

## Syllabus for Bioinformatics I

BIOL 5351 Lecture: BE 330 - Monday: 4:30 pm - 5:50 pm; Wednesday: 4:30 pm – 5:50pm  
Lab: BE 302 Wednesday 3:00-4:20 pm

### Course Description:

Within the last 40 years there has been a literal explosion in the quantity and variety of information in molecular biology. In order to cope with this ocean of data, molecular biologists have had to develop new tools that rely heavily on the power of statistics and computing yet still incorporate an understanding of the underlying biological principles. The development and application of these tools in conjunction with assembled databases of biological information has become a field of its own, known as either Bioinformatics or as Computational Biology. In the sister courses Bioinformatics I and Bioinformatics II, we explore the principles underlying the analyses of sequence and molecular databases and work to provide students with the understanding and practical experience for intelligent and efficient application of these tools. In part one, we focus primarily on the analysis of nucleic acid sequences. In part two, we expand these studies to include gene prediction, protein function and structure studies and analysis of whole genomes. Both of these courses are core components of the Interdepartmental Master's Degree in Bioinformatics. In addition, they are open to any graduate student with relevant experience in molecular biology. This course does assume that the student has some familiarity with both basic molecular biology and with the use of computers and the internet.

**Course Goals:** There are two major goals for this course. First, we want students to understand both the advantages and the limitations of a Bioinformatics approach to molecular biology. This requires that students understand the underlying principles for each technique and realize where compromises have been made and why. Second, we want students to have practical experience in the application of specific tools to research problems. This experience will include working in multiple computer environments, including Unix, Python, and making use of specific web-based and computer based software tools.

### Instructors:

#### Dr. Elizabeth J. Walsh

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BIOL 221 (Lab)

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#### Dr. Sourav Roy

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### Teaching Assistant:

Flor Hernandez

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**Course Resources:**

The Required **Text Books** for this course is **Bioinformatics by David Mount (2<sup>nd</sup> edition; Cold Spring Harbor Press)**. The primary text includes a proprietary web site that will be used as a source of exercises during the course. For lab we will be using Learning Python v 5. This is available on Blackboard. Supplementary reading material for advanced topics will be provided in class or online.

The course will be coordinated through a Blackboard course connection (access via **my.utep.edu**). Blackboard will provide an online syllabus, course calendar, course bulletin board, and some supplemental web sites and notes for lectures. Grades will also be presented through Blackboard

**Grades**

Grading for this course will be on a point system with the lecture exam grade comprising 2/3 of the final grade and lab in-class and homework assignments making up the other 1/3.

**Lecture grade will be determined as follows:**

**Exams** will consist of two written examinations to evaluate understanding of the underlying principles of the analyses presented in this course. Test will have both an in-class and take home component.

**Lab grade will be determined as follows:**

**Lab assignments and homework** will be assigned on a weekly basis. In general, the computer assignments will require you to provide your pseudocode, your syntax, and output for full credit, as well as any appropriate annotations.

**COURSE POLICIES**

**POLICY ON CLASS PARTICIPATION:** You are expected to come to class prepared to answer questions about the assigned lab. Always bring a pen and paper. Pop quizzes may be given at any time during the lab period. The instructor will post grades electronically, but students are responsible for knowing their grades at all times.

**POLICY ON CELL PHONES:** Do NOT have them on or out in class....this includes texting! Cell phones can be confiscated for the class period if used in lab.

**POLICY ON ALL OTHER ELECTRONIC DEVICES:** You cannot surf the internet, watch movies, listen to music, etc. in lab. You will be asked to leave if this happens.

**POLICY ON CAMPUS CARRY:** Persons holding a Concealed Handgun License can lawfully carry their handgun into a UTEP classroom as long as the gun remains concealed. Open carry remains prohibited on campus. In other words, none of us should see (or be able to tell that there is) a gun at UTEP. [Call the University Police at 747-5611 or dial 911 if you see any individual on campus with a handgun or other type of weapon.](#) For more information on campus carry, see [<http://sa.utep.edu/campuscarry/>]; for more information on overall campus safety, see [<http://admin.utep.edu/emergency>].

**POLICY ON MAKE-UP QUIZZES AND EXAMINATIONS:** NO make-up quizzes or exams will be given for reasons other than illness (doctor's note required) or when a student is on official University business (documentation required). Make-ups must be scheduled within a week of when the quiz or test was given.

**POLICY ON ACADEMIC INTEGRITY:** Academic dishonesty is prohibited and is considered a violation of

the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another person's as one's own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated.

While you will be working in lab teams, the work you submit for assessment must be evaluated on its own merit. Therefore, team members' reports and work should reflect the individual's thoughts. Do NOT turn in 3 near-duplicate reports with different names or everyone involved will be sent to the Dean of Students for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions. Yes, we have had to deal with this problem in the past and we are not lenient. You can calculate the consequences. All university guidelines will be strictly followed. Please read these guidelines carefully. The guidelines can be found on line at:

<http://admin.utep.edu/Default.aspx?PageContentID=2084&tabid=30292>

**POLICY ON DISRUPTIVE BEHAVIOR:** Any student who disrupts the class will be asked to leave and will be referred to the Dean of Students.

**DISABILITY STATEMENT:** If a student has or suspects he/she has a disability and needs an accommodation, he/she should contact the Center for Accommodation and Support Services (CASS) at 747-5148 or at [cass@utep.edu](mailto:cass@utep.edu) or go to Room 106 Union East Building. The student is responsible for presenting to the instructor any CASS accommodation letters and instructions.

**MILITARY STATEMENT:** If you are a military student with the potential of being called into military service and/or training during the course of the semester you are encouraged to contact the instructor regarding these matters. You must let us know during the first week of the summer.

**Note:** This syllabus is tentative and may be changed as necessary at the discretion of the instructors.

### SCHEDULE - Fall 2019

| Week of      | Topic  | Required reading                 | Instructor |
|--------------|--|----------------------------------|------------|
| Aug 26       | Introduction to Bioinformatics/Molecular Evolution<br>Molecular Cell Biology | Chap 1, papers<br>Chap 2, papers | Roy/Walsh  |
| Sept 2       | No class on 9/2; Pairwise Alignment, Dot plot                                | Chap 3, 6 to pg 258              | Roy        |
| Sept 9       | Python Programming 101   | Handout                          | Roy        |
| Sept 16      | Pairwise Alignment /Multiple Sequence Alignment                              | Chap 4, 5; papers                | Roy        |
| Sept 23      | Multiple Sequence Alignment  | Chapter 5                        | Roy        |
| Sept 30      | FASTA/BLAST Searching/Database Assignment                                    | Mount Ch 6                       | Roy        |
| Oct 7        | <b>EXAM 1</b> Lecture and Lab/ Introduction to Phylogenetics                 | Mount Ch 7                       | Walsh      |
| Oct 14       | Introduction to Phylogenetics  | Mount Ch 7; papers               | Walsh      |
| Oct 21       | Distance and Parsimony   | Mount Ch 7; papers               | Walsh      |
| Oct 28       | Prediction of RNA Secondary Structure  | Mount Ch 8; papers               | Roy        |
| <b>Nov 1</b> | <b>Drop Deadline</b>   |                                  |            |
| Nov 4        | Maximum Likelihood   | Mount Ch7                        | Walsh      |
| Nov 11       | Bayesian analysis/Next Gen Sequencing  | Mount Ch7                        | Walsh/Mohl |
| Nov 18       | Bayes con't  | Mount Ch7                        | Walsh      |
| Nov 25       | Comparison of Methods  | Papers                           | Walsh      |
| Dec 2        | Supertrees   |                                  |            |
| <b>Dec 9</b> | <b>FINAL EXAM – Comprehensive 4:00-6:50 pm</b>                               |                                  |            |