

PHYS 3101: Special Topics Biophysics | Fall 2020
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Topics: cell swimming | sensing | signaling | computation | actuation | growth

Assignments		Classes			
Mon (11:59pm)		Tue (1:15-2:30pm)		Thu (1:15-2:30pm)	
				Aug 20	Introduction
Aug 24	Reading question	Aug 25	Purcell 1997	Aug 27	Bacterial swimming
Aug 31	Reading question	Sep 1	Berg & Purcell 1977 1	Sep 3	Concentration sensing
Sep 7	Problem set 1	Sep 8	Gradient sensing	Sep 10	Diffusion simulation
Sep 14	Reading question	Sep 15	Berg & Purcell 1977 2	Sep 17	Gene expression
Sep 21	Reading question	Sep 22	Elowitz et al. 2002	Sep 24	Stochastic modeling 1
Sep 28	Comp. project 1	Sep 29	Stochastic modeling 2	Oct 1	Intrinsic/extrinsic noise
Oct 5	Reading question	Oct 6	Gillespie 1977	Oct 8	Stochastic simulation
Oct 12	Problem set 2	Oct 13	Networks and motifs	Oct 15	Autoregulation
Oct 19	Reading question	Oct 20	Hopfield 1974	Oct 22	Linear noise approx.
Oct 26	Comp. project 2	Oct 27	Dynamical systems	Oct 29	Polymer statistics 1
Nov 2	Problem set 3	Nov 3	Polymer statistics 2	Nov 5	Pulling and entropy
Nov 9	Reading question	Nov 10	Marko & Siggia 1995	Nov 12	Molecular motors
Nov 16	Reading question	Nov 17	Wang et al. 2010	Nov 19	Homeostasis 1
Nov 23	Problem set 4	Nov 24	Homeostasis 2		

Office hours: By appointment. Please do not hesitate to email me.

Completely optional books:

- Berg, Random walks in biology
- Gardiner, Handbook of stochastic methods
- van Kampen, Stochastic processes in physics and chemistry
- Alon, Introduction to systems biology
- Boal, Mechanics of the cell

Course Components:

Reading questions (10%):

- Write a question that came up while reading the paper
 - If no question arose, say that
 - If you are the presenter, please say that (to still get credit)
- Due: Monday 11:59pm before each paper presentation

- 45-60 min (allows time for discussion)
- Due: submit slides as pdf by 11:59pm the day of your presentation

Paper presentation (30%):

- Each student gives one presentation
 - Sign-up first week of classes
 - I will give the first (Aug 25)
- Format: slides
- Components:
 - Overview of goals of paper
 - Discussion of all figures and/or main mathematical results
 - Address reading questions from fellow students

Problem sets (40%):

- Format: written or typed pdf
- Solutions must be complete (words and math) and correct
- Due: Monday 11:59pm (Sep 7, Oct 12, Nov 2, Nov 23)

Computational projects (20%):

- Format: typed pdf
- Components: introduction, methods, results, conclusions
- Results must be correct
- Plots must have: axis labels (with units if applicable), legend (if applicable), caption
- Due: Monday 11:59pm (Sep 28, Oct 26)