Syllabus
EPP 622 / LFSC 696 Bioinformatics Applications
Fall 2015

Course sections: EPP 622-51159, LFSC 696-50931
Meeting Time and Place: Plant Biotechnology Building, Room 160
Course Credit Hours: 3
Course website: http://epp.agbioinfo.utk.edu/

Instructor
Meg Staton
Email: mstaton1@utk.edu
Assistant Professor
Office: PBB 154
Entomology and Plant Pathology
Office hours: MW 3:25-4:30 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 Assistants
Ann Wells (awells13@vols.utk.edu)
Qidong Jia (qjia2@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 1:25 - 3:20 and will consist of an hour of lecture/discussion followed by computer laboratory exercises. Students are required to bring their own laptops (and power cord if needed) to class.
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. The teaching assistants and 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. Website and Resources
The course website will be used to distribute reading materials, links to useful references, lecture slides, and laboratory exercises (http://epp.agbioinfo.utk.edu/). There is not a required textbook to purchase. Readings for each class period can be found on the course website. Outside of class and the website, the instructor and TA 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 any emails regarding the class.

VI. 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 assignments, two tests and final projects. The final grade will be weighted as follows:
- Labs 30%
- Test 1 20%
- Test 2 20%
- Final Project 30%

Lab Grading - Laboratory assignments will be distributed during each laboratory class period (see schedule below). Students will work on the labs during the assigned lab time, and if the exercises are not finished at the end of the class, they are due one week after they are assigned. Submissions will be accepted through blackboard (http://bblearn.utk.edu). Assignments turned in 1 week late will receive a 20% grade reduction. Assignments turned in more than 1 week late will not be graded. The lowest lab grade for the semester will be dropped.

Test 1 & 2 - Tests will be given in class 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 – 5 points
  - Final oral presentation – 15 points
  - Written report – 30 points
• Quality of data, analysis, code and documentation – 30 points
• Grade from peers – 10 points
• Providing feedback for other’s projects – 10 points

VII. Attendance
Attendance is the responsibility of each student. Presence during lecture and lab is essential for 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. Lab assignments and lecture notes will not be provided after the class unless the instructor has previously discussed the absense with the student and made those arrangements. Tests and lab assignments may not be made up after a missed class unless the instructor has previously discussed the absense with the student and made those arrangements.

VIII. How to Be Successful in This Course
• Do the readings and exercises during the week they are assigned. 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. The instructor and TA are there to help and want you to be successful. 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 and ask any questions about it to the instructor and TAs. 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 4-5 weeks and work on it during class time. Students have a month to complete the final project, during which all lecture and laboratory time is dedicated to working on the project. 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. The instructor and TAs will be available to guide analysis, answer questions and help work through problems, so continuing to attend class is a good idea. It 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
Course feedback will be solicited twice during the semester, via brief anonymous surveys of students present in class. The instructor will leave the room while students fill out the survey, and the TA or another staff member will collect the forms. 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 fill out the form online.
## Course Schedule

<table>
<thead>
<tr>
<th>Class Num.</th>
<th>Day</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Lab Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W</td>
<td>August 19th</td>
<td>Syllabus and Introduction to Linux</td>
<td>Unix Shell I</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>August 24th</td>
<td>Bioinformatics</td>
<td>Unix Shell II</td>
</tr>
<tr>
<td>3</td>
<td>W</td>
<td>August 26th</td>
<td>HPC Resources and Newton</td>
<td>Unix Shell III</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>August 31st</td>
<td>Unix Shell IV</td>
<td>Programming with Python I</td>
</tr>
<tr>
<td>5</td>
<td>W</td>
<td>September 2nd</td>
<td>Online resources and databases</td>
<td>Programming with Python II</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>September 7th</td>
<td>Labor Day Holiday</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>W</td>
<td>September 9th</td>
<td>Overview of high-throughput sequencing</td>
<td>Programming with Python III</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>September 14th</td>
<td>Pairwise sequence alignments &amp; BLAST</td>
<td>BLAST</td>
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<td></td>
<td></td>
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<td></td>
<td>(Course Feedback Survey 1)</td>
</tr>
<tr>
<td>8</td>
<td>W</td>
<td>September 16th</td>
<td>Applications of DNA sequencing</td>
<td>Programming with Python IV</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>September 21st</td>
<td>Short Read Mapping and Variant Calling</td>
<td>DNaseq Lab I</td>
</tr>
<tr>
<td>10</td>
<td>W</td>
<td>September 23rd</td>
<td>Short Read Mapping and Varaint Calling (cont)</td>
<td>DNaseq Lab II</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>September 28th</td>
<td>Genome Assembly</td>
<td>DNaseq Lab III</td>
</tr>
<tr>
<td>12</td>
<td>W</td>
<td>September 30th</td>
<td>TEST 1</td>
<td>Discuss project</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>October 5th</td>
<td>Applications of RNA sequencing</td>
<td>RNaseq Lab I</td>
</tr>
<tr>
<td>14</td>
<td>W</td>
<td>October 7th</td>
<td>RNaseq assembly and DE project design</td>
<td>RNaseq Lab II</td>
</tr>
<tr>
<td>15</td>
<td>M</td>
<td>October 12th</td>
<td>Statistics behind Differential Expression for RNaseq</td>
<td>RNaseq Lab III</td>
</tr>
<tr>
<td>16</td>
<td>W</td>
<td>October 14th *</td>
<td>HMMs and Gene Networks</td>
<td>RNaseq Lab IV</td>
</tr>
<tr>
<td></td>
<td>Day</td>
<td>Date</td>
<td>Topic</td>
<td>Note</td>
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<tr>
<td>17</td>
<td>M</td>
<td>October 19th</td>
<td>16S, Metagenomics and Metatranscriptomics</td>
<td>Project Plan Due</td>
</tr>
<tr>
<td>18</td>
<td>W</td>
<td>October 21st</td>
<td>Metabolomics and Proteomics</td>
<td>Metabolomics I</td>
</tr>
<tr>
<td>19</td>
<td>M</td>
<td>October 26th</td>
<td>TEST 2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>October 28th</td>
<td>Proteomics with Paul Abraham</td>
<td>Proteomics with Paul Abraham</td>
</tr>
<tr>
<td>21</td>
<td>M</td>
<td>November 2nd</td>
<td>Project</td>
<td>Project</td>
</tr>
<tr>
<td>22</td>
<td>W</td>
<td>November 4th</td>
<td>Project</td>
<td>Project</td>
</tr>
<tr>
<td>23</td>
<td>M</td>
<td>November 9th</td>
<td>MS out, can still come to see TAs for help</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>W</td>
<td>November 11th</td>
<td>Project</td>
<td>EC Opportunity on Friday the 13th – Monica Munoz Torres, EPP seminar, 10:10-11:00 in PBB 160</td>
</tr>
<tr>
<td>25</td>
<td>M</td>
<td>November 16th</td>
<td>Project</td>
<td>Project</td>
</tr>
<tr>
<td>26</td>
<td>W</td>
<td>November 18th</td>
<td>Project</td>
<td>Project</td>
</tr>
<tr>
<td>27</td>
<td>M</td>
<td>November 23rd</td>
<td>Project presentations</td>
<td>Project presentations</td>
</tr>
<tr>
<td>28</td>
<td>W</td>
<td>November 25th*</td>
<td>Project presentations</td>
<td>Project presentations</td>
</tr>
<tr>
<td>29</td>
<td>M</td>
<td>November 30th</td>
<td>Project presentations</td>
<td>Project presentations</td>
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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 wish you the best for a successful and productive semester.

Provost Susan Martin

ACADEMIC INTEGRITY

“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.”

UNIVERSITY CIVILITY STATEMENT

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. 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: http://civility.utk.edu/.

DISABILITIES THAT CONSTRAIN LEARNING

“Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Disability Services (ODS) at 865-974-6087 in 2227 Dunford Hall to document their eligibility for services. ODS will work with students and faculty to coordinate reasonable accommodations for students with documented disabilities.”

YOUR ROLE IN IMPROVING TEACHING AND LEARNING THROUGH COURSE 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.

KEY RESOURCES FOR STUDENTS:

• Undergraduate Catalogs: http://catalog.utk.edu (Listing of academic programs, courses, and policies)
• Graduate Catalog: http://catalog.utk.edu/index.php?catoid=2

• Hilltopics: http://dos.utk.edu/hilltopics (Campus and academic policies, procedures and standards of conduct)

• Course Timetable: https://bannerssb.utk.edu/kbanpr/bwckschd.p_disp_dyn_sched (Schedule of classes)

• Academic Planning: http://www.utk.edu/advising (Advising resources, course requirements, and major guides)

• Student Success Center: http://studentsuccess.utk.edu (Academic support resources)

• Library: http://www.lib.utk.edu (Access to library resources, databases, course reserves, and services)

• Career Services: http://career.utk.edu (Career counseling and resources; HIRE-A-VOL job search system)