BCB 5200 Introduction to BIOINFORMATICS I

Instructors:

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Class Meeting Time/Location:
> Time: MWF 2:10-3:00pm
> Location: 117 Ritter Hall

Credits/Pre-requisites:
> 3 Credits
> Undergraduate course in Genetics are required.

Course Description:
> Introduction to Bioinformatics I and II are designed to introduce senior/graduate students to the fundamental concepts, methods, and research topics in Bioinformatics for analyzing biological and health data. Introduction to Bioinformatics I course will cover introduction of Bioinformatics, introduction of computer skills for Bioinformatics, Bioinformatics database, sequence alignment, phylogenetic analysis, gene expression analysis, protein analysis, modeling and simulation of biological pathways, and systems biology. Introduction to Bioinformatics II will intensely cover omics (genomics, transcriptomics, and metagenomics) research topics especially including genome assembly, RNA-Seq analysis, and genome identification and annotation of metagenomic samples. In the Introduction to Bioinformatics II course, students will be divided into groups and work on their selected projects. Exciting cutting-edge research topics in Bioinformatics will be proposed to students.

Learning Objectives:
> After successfully complete this course, students are expected:
> 1) Know fundamental concepts of bioinformatics
> 2) Understand underlying basic bioinformatics algorithms
> 3) Use bioinformatics applications and tools to study omics data
> 4) Recognize how to apply different bioinformatics tools
> 5) Write scripts to automate existing applications
> 6) Understand cutting edge bioinformatics research topics
> 7) Ability to propose new algorithms and implement software tools for them

Course Textbook/Reading Materials (optional):

No textbook is required for this course. Assigned materials will be posted on class website. Optional reference books are as below:

- R Cookbook by Paul Teetor (O'Reilly Cookbooks)
- Bioinformatics Programming Using Python: Practical Programming for Biological Data (O'Reilly)
- Bioinformatics Data Skills: Reproducible and Robust Research with Open Source Tools 1st Edition by Vince Buffalo (O'Reilly)
- An Introduction to Bioinformatics Algorithms (Computational Molecular Biology) 1st Edition by Neil C. Jones (Cambridge, Mass. : MIT Press, c2004)
- Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology 1st Edition by Dan Gusfield (Univ. of Cambridge)
- Bioinformatics and Functional Genomics 2nd or 3rd Edition by Jonathan Pevsner (Hoboken, N.J. : Wiley-Blackwell, c2009)

Topical Outline:

Introduction of computer skills for Bioinformatics
Bioinformatics database
Sequence alignment
Phylogenetic analysis
Gene expression analysis
Protein analysis
Modeling and simulation of biological pathways and systems biology

Assignment and Grades:

Assignments: There will be ~7 assignments in a variety of format such as (but not exclusively) in-class assignments, online assignments, and take home assignments. If you miss an assignment of any kind (in class or online), there is NO make-up**.** You will not receive any credit for assignments turned in late. If you receive a 0 for an assignment due to an academic integrity violation, that 0 will count toward your final grade and may not be dropped.

Exams: There will be two exams (Midterm and Final). Each exam will cover all material (lecture and discussion). Final exam covers contents learned throughout the semester. The exams will be composed of questions in a variety of formats such as listing terms or concepts, multiple choice, short answers and essay formats. *Attendance to all exams is mandatory.* If you must miss an exam you must contact the instructor and submit a written request for a makeup exam prior to the exam. Your written request should include detailed information about the conflict and provide documentation of the conflict and any relevant contact information. Legitimate conflicts and excuses are limited to <u>death or near-death instances in the immediate family, a student's illness that requires immediate doctor's care, a University sponsored event (not club sports) and regularly scheduled religious obligations</u>. Excuses that will NOT be considered include personal travel arrangements, non-University sponsored events, a conflicting appointment, a previous illness that interfered with your study time or an illness that does not prevent you from coming to the exam. Unexcused exam absences will be counted as zero in the calculation of your final grade.

Grading Scheme

Course Item Percent of Final Grade	Percent of Final Grade
Homework Assignments	50%
Midterm Exam	20%
Final Exam	25%
Attendance	5%
Total	100%

Final grades for the course will be based on the following scale. The instructor reserve the right to make adjustments to grades based on overall performance in the course. There will be <u>no</u> opportunity for "extra credit" to improve grades that have already been earned. Bargaining for grades will not be tolerated.

Letter Grade	F	D	C-	C	C+	B-	B	B+	A-	A
%	<60	≥60 <70	≥70 <73	≥73 <77	≥77 <80	≥80- <83	≥83 <87	≥87 <90	≥90 <93	≥93

Attendance policy:

You are expected to attend every lecture and take notes. There is no makeup for exams unless you demonstrate in advance (and agreed by the instructor) that a significant life-event prevents you from attending class or if you have a documented emergency. If you schedule something else during a class when you take an exam, you will get a zero for that grade.

ACADEMIC INTEGRITY AND HONESTY

Students are expected to be honest in their academic work. The University reserves the right to penalize any student whose academic conduct at any time is, in its judgment, detrimental to the University. Such conduct shall include cases of plagiarism, collusion, cheating, giving or receiving or offering or soliciting information in examinations, or the use of previously prepared material in examinations or quizzes. Violations should be reported to your course instructor, who will investigate and adjudicate them according to the policy on academic honesty of the College of Arts and Sciences. If the charges are found to be true, the student may be liable for academic or disciplinary probation, suspension, or expulsion by the University. Students should review the College of Arts and Sciences policy on Academic Honesty (http://www.slu.edu/x16363.xml).

STUDENTS WITH SPECIAL NEEDS-DISABILITY SERVICES

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

• Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.

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- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Student Success Center (BSC 331) or by going to www.slu.edu/success. Students who believe that, due to a disability, they could benefit from academic accommodations are encouraged to contact Disability Services at 314-977-8885 or visit the Student Success Center. Confidentiality will be observed in all inquiries.

Course instructors support student accommodation requests when an approved letter from Disability Services has been received and when students discuss these accommodations with the instructor after receipt of the approved letter.
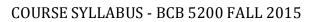
COURSE CONTENT DISCLAIMER

In this course, students may be required to read text or view materials that they may consider offensive. The ideas expressed in any given text do not necessarily reflect the views of the instructor, the English Department, the Writing Program, or Saint Louis University. Course materials are selected for their historical and/or cultural relevance, or as an example of stylistic and/or rhetorical strategies and techniques. They are meant to be examined in the context of intellectual inquiry of the sort encountered at the university level.

WRITING CENTER

I encourage you to take advantage of the writing services in the Student Success Center; getting feedback benefits writers at all skill levels. Trained writing consultants can help with any writing, multimedia project, or oral presentation. During the one-on-one consultations, you can work on everything from brainstorming and developing ideas to crafting strong sentences and documenting sources. These services do fill up, so please make an appointment! For more information, or to make, change, or cancel an appointment, call 977-3484 or visit http://www.slu.edu/writingservices.xml.

Tentative schedules

Week	Dates	Topic	Lecturer
1	08/24/2015	Welcome	Lin &Ahn
	08/26/2015	Introduction to Bioinformatics	Lin
	08/28/2015	Introduction of computer skills for Bioinformatics	Ahn
2	08/31/2015	Introduction of computer skills for Bioinformatics (Linux)	Ahn
	09/02/2015	Introduction of computer skills for Bioinformatics (R)	Ahn
	09/04/2015	Introduction of computer skills for Bioinformatics (R)	Ahn
3	09/07/2015	No Class (Labor day)	
	09/09/2015	Introduction of computer skills for Bioinformatics (Python)	Ahn
	09/11/2015	Introduction of computer skills for Bioinformatics (Python) [HW1]	Ahn
4	09/14/2015	Mutation and Genetic Variation	Lin
	09/16/2015	Sequence alignment I	Lin
	09/18/2015	Sequence alignment II	Lin
5	09/21/2015	Sequence alignment (Lab)	Lin
	09/23/2015	Database and BLAST search I	Lin
	09/25/2015	Database and BLAST search II	Lin
6	09/28/2015	Nucleotide Substitution, Rates and Patterns [HW2]	Lin
	09/30/2015	Phylogenetic analysis I	Lin
	10/02/2015	Phylogenetic analysis II	Lin
7	10/05/2015	Phylogenetic analysis III	Lin
	10/07/2015	Phylogenetic analysis (Lab-I)	Lin
	10/09/2015	Phylogenetic analysis (Lab-II) [HW3]	Lin
8	10/12/2015	Review Session	Lin & Ahn
	10/14/2015		
	10/16/2015	Fall Midterm Exam (10/16/2015)	
9	10/19/2015	Fall Break	
	10/21/2015	Gene regulation	Lin
	10/23/2015	Gene expression analysis I	Lin
10	10/26/2015	Gene expression analysis II	Lin
	10/28/2015	Gene expression analysis (Lab-I)	Lin
	10/30/2015	Gene expression analysis (Lab-II) [HW4]	Lin
11	11/02/2015	Protein analysis I	Ahn
	11/04/2015	Protein analysis II	Ahn
	11/06/2015	Protein analysis III	Ahn
12	11/09/2015	Protein analysis (Lab) [HW5]	Ahn
	11/11/2015	Modeling and simulation of biological systems I	Ahn
	11/13/2015	Modeling and simulation of biological systems II	Ahn

13	11/16/2015	Modeling and simulation of biological systems III	Ahn
	11/18/2015	Modeling and simulation of biological pathways IV	Ahn
	11/20/2015	Modeling and simulation biological pathways (Lab-I)	Ahn
14	11/23/2015	Modeling and simulation biological pathways (Lab-II) [HW6]	Ahn
	11/25/2015	Thanksgiving Break	
	11/27/2015	Thanksgiving Break	
15	11/30/2015	Systems biology I	Ahn
	12/02/2015	Systems biology II	Ahn
	12/04/2015	Systems biology (Lab) [HW7]	Ahn
16	12/07/2015	Review (Fall Classes End)	Lin &Ahn
	12/09/2015		
	12/11/2015		
17	12/14/2015	Fall Final Exam (12/14/2015)	