



**BSC6939:**  
**Genome Data Analysis**  
92241, Section 006, 1 Credit Hour  
CAS / CMMB

## **COURSE SYLLABUS**

Last Updated: 8/15/2024

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Instructor Name:	Xiaoqing Yu, Ph.D.	Semester/Term & Year:	Fall 2024
Office Number:	MRC (2nd Fl)	Class Meeting Days:	Wednesdays
Phone Number:	813-745-8381	Class Meeting Time:	3:00 pm – 3:50 pm
E-Mail:	<a href="mailto:Xiaoqing.yu@moffitt.org">Xiaoqing.yu@moffitt.org</a>	Class Meeting Location:	Virtual for FA24
Website:	N/A	Lab Meeting Location:	N/A
Office Hours:	Email for Appointment	Delivery Method:	

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### **I. Welcome!**

### **II. University Course Description**

Bioinformatics analysis techniques, including derivation of analytical variables from raw signal, descriptive methods and hypothesis testing in large dimensional studies will be presented. The basic concepts, issues and applications of these analysis techniques will be introduced. Examples using website tools and R will be used.

### **III. Course Purpose**

The goal of this class is to introduce the basic bioinformatics concepts and methods in genomic analysis for cancer research.

### **IV. Course Objectives**

Technologies to probe genomes and their products have exploded in the past decade. Bioinformatics and computational biology play a role in cancer research and familiarity with concepts in these areas becomes important for hypothesis generation, target validation and discovery. This course provides an overview of genomic data analysis, specifically analytical techniques involving DNA and gene sequences, gene mutations, gene expression and protein measurements. The lectures provide an overview of the topics and introduce key issues in experimental design and analytical strategies for these molecular types. This lecture series is intended for individuals with limited exposure to specific areas of bioinformatics.

## V. Student Learning Outcomes

Every week there will be a homework assignment (3 question quiz) for each lecture, and this will be considered a test that engages if the student understood the material. Pass: A Score of 66 or higher (2 out of 3). The class certification will be given to students who successfully pass 9 or more homework assignments/quizzes.

## VI. Required Texts and/or Readings and Course Materials

- N/A

## VII. Basis for Final Grade

Students who successfully achieve a score of 66 or higher (2/3 questions correctly answered) in 9 or more homework assignments/quizzes will receive a passing grade for the course.

## VIII. Grade Dissemination

Students can view their homework assignment/quiz scores online ([bio2.moffitt.org](http://bio2.moffitt.org)) or contact the course administrator for their current grade during the course ([bio2admin@moffitt.org](mailto:bio2admin@moffitt.org)). Final grades will be emailed to the students at the completion of the course.

## IX. Course Policies: Grades

**Late Work Policy:** Quiz/homework will be available electronically from the start of the week's lecture for exactly one week (2:59PM of the following week). No late work will be accepted. Students should contact the Course Director in the case of illness or other circumstances beyond their control.

**Extra Credit Policy:** N/A

**Grades of "Incomplete":** An Incomplete grade ("I") is exceptional and granted at the instructor's discretion only when students are unable to complete course requirements due to illness or other circumstances beyond their control. The course instructor and student must complete and sign the "I" Grade Contract Form that describes the work to be completed, the date it is due, and the grade the student would earn factoring in a zero for all incomplete assignments. The due date can be negotiated and extended by student/instructor as long as it does not exceed two semesters for undergraduate courses and one semester for graduate courses from the original date grades were due for that course. An "I" grade not cleared within the two semesters for undergraduate courses and one semester for graduate courses (including summer semester) will revert to the grade noted on the contract.

**Rewrite Policy:** N/A

**Essay Commentary Policy:** Commentary on exam papers will be delivered in written format subsequent to grading.

**Group Work Policy:** N/A

**Final Examinations Policy:** All final exams are to be scheduled in accordance with the University's final examination policy.

**X. Course Policies: Technology and Media**

**Email:** E-mail will be used a method of communication from the Course Director and Coordinator to the students regarding the dissemination of information pertaining to the course. Students can also contact the Director and or Coordinator via this method. Response times will be within a 24-hour period, Monday to Friday.

**Canvas:** Final pass/fail grades will be available within Canvas. Lecture material and quizzes will be available at the [bio2.moffitt.org](http://bio2.moffitt.org) site.

**Online Proctoring:** N/A

**Panopto:** N/A

**Laptop Usage:** Laptop computer and tablet use are permitted for note taking during the classes.

**Classroom Devices:** Use of technology for audio recording is permitted provided; 1) the student has the consent of each instructor and their classmates and; 2) that the recording is expressly for their personal use only and will not be disseminated to other students or uploaded to any platform that would allow other persons to hear the recording. Visual recording or photography is not permitted.

**Phone Usage:** Phone usage is strictly forbidden during class with the exception of use for audio recording as stated above.

**Classroom Response Clickers:** N/A

**Course Blog:** N/A

**Course Wiki:** N/A

**XI. Course Policies: Policies about disability access, religious observances, academic grievances, academic misconduct, and several other topics are governed by a central set of policies that apply to all classes at USF. These may be accessed at:**  
<https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx>

**Attendance Policy:** All students have a right to expect that the University will reasonably accommodate their religious observances, practices and beliefs. If you observe religious holidays, you should plan your allowed absences to include those dates.

**Professionalism Policy:** Per university policy and classroom etiquette; mobile phones, iPods, etc. **must be silenced** during all classroom and lab lectures. Those not heeding this rule will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time for all class meetings. Students who habitually disturb the class by talking, arriving late, etc., and have been warned may suffer a reduction in their final class grade.

**End of Semester Student Evaluations:** This course will make use of an evaluation for students to provide feedback to the instructor, program and University regarding the course. These surveys will be made available at intervals during the semester. Your participation is highly encouraged and valued.

**Campus Emergencies:** In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Canvas, Elluminate, Skype, and email messaging and/or an alternate schedule. It's the responsibility of the student to monitor the Canvas site for each class for course specific communication, and the main USF, college, and department websites, emails, and MoBull messages for important general information.

## **XII. Important Dates to Remember**

All the dates and assignments are tentative, and can be changed at the discretion of the professor.

First Day of Class:	August 28
Drop/Add Deadline:	August 30
Labor Day Holiday	September 2
Withdrawal Deadline:	November 2
Veteran's Day Holiday:	November 11
Thanksgiving Holiday:	November 28-29

**Religious Observances:** All students have a right to expect that the University will reasonably accommodate their religious observances, practices and beliefs. If you observe religious holidays, you should plan your allowed absences to include those dates.

## **XIII. Course Schedule**

Day/Date	Instructor	Contents	Goals
<b>Lecture #1</b> August 28	Steven Eschrich, Ph.D. Julie Dutil, Ph.D.	Introduction and Overview to Bioinformatics Genetic Ancestry	- Overview - Discussion of bioinformatics collaborative resources - Basic bioinformatics techniques - ADMIXTURE, PCA, tSNE
<b>Lecture #2</b> September 4	Jamie Teer, Ph.D.	Next Generation Sequencing	- Next-gen overview - Alignments - Capture approaches - Interpreting mutations in the context of cancer
<b>Lecture #3</b> September 11	Anders Berglund, Ph.D.	DNA Methylation	-Methylation Arrays -Visualization -Gene expression regulation
<b>Lecture #4</b> September 18	Mingxiang Teng, Ph.D.	Expanded sequencing approaches: ChipSeq	- Quality control - Peak calling - Super enhancers & Differential peak calling
<b>Lecture #5</b> September 25	Ling Cen, Ph.D.	RNASeq	- Overview of the workflow - Experimental design - Data analytics - Advanced applications
<b>Lecture # 6</b> October 2	Sophia Song, Ph.D.	Single-Cell Sequencing	- Description of technology - Analytical approaches - Experimental design
<b>Lecture # 7</b> October 9	Quincy Mo, Ph.D.	Multi-omics Integrative Analysis	- Multi-omics Integrative Analysis
<b>Lecture #8</b> October 16	Paul Stewart, Ph.D.	Proteomics & Metabolomics	- Introduction to mass spectrometry-based omics - Analysis techniques (Labeled vs. Label-free) - - Metabolomics
<b>Lecture #9</b> October 23	Anders Berglund, Ph.D.	Public Data Sources, Visualization	- GEO, ArrayExpress, TCGA, TCGA tools, cBioPortal, GTEx and PanCancer Analysis
<b>Lecture #10</b> November 6	Timothy Shaw, Ph.D.	Alternative Splicing	- Transcript-level RNASeq - Detecting alternate splicing - Outlier splicing analysis
<b>Lecture #11</b> November 13	Alex Soupir, Ph.D.	Spatial transcriptomics analysis	-Resolution vs transcriptome coverage. -Deconvolution and cell typing. -Spatial gene set enrichment. -Application of point pattern methods.
<b>Lecture #12</b> November 20	Xiaoqing Yu, PhD	Computational Immunology	- BCR/TCR sequencing - Neoantigen prediction

			- HLA typing
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*\* Note: The Schedule is subject to revision*

**XIV. Essay and Project Assignments**

Lab Exercises/Homework (Specific Times and Locations TBD)

- Quizzes will be available on the bio2.moffitt.org from the start of the week’s lecture for exactly one week (2:59PM of the following week).

**XV. Standard University Policies**

Policies about disability access, religious observances, academic grievances, academic integrity and misconduct, academic continuity, food insecurity, and sexual harassment are governed by a central set of policies that apply to all classes at USF. These may be accessed at: <https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx>

**XVI. Covid-19 Procedures**

All students must comply with university policies and posted signs regarding COVID-19 mitigation measures, including wearing face coverings and maintaining social distancing. Failure to do so may result in dismissal from class, referral to the Student Conduct Office, and possible removal from campus.

Additional details are available on the University’s Core Syllabus Policy Statements page: <https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx>

***\*\*The instructor reserves the right to change this syllabus at any time.***