BIM216 Advanced Topics in Cellular Engineering

Open Seats:
CRN:34024
Units: 4
Description:
Advanced research strategies and technologies used in the study of cellular function in health and disease. Static and dynamic measurements of stress, strain, and molecular scale forces in blood and vascular cells, as well as genetic approaches to the study of inflammatory and other disease processes.
Prerequisites: BIM 214; or Consent of Instructor.
Course Drop Date: 10/22/2019 (20 Day Drop)

Lectures: TR 10:00 - 11:50 AM
GBSF 2206
Instructor: *Simon, Scott*
Instructor Email: *sisimon@ucdavis.edu*
BIM 216 Sec: 001 CRN:14025

Description:
A difficult transition for first and second year graduate student is to grasp how hypothesis driven research is conducted. A critical skill to learn is the process of forming a testable hypothesis and formulating a set of specific aims or experimental objectives to prove or disprove the same. This skill will be most important as you progress towards the qualifying examination and a thesis research project.

This course will introduce you to advanced research strategies and technologies used in conducting bioengineering research. It will train you how to effectively critique a scientific research publication (and present it in a Power Point format), form a hypothesis, and formulate an experimental approach complete with specific aims, methods, and research design. The content will focus on Cell and Molecular techniques and engineering principles. A number of modules will be covered such as microfluidic and lab-chip technology, stem cell engineering, and tissue regeneration, inflammatory disease mechanism. There will also be introduction to static and dynamic measurements of stress, strain, and molecular scale forces, as well as genetic approaches to the study of disease.

Grading:

Assignments	Value
7 Critiques-	**50%**
1 verbal presentation-	**10%**
1 Final PowerPoint presentation-	**10%**
1 Final NIH proposal-	**30%**

BIM216 Fall 2019 Professor Scott I Simon Office: GBSF-3313, x20299
Tu-Th GBSF Room-2206 10:00-11:50 AM

Week	Topic	Reading List	Homework
1.1 Tu Sept 24	**Inflammation/Infection** Didactic lecture	Review **2 papers- Critique 1**	**Critique #1 due Oct 4**
1.2 Th Sept 26	**Lab chip devices** Theory/Experiment/Hypotheses Review NIH abstracts in class	**Sanders NIH review outline**	
2.1 Tu Oct 1	**Molecular dynamics of Cell Adhesion** Theory/Experiment/Hypoth	**See reading list**	**Critique #2 R21 due Oct 11**
2.2 Th Oct 3	**Cardiovascular Disease** Didactic lecture	**R21 Grant handout**	
3.1 Tu Oct 8	**Mechanobiology & Atherosclerosis** Tony Passerini	**See reading list**	**Critique #3 of Athero paper due Oct 22**
3.2 Th Oct 10	**Artery-Chip** Theory/Experiment/Hypothesis	R21 Grant handout	**R01 grant handout #1**
4.1 Tu Oct 15	**Single Molecule Mechanics** Theory/Experiment/Hypothesis Volkmar Heinrich		**Critique on R01 #4 Due Oct 30**
4.2 Th Oct 17	**Molecular Mechanics** Experiment/Grant		
5.1 Tu Oct 22	**T**heory-detection Single molecules flow chamber	Zhu Review Evans PNAS Evans BJ Green J Immunol 2004	**HW #5 NIH Final: Hypothesis Specific Aims- Due Nov 6 Bibliography of 5-10 refs**
5.2 Th Oct 24	AFM Single molecule studies Integrin single molecule-Cell studies **Intro to Transgenics;**	Hynes Review Capechi Review Taliadores Ley and Dunne Ding et al	
6.1 Tu Oct 29	**Use of Gene therapy to study disease**	Leif Anderson Readings posted	

	CRISPR/CAS9 Transgenic models experiments		
6.2 Th Oct 31	Transgenic studies of Leukocyte rolling **Discuss NIH assignment**	Neelamegham et al. Sci Reports	**Outline #5 due Today**
7.1 Tu Nov 5	**Stem Cell Engineering Introduction** **Stem cells cont** **Experiment**		**Critique #6 on R01 assignment due Nov 20**
7.2 Th Nov 7	Stem cell continued Discussions on NIH R01 reports		
8.1 Tu Nov 12	Stem cell regenerative medicine translation and R01 example		**HW #7 First Draft NIH research presentations due Nov 27**
8.2 Th Nov 14	Stem Cells Cont. Review R01 handout Preparation for presentations		
Tu Nov 19			
9.1 Th Nov 21	NIH Final presentations 5 presentations	**NIH presentations**	
9.2 Tu Nov 26	NIH Final presentations 5 presentations	**NIH presentations**	
10.1 Th Nov 28	Thanksgiving Holiday		
10.2 Tu Dec 3	NIH Presentations 5 presentations	**NIH presentations**	

Main source of online Biomedical literature query:
www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=PubMed

- Six areas of cellular engineering will be covered
- Homework makes up 50% of grade and consist of 1-2 page critiques or a research paper from hand out bibliography
- Short verbal presentation of a critique is required of each student 10% grade
- Term paper consists of an NIH style proposal (10 pages not including references) and this counts for 30% of grade, a presentation of this proposal is required and counts for remaining 10% of grade.