



BIFS 619 9040 SYSTEMS LEVEL APPROACHES IN BIOINFORMATICS (2182) BIFS-619

Spring 2018 Section 9040 3 Credits 01/29/2018 to 04/22/2018

Faculty Contact

Manonmani Kumar manonmani.kumar@faculty.umuc.edu

Course Description

Prerequisite: BIFS 617. A study of the bioinformatic techniques used in "omics" (genomics, proteomics, etc.) experiments. Focus is on analyzing experiment protocols, comparing the tools used for these experiments, and interpreting the data resulting from the experiments.

Course Introduction

This course provides a basis for understanding all current, most used, '-omics' techniques. Exercises provide a basis for interpreting '-omics' data and practicing the analysis of this type of data.

The last date to withdraw can be found online at: <http://www.umuc.edu/students/calendar/graduate.cf>
(<http://www.umuc.edu/students/calendar/graduate.cfm>)

Course Outcomes

At the end of this course, students should be able to:

1. Synthesize general information about the information transfer apparatuses to recognize their effects on various cellular pathways.
2. Examine the roles mutations play on nucleic acids to illustrate their evolutionary effects.
3. Compare and contrast the techniques for determining protein-DNA interactions to determine the strengths and weaknesses of each.
4. Evaluate the different techniques used in each type of '-omics' experiment to determine the strengths and pitfalls of each.
5. Compare methods for synthesizing '-omics' experimental data sets (big data) to determine how models of cellular processes can be generated.

Course Materials

Click to access your course materials
information (<http://webapps.umuc.edu/grcmBook/BPage.cfm?C=BIFS%20619&S=9040&Sem=2182>)

⚙️ Class Guidelines

Any required text material not listed in the Course Schedule will be provided in the classroom.

Class Governance

Two important UMUC policies guide all interactions in this class:

- Policy 151.00 - Code of Student Conduct (<http://www.umuc.edu/policies/studentpolicies/stud15100.cfm>)- sets the expectation that interactions in this class will be collegial, scholarly, and respectful; providing all members of the learning community with a safe place to study and interact.
- Policy 150.25 - Academic Dishonesty and Plagiarism (<https://www.umuc.edu/policies/academicpolicies/aa15025.cfm>) - reinforces the importance of demonstrating academic integrity in class work so that each student has a fair and equal opportunity to succeed.

✓ Grading Information

Grading Criteria

Assignment Title	Gradebook Assignment Type	Individual or Team	Frequency of Assignment	Grading Scale	Percentage of Total Grade	Outcome(s) Addressed by Assignment
Class Participation	Discussions	Individual	10	100%	20%	#1, 2, 3, 4, 5
Assignments	Assignments	Individual	3	100%	20%	#1, 3, 4, 5
Mid-term Exam	Midterm Exam	Individual	1	100%	10%	#1, 2, 3, 4
Group Project	Paper	Team	1	100%	30%	#1, 2, 3, 4, 5
Final Exam	Final Exam	Individual	1	100%	20%	#1, 2, 3, 4, 5
Total					100%	

Course Specific Grading Policies

Original Work

All work must be original for this course. Reusing your own work without the permission of the professor will result in a zero for the assignment.

Submitting work

- Exams, research paper, and group project must be submitted as MS Word or .pdf documents.
- Filenames for submitted documents should be labeled as follows: last name_first name_assignment type.docx or .pdf.

Late Work/Extra Credit

- All submission deadlines are 11:59:59 pm U.S. Eastern time.
- Ten percent (10%) of your final score for the assignment will be deducted for each day an assignment is late.
- It is understandable that life happens and situations may arise where it will be difficult/impossible to turn assignments in on time. In these cases, it is the student's responsibility to contact the instructor as soon as he/she is aware of the conflict to resolve the issue. Instructors may grant limited extensions of time for unexpected business, health or personal emergencies beyond the student's control. In order to be granted such an extension, the student must make the request in advance of the due date and support the request by a compelling rationale that would be fair to others in the class.
- There will be NO extra credit assignments given for this class.

Project Descriptions

Class Participation

Twenty percent (20%) of the student's final grade will be given for timely participation in discussions. Students are expected to contribute to the discussions posted, including responding to their fellow classmates' posts, developing rapport and making contributions beyond single postings on each discussion topic. A 'B' grade would correspond to approximately three substantial postings (one main and two responses) per subject per week. Supporting documentation is not essential in students' posts but is suggested.

Assignments

Twenty percent (20%) of the student's final grade will come from three assignments. Each will consist of an exercise parsing '-omics' data. Each assignment will be a little different; however, your instructor will provide clear instructions on how to complete the assignment. Due dates for each are listed in the course schedule below.

Group Project

Thirty percent (30%) of the student's final grade will come from this group project. This project is designed to bolster students' skills in working in teams to solve bioinformatics problems. Specifically, each group will first select a topic on the parsing of data either proposed by the instructor or their own, which **must** first be approved by the instructor. The group will then complete the project, which will usually contain a component of coding (script writing) to automate the parsing of data. The group will then write a short description (about 5 pages) of their project and include step-by-step instructions on how to run their script. The instructor suggested topics will appear in the classroom in Week 4. This assignment is due at the end of week 11.

Finally, the written portion of the group project will need to be submitted to Turnitin. Students unfamiliar with Turnitin can go to the following URL: <http://www.umuc.edu/library/libresources/turnitin.cfm#students> (<http://www.umuc.edu/library/libresources/turnitin.cfm#students>). The instructor will provide you with the Class ID and password needed to submit your paper.

Exams

Thirty percent (30%) of the student's final grade will come from two exams: one midterm (10%) and one final (20%). The instructor will provide full and detailed information about each of the tests. Generally, each test will consist of a number of short answer type questions. The midterm will be conducted during week six and the final will be conducted during week 12.

Academic Policies

Academic Policies and Guidelines

ACADEMIC INTEGRITY

As a member of the University of Maryland University College (UMUC) academic community that honors integrity and respect for others you are expected to maintain a high level of personal integrity in your academic work at all times. Your work should be original and must not be reused in other courses.

CLASSROOM CIVILITY

Students are expected to work together cooperatively, and treat fellow students and faculty with respect, showing professionalism and courtesy in all interactions. Please review the Code of Civility for more guidance on interacting in UMUC classrooms: <https://www.umuc.edu/students/support/studentlife/conduct/code.cfm> (<https://www.umuc.edu/students/support/studentlife/conduct/code.cfm>).

POLICIES AND PROCEDURES

UMUC is committed to ensuring that all individuals are treated equally according to Policy 040.30 Affirmative Action, Equal Opportunity, and Sexual Harassment (<https://www.umuc.edu/policies/adminpolicies/admin04030.cfm>).

Students with disabilities who need accommodations in a course are encouraged to contact the Office of Accessibility Services (OAS) at accessibilityservices@umuc.edu (<mailto:accessibilityservices@umuc.edu>), or call 800-888-UMUC (8682) or 240-684-2287.

The following academic policies and procedures apply to this course and your studies at UMUC.

150.25	<p>Academic Dishonesty and Plagiarism (https://www.umuc.edu/policies/academicpolicies/aa15025.cfm) – UMUC defines academic dishonesty as the failure to maintain academic integrity. All charges of academic dishonesty will be brought in accordance with this Policy.</p> <p>Note: Your instructor may use Turnitin.com, an educational tool that helps identify and prevent plagiarism from Internet resources, by requiring you to submit assignments electronically. To learn more about the tool and options regarding the storage of your assignment in the Turnitin database go to: https://www.umuc.edu/library/libresources/turnitin.cfm (https://www.umuc.edu/library/libresources/turnitin.cfm).</p>
151.00	<p>Code of Student Conduct (https://www.umuc.edu/policies/studentpolicies/stud15100.cfm)</p>

170.40	The following policies describe the requirements for the award of each degree:
170.41	Degree Completion Requirements for the Graduate
170.42	School (https://www.umuc.edu/policies/academicpolicies/aa17040.cfm) Degree Completion Requirements for a Bachelor's Degree (https://www.umuc.edu/policies/academicpolicies/aa17041.cfm) Degree Completion Requirements for an Associate's Degree (https://www.umuc.edu/policies/academicpolicies/aa17042.cfm)
170.71	Policy on Grade of Incomplete (https://www.umuc.edu/policies/academicpolicies/aa17071.cfm) - The mark of I is exceptional and considered only for certain courses. Students who have completed 60% of their coursework with a grade of B or better for graduate courses or C or better for undergraduate courses and request an I before the end of the term. The mark of I is not available for noncredit courses.
170.72	Course Withdrawal Policy (https://www.umuc.edu/policies/academicpolicies/aa17072.cfm) - Students must follow drop and withdrawal procedures and deadlines available at https://www.umuc.edu/ (https://www.umuc.edu/) under Academic Calendar.
130.80	Procedures for Review of Alleged Arbitrary and Capricious Grading (https://www.umuc.edu/policies/academicpolicies/aa13080.cfm) – appeals may be made on final course grades as described herein.
205.06	Calculation Of Grade-Point Average (GPA) for Inclusion on Transcripts and Transcript Requests (https://www.umuc.edu/policies/academicpolicies/aa20506.cfm) – Note: Undergraduate and Graduate Schools have different Grading Policies (i.e. The Graduate School does not award the grade of D). See Course Syllabus for Grading Policies.

GRADING

According to UMUC's grading policy, the following marks are used:

	Undergraduate	Graduate
A	90-100	90-100
B	80-89	80-89
C	70-79	70-79*
D	60-69	N/A**
F	59 or below	69 or below
FN	Failure-Non attendance	Failure-Non attendance
G	Grade Pending	Grade Pending
P	Passing	Passing
S	Satisfactory	Satisfactory

U	Unsatisfactory	Unsatisfactory
I	Incomplete	Incomplete
AU	Audit	Audit
W	Withdrew	Withdrew

* The grade of "B" represents the benchmark for The Graduate School. Students must maintain a Grade Point Average (GPA) of 3.0 or higher. Classes where final grade of C or F places a student on Academic Probation must be repeated.

** The Graduate School does not award the grade of D.

COURSE EVALUATION SURVEY

UMUC values its students' feedback. You will be asked to complete an online evaluation toward the end of the term. The primary purpose of this evaluation process is to assess the effectiveness of classroom instruction in order to provide the best learning experience possible and make continuous improvements to every class. Responses are kept confidential. Please take full advantage of this opportunity to provide your feedback.

LIBRARY SUPPORT

Extensive library resources and services are available online, 24 hours a day, seven days a week at <https://www.umuc.edu/library/index.cfm> (<https://www.umuc.edu/library/index.cfm>) to support you in your studies. The UMUC Library provides research assistance in creating search strategies, selecting relevant databases, and evaluating and citing resources in a variety of formats via its Ask a Librarian service at <https://www.umuc.edu/library/libask/index.cfm> (<https://www.umuc.edu/library/libask/index.cfm>).

EXTERNAL LINK DISCLAIMER

This course may contain links to external sites neither owned nor maintained by UMUC. UMUC bears no responsibility for the accuracy, legality, or content of external sites or for that of subsequent links. In addition, the terms of use, security policies, and privacy policies may differ from those of UMUC. Contact the external site for answers to questions regarding its content, terms of use, and policies.

LEARNING MANAGEMENT SYSTEM SUPPORT

To successfully navigate the online classroom new students are encouraged to view the Classroom Walkthrough under Help in the upper right menu of the LEO classroom. Those requiring technical assistance can access Help@UMUC Support directly in LEO under the Help menu. Additional technical support is available 24 hours a day, seven days a week via self-help and live chat at <https://www.umuc.edu/help> (<https://www.umuc.edu/help>) or by phone toll-free at 888-360-UMUC (8682).

SYLLABUS CHANGES

All items on this syllabus are subject to change at the discretion of the Instructor and the Office of Academic Affairs.

Class & Assignment Schedule

Week	Topic	Readings	Assignment
------	-------	----------	------------

1	<ul style="list-style-type: none"> • Mechanism/Regulation of Replication • Mechanism/Regulation of Transcription 	<ul style="list-style-type: none"> • BIFS_619_Week1.pdf • BIFS_619_Week1b.pdf 	<ul style="list-style-type: none"> • Participate in Week 1 Discussions
2	<ul style="list-style-type: none"> • Mechanism/Regulation of Translation • Folding and Secretion/translocation 	<ul style="list-style-type: none"> • BIFS_619_Week2.pdf 	<ul style="list-style-type: none"> • Participate in Week 2 Discussions
3	<ul style="list-style-type: none"> • Types of mutations • Repair of mutations • Movement of DNA from cell to cell 	<ul style="list-style-type: none"> • BIFS_619_Week3.pdf 	<ul style="list-style-type: none"> • Participate in Week 3 Discussions
4	<ul style="list-style-type: none"> • Sanger Sequencing • Modern Sequencing • DNA Microarrays • Group Project Topics Listed 	<ul style="list-style-type: none"> • BIFS_619_Week4.pdf • NextGen_Seq_Platforms.pdf 	<ul style="list-style-type: none"> • Participate in Week 4 Discussions
5	<ul style="list-style-type: none"> • Two dimensional gels • Mass Spectrometry 	<ul style="list-style-type: none"> • BIFS_619_Week5.pdf • MS_Based_Proteomics.pdf 	<ul style="list-style-type: none"> • Participate in Week 5 Discussions • Assignment #1 Due
6			<ul style="list-style-type: none"> • Mid-Term Exam
7	<ul style="list-style-type: none"> • EMSA • ChIP and ChIP-chip • One-hybrid 	<ul style="list-style-type: none"> • DNA_Protein_interactions.pdf 	<ul style="list-style-type: none"> • Participate in Week 7 Discussions
8	<ul style="list-style-type: none"> • Whole genome alignments • Pan and core genomes • Metagenomics 	<ul style="list-style-type: none"> • BIFS_619_Week8.pdf 	<ul style="list-style-type: none"> • Participate in Week 8 Discussions • Assignment #2 Due
9	<ul style="list-style-type: none"> • Structure of lipids • Lipid extraction and detection 	<ul style="list-style-type: none"> • MS_for_Lipidomics.pdf 	<ul style="list-style-type: none"> • Participate in Week 9 Discussions
10	<ul style="list-style-type: none"> • Primary and secondary metabolites • Detection methods • Functional genomics 	<ul style="list-style-type: none"> • Human_Metabolome_3.pdf • Metabolomics_CSF.pdf 	<ul style="list-style-type: none"> • Participate in Week 10 Discussions • Assignment #3 Due
11	<ul style="list-style-type: none"> • Systems biology • Network biology 	<ul style="list-style-type: none"> • Advances in Sys_Bio_Autoimmune.pdf • Network_Biology.pdf • Stystem_Genetics.pdf 	<ul style="list-style-type: none"> • Participate in Week 11 Discussions

12

• Final Exam