

Time & Place: Tuesday & Thursday, 10:30am – 12:10pm,

Room: MAIN 1114

Instructor: Takeshi Sakamoto, Associate Professor, Department of Physics and Astronomy

Office hours: stop-by my office or make an appointment (recommend)

Telephone: 313-577-2970

E-mail: Sakamoto@wayne.edu

Textbook: Philip Nelson: Biological Physics, ISBN 0-7167-9897-2

Key Goal for Biological physics: Biological physics deals with fundamental physical principles at the center of life's processes. In this course, we will concentrate on the physics of molecular dynamics through cellular processes. This course covers many concepts used in biological systems, including thermodynamics, electro-dynamics, kinetics, and statistical mechanics. Thus, in addition to learning about the physics of life, this course will also serve as an introduction to these important areas of physics. We will also learn mathematical techniques in this course, as needed. Studying from real research paper and present what students learn, we will integrate knowledge from book and combine with real world what is happen.

Level of course:

This course is a senior level undergraduate course. As such, we will learn how to analyze complex physical situations and use modestly advanced calculus. Students need to be aware **this is not an easy course**. A high level of attention and dedication is expected from students who want to achieve a grade of A. Understanding the course material will be assisted by weekly problem solving sessions, as well as quizzes and regular homework assignments.

Assignment: total 110 points

Attendance 10% : Will be taken every class

Homework 20% : will be given weekly. Students will present their homework solutions during our weekly problems solving session. Problem/solving of homework is held on (usually) Thursday.

Problem solving 15% : Handing in a problem for homework, but not understanding the solution, will result in a loss of points for both the problem-solving session and the handed-in homework. Problem solving will be graded on an honest effort basis, not on absolute correctness of solution presented. It is important to demonstrate you have spent time and effort to think about the problem and *can explain* how you arrived at your solution. Therefore, do **not** copy solutions from others. Instead, if you need help, discuss problems with your fellow students or with me.

Review Exam 5% : is based on material from the text book already covered in PHY 4700. These previously covered topics are needed to understand the more advanced chapters in the book.

Mid-Exam (2x10%) 20% : will be 1 hour long

Final Exam 40% : is 2 hours

Grading: The overall course grade will be determined on the basis of the following table:

Grade	Cumulated score	Grade	Cumulated score	Grade	Cumulated score
A	91 – 100	B-	70 – 74	D+	50 – 54
A-	85 – 90	C+	65 – 69	D	45 - 49
B+	80 – 84	C	60 – 64	D-	40 - 44
B	75 - 79	C-	55 - 59	F	0 – 39

Week of	Topics	Reading (pages)
Aug. 31 (Th)	Course remark, review problem solving	1 – 154
Sep. 5 (T)	review problem solving	
Sep. 7 (Th)	review problem solving	
Sep. 12 (T)	Review Exam (Ch.1 ~5, exclude ch2)	
Sep. 14 (Th)	Ch. 6: Entropy, Temperature, and the second law. Reading quiz; ch6 Up-load:Homework6	196 – 209
Sep. 19 (T)	Ch. 6: Open system, Microscopic system, and Excursion.	210 – 245
Sep. 21 (Th)	Problem solving for ch. 6 (Due date for HW ch6)	
Sep. 26 (T)	Ch. 7: Microscopic view of entropic forces and Osmotic pressure. Reading quiz; ch7 Up-load: Homework7	246 – 253
Sep. 28 (Th)	Ch. 7: Osmotic flow, a repulsive interlude, and properties of water.	254 – 293
Oct. 3 (T)	Ch. 8: Chemical potential & chemical reactions Reading quiz; ch8, Up-load: Homework 8	294 – 307
Oct. 5 (Th)	Ch. 8: Dissociation & self-assembly of amphiphiles Problem solving for ch7 (Due date of HW ch7)	308 – 320
Oct. 10 (T)	Ch. 8: self-assembly in cells	322 – 340
Oct. 12 (Th)	Ch. 8: Chemical potential & chemical reactions Problem Solving for ch 8. (Due date of HW ch8)	294 – 307
Oct. 17 (T)	Mix-exam 1 (Chapter 6, 7 & 8)	
Oct. 19 (Th)	Ch. 9: Elasticity and stiffness Reading quiz; ch9, Up-load: Homework 9	341 – 353
Oct. 24 (T)	Ch. 9: Cooperativity and Thermal switching	358 – 375
Oct. 26 (Th)	Ch. 9: Allostery, Problem Solving for ch 9.	376 – 401
Oct. 31 (T)	Ch. 10: Molecular machine Reading quiz; ch10, Up-load: Homework 10	401 – 421
Nov. 2 (Th)	Ch. 10: Mechanical principles	422 – 431
Nov. 7 (T)	Ch. 10: Kinetics of enzymes, Problem solving ch10	432 – 451
Nov. 9 (Th)	Ch. 11: Electroosmotic effects & Ion pumping Reading quiz; ch11, Up-load; Homework 11	469 – 485
Nov. 14 (T)	Ch. 11: Mitochondria as factors	486 – 505
Nov. 16 (Th)	Problem Solving for ch 11	
Nov. 21 (T)	Mid-exam 2 (Ch. 9, 10, & 11)	
Nov. 23 *Th)	No Class	
Nov. 28 (Th)	Ch. 12: Nerve impulses Reading quiz	506 – 531
Nov. 30 (T)	Ch. 12: Nerve impulses Homework 12	532 - 556
Dec. 5 (Th)	Review Final Exam, Problem Solving for ch 12	
Dec. 7 (T)	Final Exam	

Official Final exam: December 14th, 10:15 am ~ 12:15 pm