

COURSE SYLLABUS

COURSE NAME:	Omics Experience: Quantitative Science Short Course
CLASS DATES:	May 27, 2020 – July 17, 2020
LOCATION:	Web-based modules; Zoom meeting Mock Tumor Boards (<i>link included below</i>)
CLASS HOURS:	Weeks 1-8: 1 hr/week online; Weeks 4-6: Tuesdays 3:00 pm – 4:00 pm

BACKGROUND	Quantitative sciences have become increasingly essential to cancer research. From designing clinical trials to analyzing complex molecular data, the need for quantitative thinking is an important skill for future scientists and clinicians. 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 the basic principles of biostatistics and genomic data analysis, including 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. In addition to the coursework, students will participate in a mock molecular tumor board. Participants will utilize their knowledge of public sequencing resources to evaluate hypothetical cancer patients with specific genomic alterations in their tumors. This course is designed for students with limited previous exposure to biostatistics and bioinformatics, but with a willingness to learn.
COURSE DESCRIPTION	Biostatistics techniques include descriptive statistics, hypothesis testing, and correlation. 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.
COURSE GOAL	The goal of this class is to introduce the basic statistical and bioinformatics concepts and methods for cancer research.
WHO WILL TAKE THIS COURSE?	PHSU and MCC/USF summer rotation students (Master's, PhD and Medical students)
COURSE PREREQUISITES	None
COURSE FORMAT	<p>Lectures (weeks 1-8): The course will consist of pre-recorded lectures and online questions to assess understanding of content. The lecture materials (recordings and slides) will be posted from the beginning of the course.</p> <p>Mock Molecular Tumor Boards (weeks 4-6): The practical portion of the course will consist of three mock molecular tumors boards which will meet once a week for 1 hour, in weeks 4-6. Each student will present a virtual case study and participate in other case study discussions.</p>
HOME WORK	<p>Lectures (weeks 1-8): After every lecture, there will be a quiz assignment (3 questions) that engages if the student understood the material. To pass a quiz, a score of 66 or higher is required.</p> <p>Mock Molecular Tumor Boards (weeks 4-6): Each student is expected to present one virtual case study (mock cancer patient with defined genomic tumor alterations), including prevalence, clinical significance and literature-supported treatment options.</p>

CLASS CERTIFICATION	The class certification will be given to students who successfully pass 6 or more quiz assignments and complete a presentation at a mock tumor board.		
COURSE LOCATIONS	Remote course attendance. Zoom link: https://moffitt.zoom.us/j/8137452682 Password: 448505		
OFFICE HOURS	Contact Instructor via email to arrange meeting. Drs. Dutil and Teer will hold virtual office hours during the 3 rd week (June 8-12) for questions regarding the mock molecular tumor board. Times will be posted.		
COURSE ORGANIZER	Steven Eschrich, PhD Senior Member Dept. of Biostatistics & Bioinformatics	COURSE ADMINISTRATIVE COORDINATOR	Yairi Rivera-Torgerson Program Coordinator PHSU-MCC Partnership yairi.rivera-torgerson@moffitt.org Tel: (813) 745-2682

FACULTY PROFILE

Name	Academic Rank	Primary Research Focus
Anders Berglund, Ph.D.	Assistant Member	Gene Expression, Methylation, Principal Components Analysis
Ling Cen, Ph.D.	Team Lead, Bioinformatics	RNASeq
Y. Ann Chen, Ph.D.	Associate Member	Multi-omics Integration, Single Cell Analysis
Julie Dutil, Ph.D.	Associate Professor	Bioinformatics, Ancestry Markers
Steven Eschrich, Ph.D.	Senior Member	Gene Expression, Proteomics
Paul Stewart, Ph.D.	Bioinformatics Staff Scientist	Proteomics, Metabolomics, Multi-omics Integration
Jamie Teer, Ph.D.	Associate Member	Massively Parallel Sequencing, DNA Sequencing
Xiaoqing Yu, Ph.D.	Assistant Member	RNASeq, Single-Cell Sequencing

COURSE SCHEDULE/DESCRIPTION

Day/Date	Instructor	Contents	Goals
Course Intro Week 1 May 27 – 2pm	Steven Eschrich, Ph.D.	Course Overview and Mock tumor board instructions	<ul style="list-style-type: none"> • Overview of course • Patients for mock tumor boards
Weekly Lectures			
Lecture #1 Week 1 May 25 – 29	Jamie Teer, Ph.D.	Next Generation Sequencing	<ul style="list-style-type: none"> • Next-gen overview • Alignments • Capture approaches • Interpreting mutations in the context of cancer
Lecture #2 Week 2 June 1 – 5	Online	Using cBioPortal	<ul style="list-style-type: none"> • https://www.cbioportal.org/tutorials#webinar-1 • https://www.cbioportal.org/tutorials#webinar-2
Lecture #3 Week 3 June 8 – 12	Anders Berglund, Ph.D.	Public Data Sources, Visualization and Methylation	<ul style="list-style-type: none"> • GEO, ArrayExpress, OncoPrint, TCGA, TCGA tools, UCSC Genome Browser
Lecture #4 Week 4 June 15 – 19	Y. Ann Chen, Ph.D.	Introduction	<ul style="list-style-type: none"> • Understand data types and variables • Descriptive statistics and graphical summaries • Understand the use of statistical distributions and assumptions
Lecture #5 Week 5 June 22 – 26	Steven Eschrich, Ph.D.	Introduction and Overview to Bioinformatics	<ul style="list-style-type: none"> • Overview • Discussion of bioinformatics collaborative resources • Emerging technologies
Lecture #6 Week 6 June 29 – July 3	Ling Cen, Ph.D.	RNASeq	<ul style="list-style-type: none"> • Two types of RNASeq • Modeling RNASeq • Finding gene fusions, variant calling
Lecture #7 Week 7 July 6 – 10	Xiaoqing Yu, Ph.D.	Single-Cell Sequencing	
Lecture #8 Week 8 July 13 – 17	Paul Stewart, Ph.D.	R/Bioconductor Primer	
Mock Tumor Boards			
Mock Tumor Board #1 Week 4 June 16	Steven Eschrich, Ph.D.	<ul style="list-style-type: none"> • Kenneth Cintrón • Jonathan Colón • Stephanie Colón 	
Mock Tumor Board #2 Week 5 June 23	Steven Eschrich, Ph.D.	<ul style="list-style-type: none"> • Cathy Garcia-Torres • Yomara Huertas • Caitlyn Johnson • Mónica Rodríguez 	
Mock Tumor Board #3 Week 6 June 30	Steven Eschrich, Ph.D.	<ul style="list-style-type: none"> • Roberto Rosado • Inevy Seguinot • Madelyn Zapata 	