). Each student will receive an email toward the end of the semester providing a link to the survey. I strongly encourage each student to participate in all opportunities to give feedback. I take the information very seriously and use it to improve the class each year.

Course Schedule

Class Num.	Day	Date	Lecture Topic	Lab Topic	Assignments	Due Dates
1	W	August 22	Syllabus and Introduction to Linux	Shell Lab I		
2	M	August 27	Bioinformatics	Shell Lab II	HW1 assigned	
3	W	August 29	HPC Resources	Shell Lab III		
	M	September 3	Labor Day Holiday			
4	W	September 5	Online resources and databases	Shell Lab IV	HW2 assigned	HW1 due
5	M	September 10	Pairwise sequence alignments & BLAST	BLAST		

6	W	September 12	Overview of high-throughput sequencing	Shell Lab V		HW2 due
7	M	September 17	Shell Test	Shell Test		
8	W	September 19	Applications of DNA sequencing	DNASeq Lab I - Fastqc, mapping	HW3 assigned	
9	M	September 24	Short Read QC and Mapping	DNASeq Lab II - mapping and IGV		
10	W	September 26	Short Read Mapping and Visualization	DNASeq Lab III - variant calling	HW4 assigned	HW3 due
11	M	October 1	Genome Assembly	DNASeq Lab IV - assembly		
12	W	October 3	Genome Annotation	Python I		HW4 due
13	M	October 8	Test 1			
14	W	October 10	Python	Python II	HW5 assigned	
15	M	October 15	Python	Python III		
16	W	October 17	Python	Python IV	HW6 assigned	HW5 due
17	M	October 22	RNAseq Intro	RNASeq Lab I – Mapping and Visualization		
18	W	October 24	Differential Expression Statistics	RNASeq Lab II – Counting and DE analysis	HW7 assigned	HW6 due
19	M	October 29	Transcriptome assembly	RNASeq Lab III – Transcriptome Assembly, ORF finding		
20	W	October 31	Functional Annotation with Python Example	Work on Project		HW7 due
21	M	November 5	Guest Lecture Dr. Olukolu - Variant Calling and Filtering			Project proposal due
22	W	November 7	Guest Lecture Dr. Olukolu - Variant Calling and Filtering		HW8 assigned	
23	M	November 12	Test 2			
24	W	November 14	Work on Project	Work on Project		HW8 due
25	M	November	Work on Project	Work on Project		

		19				
26	W	November 21	Work on Project (no class meeting)	Work on Project (no class meeting)		
27	M	November 26	Work on Project	Work on Project		
28	W	November 28	Project Final Presentations	Project Final Presentations		
29	M	December 3	Project Final Presentations	Project Final Presentations		
30	Tu	December 11 2:45-4:45	Project Final Presentations	Project Final Presentations		

UNIVERSITY POLICIES

Dear Student,

The purpose of this **Campus Syllabus** is to provide you with important information that is common across courses at UT. Please observe the following policies and familiarize yourself with the university resources listed below. At UT, we are committed to providing you with a high-quality learning experience. I want to wish you the best for a successful and productive semester.

- Dr. David C. Manderscheid, Provost and Senior Vice Chancellor

UNIVERSITY CIVILITY STATEMENT – http://civility.utk.edu/

"Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, gracious-ness, cordiality, affability, amiability and courteous-ness. Civility enhances academic freedom and integrity and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other's well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus."

EMERGENCY ALERT SYSTEM – http://safety.utk.edu/

The University of Tennessee is committed to providing a safe environment to learn and work. When you are alerted to an emergency, please take appropriate action. Learn more about what to do in an emergency and sign up for UT Alerts. Check the emergency posters near exits and elevators for building specific information.

In the event of an emergency, the course schedule and assignments may be subject to change. If changes to graded activities are required, reasonable adjustments will be made, and you will be responsible for meeting revised deadlines.

ACADEMIC INTEGRITY

Each student is responsible for his/her personal integrity in academic life and for adhering to UT's Honor Statement. The Honor Statement reads: "An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

YOUR ROLE IN IMPROVING THE COURSE THROUGH ASSESSMENT

At UT, it is our collective responsibility to improve the state of teaching and learning.   During the semester you may be requested to assess aspects of this course either during class or at the completion of the class. You are encouraged to respond to these various forms of assessment as a means of continuing to improve the quality of the UT learning experience.

STUDENTS WITH DISABILITIES – http://sds.utk.edu

"Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Student Disability Services (SDS) at 865-974-6087 in 100 Dunford Hall to document their eligibility for services. Student Disability Services will work with students and faculty to coordinate reasonable accommodations for students with documented disabilities."

ACCESSIBILITY – http://accessibility.utk.edu/

UT values accessibility for everyone in our community and has expressed this value in system-wide policy. All communications, learning material, and technology at UT should be accessible. For more information about accessibility including the full policy and opportunities for training, visit the UT accessibility webpage.

WELLNESS – http://counselingcenter.utk.edu/ and http://wellness.utk.edu/

The Student Counseling Center is the university's primary facility for personal counseling, psychotherapy, and psychological outreach and consultation services.

The Center for Health Education and Wellness manages *974-HELP*, the distressed student protocol, case management, the *Sexual Assault Response Team*, and the *Threat Assessment Task Force*.

Key Campus Resources for Students:

- Center for Career Development (Career counseling and resources; HIRE-A-VOL job search system)

- [Course Catalogs](#) (Listing of academic programs, courses, and policies)

- [Hilltopics](#) (Campus and academic policies, procedures and standards of conduct)

- [OIT HelpDesk](#) (865) 974-9900

- [Schedule of Classes/Timetable](#)

- [Student Health Center](#) (visit the site for a list of services)

- [Student Success Center](#) (Academic support resources)

- [Undergraduate Academic Advising](#) (Advising resources, course requirements, and major guides)

- [University Libraries](#) (Access to library resources, databases, course reserves, and services)