

PHYS 3730: Introduction to Biophysics | Fall 2022

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

Topics: cell swimming, sensing, signaling, computation, actuation, growth, and information | [video lecture](#)

Class (Tue 11am-12:15pm)		Due (Wed 11:59pm)		Class (Thu 11am-12:15pm)		Quiz
Aug 30	Introduction	Aug 31	Paper signup	Sep 1	Paper 1	
Sep 6	Bacterial swimming	Sep 7	Paper questions	Sep 8	Papers 2 / Paper 3	
Sep 13	Concentration sensing	Sep 14		Sep 15	Gradient sensing	HW 1
Sep 20	Diffusion simulation	Sep 21	Paper questions	Sep 22	Paper 4 / Paper 5	
Sep 27	Gene expression	Sep 28		Sep 30	Stochastic modeling 1	
Oct 4	Stochastic modeling 2	Oct 5	Comp. project 1	Oct 6	Intrinsic/extrinsic noise	
Oct 11	Stochastic simulation	Oct 12		Oct 13	Network motifs	HW 2
Oct 18	Autoregulation	Oct 19	Paper questions	Oct 20	Paper 6 / Paper 7	
Oct 25	Linear noise approx.	Oct 26	Comp. project 2	Oct 27	Dynamical systems	
Nov 1	Polymer statistics 1	Nov 2		Nov 3	Polymer statistics 2	HW 3
Nov 8	Entropic elasticity	Nov 9	Paper questions	Nov 10	Paper 8 / Paper 9	
Nov 15	Molecular motors	Nov 16		Nov 17	Growth and division 1	HW 4
Nov 22	THANKSGIVING	Nov 23		Nov 24	THANKSGIVING	
Nov 29	Growth and division 2	Nov 30	Paper questions	Dec 1	Paper 10 / Paper 11	
Dec 6	Information theory	Dec 7		Dec 8	Special topics	HW 5

Office hour: Wed 1-2pm, 206 Allen

Optional books (on reserve):

- Berg, Random walks in biology (Ch 2, 3)
- Gardiner, Handbook of stochastic methods (Ch 7)
- van Kampen, Stochastic processes (Ch 6-10)
- Alon, Introduction to systems biology (Ch 2, 3, 4, 9)
- Boal, Mechanics of the cell (Ch 3, 11.3, 11.5)
- Nelson, Biological physics (Ch 10.2)

- 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: Wednesdays 11:59pm before each presentation day (Canvas)

Paper presentation (30%):

- Format: slides, 30 min
- Components: overview of paper, main results, comprehension, clarity, addressing questions

HW Quizzes (40%):

- 15 min, end of class on selected Thursdays, 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 Wednesdays 11:59pm (Canvas)