SYLLABUS **Biological Physics PHY5750** **Fall 2014**

Time & Place: Tuesday & Thursday, 10:40am – 12:30pm,
Room: STAT 0333
Instructor: Takeshi Sakamoto, Assistant 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 10% : 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.

Project presentation 10%: Giving a project to a team (two students per team), the team will study the topics and will present their studies. Presentation will be 2030 min with 30min discussion.

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. 28 (Thu)	Course remark, Review exam of Chapter 1 – 4		1 – 154
Sep. 2 (T)/	Ch. 6: Entropy, Temperature, and the second law.	Reading quiz	196 – 209
Sep. 4 (Thu)	Ch. 6: Open system, Microscopic system, and Excursion.		210 – 245
Sep. 9 (T)	Presentation for chapter 6	Homework6	
Sep. 11 (Thu)	Ch. 7: Microscopic view of entropic forces and Osmotic pressure.	Reading quiz	246 – 253
Sep. 16 (T)	Ch. 7: Osmotic flow, a repulsive interlude, and a properties of water.	Homework7	254 – 293
Sep. 18 (Thu)	Problem solving for ch. 7	Homework7	
Sep. 23 (T)	Mid-Exam 1 (Ch. 6 & 7)		
Sep. 25 (Thu)	Presentation for chapter 7 and research for chapter 6 & 7		
Sep. 30 (T)	Ch. 8: Chemical potential & chemical reactions	Reading quiz	294 – 307
Oct. 2 (Thu)	Ch. 8: Dissociation & self-assembly of amphiphiles		308 – 320
Oct. 7 (T)	Ch. 8: self-assembly in cells	Homework 8	322 – 340
Oct. 9 (Thu)	Presentation for chapter 8 and research for chapter 8	Homework 8	
Oct. 14 (T)	Ch. 9: Elasticity and stiffness	Reading quiz	341 – 353
Oct. 16 (Thu)	Ch. 9: Cooperativity and Thermal switching		358 – 375
Oct. 21 (T)	Ch. 9: Allostery	Homework 9	376 – 401
Oct. 23 (Thu)	Presentation for chapter 9 and research for chapter 9	Homework 9	
Oct. 28 (T)	Mix-exam 2 (Chapter 8 & 9)		
Oct. 30 (Thu)	Ch. 10: Molecular machine	Reading quiz	401 – 421
Nov. 4 (T)	Ch. 10: Mechanical principles		422 – 431
Nov. 6 (Thu)	Ch. 10: Kinetics of enzymes	Homework 10	432 – 451
Nov. 11 (T)	Presentation and research for chapter 10	Homework 10	
Nov. 13 (Thu)	Ch. 11: Electroosmotic effects & Ion pumping	Reading quiz	469 – 485
Nov. 18 (T)	Ch. 11: Mitochondria as factores		486 – 505
Nov. 20 (Thu)	Presentation and research for chapter 11	Homework 11	
Nov. 25 (T)	Ch. 12: Nerve impulses	Reading quiz	506 – 531
Nov. 27 (Thu)	No class		
Dec. 2 (T)	Ch. 12: Nerve impulses	Homework 12	532 - 556
Dec. 4 (Thu)	Review Final Exam		

Note: presentation will be 20~30 min with 30 min discussion.