PHYS 3730: Introduction to Biophysics | Spring 2025

Prof. Andrew Mugler | andrew.mugler@pitt.edu

Topics: cell swimming, sensing, regulation, computation, actuation, growth, ecology | prerecorded

Class (Mon 11am-12:15pm)		Due (Tue 5pm)		Class (Wed 11am-12:15pm)		Quiz
				Jan 8	Introduction	
Jan 13	Lecture / Paper 1	Jan 14	Paper signup	Jan 15	Cell swimming	
Jan 20	MLK DAY	Jan 21	Paper questions	Jan 22	Paper 2 / Paper 3	
Jan 27	Diffusion simulation			Jan 29	Concentration sensing	HW 1
Feb 3	Gradient sensing	Feb 4	Paper questions	Feb 5	Paper 4 / Paper 5	
Feb 10	Gene expression	Feb 11	Comp. project 1	Feb 12	Stochastic modeling 1	
Feb 17	Stochastic simulation	Feb 18	Paper questions	Feb 19	Paper 6 / Paper 7	
Feb 24	Stochastic modeling 2			Feb 26	Stochastic modeling 3	HW 2
Mar 3	SPRING BREAK			Mar 5	SPRING BREAK	
Mar 10	Gene circuits 1	Mar 11	Comp. project 2	Mar 12	Gene circuits 2	
Mar 17	Information theory			Mar 19	Polymer statistics 1	
Mar 24	Polymer statistics 2			Mar 26	Entropic elasticity	HW 3
Mar 31	Growth and division 1	Apr 1	Paper questions	Apr 2	Paper 8 / Paper 9	
Apr 7	Growth and division 2			Apr 9	Microbial ecology 1	HW 4
Apr 14	Microbial ecology 2	Apr 15	Paper questions	Apr 16	Paper 10 / Lecture	
Apr 21	Micro eco 3 / Quiz 5					HW 5

Office hour: Tuesdays 10:45-11:45am, 216 Allen

Optional books (on reserve) and reviews (on Canvas):

- Berg, Random walks in biology (Ch 2, 3)
- Gardiner, Handbook of stochastic methods (Ch 7)
- van Kampen, Stochastic processes (Ch 6-10)
- Boal, Mechanics of the cell (Ch 3)
- Willis & Huang, Sizing up the bacterial cell cycle
- Cui et al, Lectures on community ecology

- Go to http://library.pitt.edu
- Select “Course Reserves” link in center
- In PittCat Course Reserve search box enter professor, or course name or no.
- Click on title of item, or for physical items, take call number to Service Desk at Science & Engineering Library

Learning goals:

- Digest and present biophysics content from original sources
- Apply analytic methods to biophysics problems, collaboratively and independently
- Learn, implement, and write up computational concepts from biophysics
- Engage with the class via lecture, presentations, and Canvas

Course Components:

Paper questions (10%):

- Due: Tuesdays 5pm before each presentation day (Canvas)

Paper presentation (30%):

- Format: slides, 30 min
- Components: overview, details on selected results, comprehension, clarity, addressing questions

HW Quizzes (40%):

- 15 min, end of class on selected Wednesdays, randomly chosen HW problem

Computational projects (20%):

- Format: typed pdf
- Components: introduction, methods, (correct) results, conclusions
- Plots must have: axis labels (with units if applicable), legend (if applicable), caption
- Due: selected Tuesdays 5pm (Canvas)