COURSE SYLLABUS

COURSE NAME: **Genomics Experience: Quantitative Science Short Course**

CLASS DATES: **May 24, 2021 – July 16, 2021**

LOCATION: **Web-based modules; Zoom meeting Mock Tumor Boards (*link included below*)**

CLASS HOURS: **Weeks 1-8: 1 hr./week online; Weeks 4-7: 1.5 hrs./week Mock Tumor Boards (Zoom)**

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 concepts of genomics and its use in oncology and 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	**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. **Mock Molecular Tumor Boards (*weeks 4-7*):** The practical portion of the course will consist of three mock molecular tumors boards which will meet once a week for 1.5 hours, in weeks 4-7. Each student will present a virtual case study and participate in other case study discussions. **Note:** Cameras are required during these virtual sessions to encourage discussions.
HOMEWORK	**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 (2/3) or higher is required.** **Mock Molecular Tumor Boards (*weeks 4-7*):** 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.

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 LOCATION	PSHU-MCC Genomics Experience – 2021 Website link: http://bio2.moffitt.org/lms/course/view.php?id=31 Please follow registration instructions provided by Yairí Rivera-Torgerson.		
MOCK TUMOR BOARD LOCATION	Remote course attendance Zoom link: https://moffitt.zoom.us/j/8137452682 Password: 448505		
OFFICE HOURS	Drs. Dutil, Teer and Walko will hold virtual office hours during weeks 3 to 6 (June 7-July 2) for questions regarding the mock molecular tumor board. Times will be posted on course website.		
COURSE ORGANIZER	Steven Eschrich, PhD Senior Member Dept. of Biostatistics & Bioinformatics	**COURSE ADMINISTRATIVE COORDINATOR**	Yairí Rivera-Torgerson PHSU-MCC Partnership Program Coordinator yairi.rivera-torgerson@moffitt.org Tel: (813) 745-2682
COURSE FACILITATORS	Jamie Teer, PhD Julie Dutil, PhD Christine Walko, PharmD		

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
Julie Dutil, Ph.D.	Associate Professor	Bioinformatics, Ancestry Markers
Paul Stewart, Ph.D.	Senior Bioinformatics Staff Scientist	Proteomics, Metabolomics, Multi-omics Integration
Jamie Teer, Ph.D.	Associate Member	Massively Parallel Sequencing, DNA Sequencing

COURSE SCHEDULE/DESCRIPTION

Day/Date	Instructor	Contents	Goals
Course Intro Week 1 May 24 – 11:30 am	Steven Eschrich, Ph.D.	Course Overview and Mock tumor board instructions	• Overview of course • Patients for mock tumor boards
Weekly Lectures			
Lecture #1 Week 1 May 24 – 28		From the Human Genome Project to Precision Medicine	• https://videocast.nih.gov/watch=27871
Lecture #2 Week 2 May 31 – June 4	Online	Using cBioPortal	• https://www.cbioportal.org/tutorials#webinar-1 • https://www.cbioportal.org/tutorials#webinar-2
Lecture #3 Week 3 June 7 – 11	Jamie Teer, Ph.D.	Next Generation Sequencing	• Next-gen overview • Alignments • Capture approaches • Interpreting mutations in the context of cancer
Lecture #4 Week 4 June 14 – 18	Anders Berglund, Ph.D.	Public Data Sources, Visualization and Methylation	• GEO, ArrayExpress, TCGA, TCGA tools, cBioPortal, GTEx and PanCancer Analysis
Lecture #5 Week 5 June 21 – 25	Julie Dutil, Ph.D.	Genetic Ancestry	• ADMIXTURE, PCA, tSNE
Lecture #6 Week 6 June 28 – July 2	Ling Cen, Ph.D.	RNASeq	• Overview of the workflow • Experimental design • Data analytics • Advanced applications
Lecture #7 Week 7 July 5 – 9	Paul Stewart, Ph.D.	Proteomics & Metabolomics	• Introduction to mass spectrometry-based omics • Analysis techniques (Labeled vs. Label-free) • Metabolomics
Lecture #8 Week 8 July 12 – 16	Paul Stewart, Ph.D.	R/Bioconductor Primer	• Introduction to R • Working with a matrix • Simple plotting using ggplot
Mock Tumor Boards			
Mock Tumor Board #1 Week 4 – June 16	Steven Eschrich, Ph.D.	• Pamela Sandoval • Diane Rodríguez • Daniela Castelblanco	Lung cases
Mock Tumor Board #2 Week 5 – June 24	Jamie Teer, Ph.D.	• Carla Barrientos • Rosalie Mattiola • Stephanie Roberts	GI cases
Mock Tumor Board #3 Week 6 – June 30	Julie Dutil, Ph.D.	• Caren Abreu • Lucas Miller • Evan Adler	Breast cases
Mock Tumor Board #4 Week 7 – July 7	Christine Walko, PharmD	• Camila Luis • Natasha Mark • Camily Morales	Sarcoma/Pediatric cases