Biological Physics - PHY 5750
Fall 2019

Lectures and Activities

Tuesdays and Thursdays, 12:30 pm to 2:10 pm in room 0159 Old Main
Course CRN: 13550; Section 001
Four credit hours

Final Exam

Thursday, December 12, 12:30 pm to 2:30 pm in 0159 Old Main

Required Texts

Biological Physics by Philip Nelson

Potentially Useful Texts that can be found on Canvas

Biophysics: an introduction by Rodney M.J. Cotterill
Some faculty like this book more than the one Nelson's. I think they both have their good sections, but I generally prefer Nelson's book.

An Introduction to Thermal Physics by David Schroeder
This is an excellent introduction to thermodynamics with no particular emphasis on biological problems.

Thermal Physics of Membranes by Thomas Heimburg
This is an advanced book that we may play with at the end of the semester.

Lecturer

Professor Christopher V. Kelly
Office: 283 Physics Building
Email: cvkelly@wayne.edu
Office Hours: By appointment. And I will aim to answer questions promptly by email also. Send me an email with a few times that work for you. I'll choose one and we can meet in my office.

Course Web Page: Canvas @ https://canvas.wayne.edu/courses/109043

Pre-requisites

PHY 3700 and comfort with multivariable calculus
PHY 3750 and comfort making plots and performing simple simulations
PHY 4700 and comfort with introductory biophysics

Recommended co-enrollment

PHY 6750 and maybe PHY 5620/5621

How to be successful in this course

The key to being successful in this course is to engage at all levels. Read the relevant sections of the text before lectures, be attentive during lectures, be a leader in organizing study groups, ask questions, complete the homework on time, learn from your mistakes, and follow up during office hours. Students who display a strong desire to thrive will demonstrate their efforts via detailed questions from the readings or assignments that reflect their individual effort to understand the subject

matter. Utilize the numerous resources available to you and recognize that success in this course will not be achieved solely through passive observation of the lectures.

Course Content

This course will introduce the principles of thermodynamics and statistical mechanics applied to biological systems. The supplemental reading material will be put on Canvas. This course will be broken into three sections:

Section 1: Nelson chapters 1-5
Section 2: Nelson chapters 6-9
Section 3: Nelson chapters 10-12 and special topics

Learning Objectives

1) Understand and use the various ensembles of thermodynamics
2) Analysis of diversity of states and probability functions in statistical mechanics
3) The applications of thermodynamics and statistical mechanics to biological systems

Homework

Homework will be assigned and submitted on a weekly basis. Often, showing your work will be necessary to get full marks. Diagrams and derivations are often required. Occasionally, only a selection of the required homework answers will be graded. Homework questions will mostly be graded on a 0, check-, check, check+ scale while some problems will be graded in greater detail.

0 : The question was not seriously attempted. 0 Points.
Check- : A strong effort and significant errors were made. 1 Point.
Check : The answer is close but with minor mistakes OR the answer is correct but insufficient work was shown to demonstrate student understands. 2 Points.
Check+: The answer is perfect. The answer clearly shows that the student well understands the subject. 3 Points.

Homework solutions will be provided, and the students are strongly encouraged to compare their answers to the solutions. Some questions can be answered in multiple ways and comparing your answers to the solution will often be informative.

Students are encouraged to work together on the homework via small study groups. However, each student is required to write their own answers without copying or plagiarizing others. Your homework is expected to be a reflection of your effort and your understanding. Any copying or plagiarizing will be considered cheating, result in no credit, and possibly university-level disciplinary actions. (http://www.otl.wayne.edu/wsu_integrity.php)

Participation in Lecture

Your participation in all activities of the course will help you and other students learn the material. Participation points will be given for pre-class surveys, in-class activities, and out-of-class study-group participation. Participation points may count for up to 10% of your final grade.

A large portion of your participation grade will come from an end-of-the-semester presentation. This presentation will be done individually to the whole class, as indicated in the schedule below. Details of the presentation will come later in the semester.

Exams

There will be two mid-semester exams and one final. All exams will be cumulative, with an emphasis on the most recent section. The exams may include multiple choice, short answer, or long answer problems. The final exam will be worth double each of the mid-semester exams towards your final grade. Exams will be given during the lecture time.

You are only allowed to bring writing implements and a single-sided 8.5"x11" page of personally made, hand-written equations and diagrams for use on the exam. No complete non-math sentences are allowed on your equation sheet. You may not use any notes other than the single page of single-sided hand-written equation sheet that you made yourself. These notes will be handed in immediately following the exams.

No calculators, computers, phones, or non-preapproved textbooks are allowed for use on the exams. **Any use of telephones during an exam is strictly forbidden and will result in the assessment of cheating.** For the exams, any use of non-sanctioned assistance (e.g., electronic devices, other people, non-sanctioned cheat-sheets, or non-required books) will be considered cheating, result in no credit, and possibly university-level disciplinary actions.

Make-up exams are not available barring exceptional circumstances as assessed solely by the lecturer. A re-grading of some exam answers may or may not be permitted if requested. However, any re-grading may result in an increase, decrease, or no change in the grade given with a final decision made by the lecturer.

Final Grade

The final grade will be a combination of the grades from the homework (HW), Participation (P) the two mid-semester exams (E1, E2), and the final exam (F). However, to accommodate the diverse learning methods of different students, final grades (FG) may be calculated according to whichever of the following methods results in the highest final grade for each student.

FG = (P/2+HW/2+E1+E2+2*F) / 5
FG = (P/2+HW+E1/2+E2+2*F) / 5
FG = (P/2+HW+E1+E2/2+2*F) / 5
FG = (P/2+HW+E1+E2+1.5*F) / 5

Final Grades may be scaled and converted to a final letter grade with the following approximate scale:

FG	Letter Grade
90-100%	A-/A
80-89%	B-/B/B+
70-79	C-/C/C+
60-69	D-/D/D+
<60	E

Students with disabilities

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. The SDS telephone number is 313-577-1851 or 313-202-4216 for videophone use. Once you have met with your disability specialist, I will be glad to meet with you privately during my office hours to discuss your accommodations. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University. You can learn more about the disability office at **www.studentdisability.wayne.edu**.

Honors Option

Students who wish to get honors credit with this course should fill out all the paperwork required by the honors college and write a 10-page research paper. You are encouraged to write on the same subject which you present to the class in December. Everyone will give a presentation. Honors students will additionally submit a paper.

Syllabus Modifications

I will be trying diverse teaching techniques throughout this semester. As I learn what is working and what is not, I will be modifying the policies of this course. And so, this syllabus is a dynamic document that may be updated as the semester progresses.

Tentative Lecture Schedule

Aug 29	R	Introduction, Syllabus, Math, Nelson Ch. 1-2
Sept 3	T	Nelson Ch 3
5	R	
10	T	Nelson Ch 4
12	R	
17	T	Nelson Ch 5
19	R	
24	T	Review
26	**R**	**Exam 1**
Oct 1	T	Nelson Ch 6
3	R	
8	T	Nelson Ch 7
10	R	
15	T	Nelson Ch 8
17	R	**Guest Lecture**. Likely topic: Fluorescence for measuring diffusion
22	T	Nelson Ch 9
24	R	
29	T	Review
31	**R**	**Exam 2**
Nov 5	T	Nelson Ch 10
7	R	Nelson Ch 11
12	T	
14	R	Nelson Ch 12
19	T	
21	R	**Guest Lecture**. Likely topic: Molecular dynamics simulations
26	T	
28	R	**No class**. Happy T-Day.
3-Dec	T	**Student Presentations**
5	R	**Student Presentations** and Review
12-Dec	**R**	**Final Exam - 12:30 pm to 2:30 pm in room 0159 Old Main**

This schedule is subject to change.