

Syllabus

Instructor

Prof. Paul Eugenio

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Class Meetings

TuTh 2:00 PM to 3:15 PM, at UPL 212. These classes involve mainly lectures, discussions, demonstrations, problem solving, and one guest seminar. There will be weekly homework. Much of the material discussed in the lectures is not well covered in the textbook, so attending the classes is *very* important.

Office Hours

Wednesday 3:00-4:30 pm in Keen Room 205/202 or upon appointment.

Course Website

<http://hadron.physics.fsu.edu/~eugenio/biomedphy>

Course Description

This is the first semester of a two-semester sequence intended to discuss the applications of physics concepts (covered in College Physics, PHY 2053 and 2054) to biological systems and in medical applications. The first-semester course will cover the physical basis of some common biological processes. It will discuss the physics of bio-statics, bio-dynamics, fluid motion (blood flow), heat and thermodynamics of living systems (respiration and osmosis), and structure and function of muscles. The physics prerequisite for this course is PHY2053. The level of mathematical skills necessary to complete this course is proficiency with algebra and trigonometry.

Texts

Main text:

- *Physics in Biology and Medicine* by Paul Davidovits, 3rd or 4th Edition, Harcourt/Academic

Press. Further readings:

- *Handouts* will be posted on the course website as the semester progresses. **Course Topics** (Chapter numbers refer to the textbook)

1. Introduction and Review

Elementary concepts in mechanics and thermal physics.

2. Bio-Statics Ch. 1, 2

Equilibrium, muscles, skeleton, joints.

3. Bio-Dynamics Ch. 3, 4, 5

Translational and angular motion (jumping, running, walking), stretch and compression, bone fracture and injury.

4. Fluid Motion and Blood Flow Ch. 7, 8

Hydrostatics, Hydrodynamics, Blood pressure and flow, heart, atherosclerosis.

5. Heat, Thermodynamics and Life Ch. 9, 10, 11

Heat transfer and diffusion, respiratory system, body temperature regulation, food and energy, Biomolecular thermodynamics

6. Muscles, molecular motors, and active transport

Student Responsibilities

Class Participation: Attend all lectures; what you retain from these classes may surprise you. Students are expected to come to class prepared to learn. **Students should arrive to class on time and remain in class for the entire class period.** Students should actively participate in the studio discussions. Please come to office hours for any questions related to the course. Do not wait until the mid-terms and final- exam to express your confusion or to discuss topics that are unclear.

Homework: Success in this course depends to a large extent on the effort put into completing the weekly homework assignments. The homework will be a significant component of the final grade, and it is the best way to prepare for the exams.

Exams: There will be two midterm exams and one final exam. The midterms and the final exams are cumulative, although the final will emphasize the latter part of the course. There will be ***NO MAKE UP exams*** except for excused absences. Excused absences include documented illness, deaths in the immediate family and other documented crises, call to active military duty, religious holy days, and official University activities.

Late Homework Policy

Unless you have made previous arrangements or have a reason I will accept (such as sickness, accident, death in family, ...), the grade for any homework turned in after I have posted the solutions on the web will count toward your final grade with 1/2 its normal weight (i.e., 100% will be recorded as 50%, etc.).

Homework solutions will be posted on the course website after the due date.

Completion and Grading of the Course

A student will have completed the course and will be eligible for a grade greater than “F” only if the student attempts the final exam **Tuesday, December 11, 5:30-7:30pm in UPL 212.**

The final course grade will be calculated using the scores on homework, midterms and final examinations. These components will be weighted as follows:

Course Grade Components

Grade Component	%
Homework Problems	25%
Studio Discussions	10%
Midterm I	20%
Midterm II	20%
Final Exam	25%

Your final grade will be based on your total score in the four areas. The total course score will be converted into a letter grade, using the table shown below:

Calculation of the Course Grade

Total Score (%)	Grade
90.0 – 100.0	A
85.0 – 89.9	A-
80.0 – 84.9	B+
75.0 – 79.9	B
70.0 – 74.9	B-
68.0 – 69.9	C+
63.0 – 67.9	C
60.0 – 62.9	C-
55.0 – 59.9	D
54.9 or below	F

Resources for Students

The instructor wants you all to do well in this course. Several resources are available to help you towards this goal:

- **Classes:** Attend all classes. This counts significantly towards your grade. What you retain from these classes may surprise you.
- **Office Hours and Help Sessions:** Make use of the instructor’s office hours and help sessions. Sometimes a one-on-one discussion can clear things up quickly.

Course Information on the World-Wide Web

This syllabus, lecture notes, supplementary materials, solutions to homework and exam problems, and important announcements can be found on the course website.

Text: *Physics in Biology and Medicine* by Paul Davidovits, 3rd or 4th Ed., Harcourt/Academic Press
 Instructor: Prof. Per Arne Rikvold.

DATES FOR MIDTERMS AND GUEST LECTURE ARE TENTATIVE AND MAY BE CHANGED LATER.

Date	Reading and Homework	Homework Due	Other
Tu Aug 28 Th Aug 30	Welcome to the Course! Review of Basic Physics Concepts		Mandatory first-day attendance!
Tu Sep 04 Th Sep 06	Ch. 1 Static Forces: Equilibrium and stability Ch. 1 Static Forces and the body: The musculoskeletal system		
Tu Sep 11 Th Sep 13	Ch. 1 Hip and back, Ch. 2 Friction Ch. 2 Friction, Ch. 3 Translational Motion: The vertical Jump	Set 1. Th Sep 13	
Tu Sep 18 Th Sep 20	Ch. 3 Translational Motion: Projectile motion Ch. 4 Rotational Motion: Centripetal force and turning a curve	Set 2. Th Sep 20	
Tu Sep 25 Th Sep 27	Ch. 4 Rotational Motion: Walking and running. Review for Midterm I	Set 3. Th Sep 27	
Tu Oct 02 Th Oct 04	Midterm I Ch. 5 Elasticity and Strength of Materials: To break or not to break a bone	No homework this week!	Midterm I Tu Oct 02
Tu Oct 09 Th Oct 11	Guest Lecture: Prosthetics and orthotics. Ch. 7 Fluids at rest 1: Pressure, Pascal's principle, Archimedes' principle	Set 4. Th Oct 11	
Tu Oct 16 Th Oct 18	Ch. 7 Fluids at rest 2: More on buoyancy. Surfactants. Ch. 8 Fluids in motion 1: Bernoulli's law, flight	Set 5. Th Oct 18	
Tu Oct 23 Th Oct 25	Ch. 8 Fluids in motion 2: Viscous fluids and the cardiovascular system Ch. 8 Cardiovascular system 2: Blood pressure	Set 6. Th Oct 25	
Tu Oct 30	Ch. 9 Heat and kinetic theory 1: Temperature, heat, ideal gases, specific heat, phase changes and latent heat.	Set 7. Th Nov 01	

Date	Reading and Homework	Homework Due	Other
Th Nov 01	Ch. 9 Heat and kinetic theory 2: Heat transfer, diffusion		
Tu Nov 06	Review for Midterm II	No homework this week !	Midterm II Tu Nov 08
Th Nov 08	Midterm II		
Tu Nov 13	Ch. 9 Diffusion and the respiratory system heat, ideal gases, specific heat, phase changes and latent heat	Set 8. Th Nov 15	
Th Nov 15	Osmosis and the kidneys		
Tu Nov 20	Ch 10: Thermodynamics of life 1: First and Second Law, thermal efficiency	Set 9. Tu Nov 20	
Th Nov 22	Thanksgiving Day. No classes.		
Tu Nov 27	Ch 10: Thermodynamics of life 2: Temperature regulation, Entropy	Set 10. Th Nov 29	
Th Nov 29	Ch. 10: Thermodynamics of life 3: Free energies, Metabolic reactions, ATP and ADP		
Tu Dec 04	Molecular motors : Muscles and intracellular transport	Set 11. Th Dec 06	
Th Dec 06	Review for Final		
FINAL EXAM: Tuesday, Dec. 11 5:30 – 7:30 PM. (UPL 212) *** GOOD LUCK!***			

University Attendance Policy:

Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.

Academic Honor Policy:

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to "...be honest and truthful and...[to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at <http://dof.fsu.edu/honorpolicy.htm>.)

Americans With Disabilities Act:

Students with disabilities needing academic accommodation should:

- (1) register with and provide documentation to the Student Disability Resource Center; and
- (2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact the: Student Disability Resource Center

874 Traditions Way

108 Student Services Building

Florida State University

Tallahassee, FL 32306-4167

(850) 644-9566 (voice)

(850) 644-8504 (TDD)

sdrc@admin.fsu.edu

<http://www.disabilitycenter.fsu.edu/>

Free Tutoring from FSU:

On-campus tutoring and writing assistance is available for many courses at Florida State University.

For more information, visit the Academic Center for Excellence (ACE) Tutoring Services'

comprehensive list of on-campus tutoring options at <http://ace.fsu.edu/tutoring> or contact

tutor@fsu.edu. High-quality tutoring is available by appointment and on a walk-in basis. These

services are offered by tutors trained to encourage the highest level of individual academic success while upholding personal academic integrity.

Syllabus Change Policy:

Except for changes that substantially affect implementation of the evaluation (grading) statement, **this syllabus is a guide for the course and is subject to change with advance notice.**