What:	PHYS 105	Instructor:	Brad Moser
When:	MWF 11:00-11:50 am	Office:	Science Center G028
Where:	Science Center G041	Email:	bmoser@hamilton.edu
Website:	https://blackboard.hamilton.edu/	Office hours:	Wed. 2-4, Thur. 10-12
	1		or reach out to me!

Course Description and Topics:

From the course catalog: The second semester of a year-long sequence (100 and 105) for pre-med students and other scientists who require a year of physics. Topics include electricity, fluids, waves, optics, atomic physics and nuclear physics. Emphasis on applications of physics in medicine and in other sciences.

Course Topics:

Unit 0	Learning Physics	Unit 6	Pressure & Volume
Unit 1	Charge and Force	Unit 7	Fluid Dynamics
Unit 2	Field and Potential	Unit 8	Fluid Applications
Unit 3	Electric Current	Unit 9	Geometric Optics
Unit 4	Circuit Applications	Unit 10	Image Formation
Unit 5	Static Pressure	Unit 11	Wave Optics

Additional information: The course strongly emphasizes life science and medical applications. Classroom activities emphasize problem solving and sensemaking, while the laboratories focus on building experimental intuition of concepts. The application of physics principles to each student's major program of study is prioritized.

This course primarily uses resources from the Introductory Physics for Life Sciences (IPLS) community. Curriculum decisions are informed by many years of the instructor interacting with this community. Therefore, the topics in this course vary, at times, from those offered in a traditional Physics II course. You will find that the PHYS 105 courses deviates substantially from the PHYS 205 material and format at times.

The course focuses on three major themes: electricity and circuits, fluids, and optics. The course format also emphasizes opportunities for student choice and independent study.

Required Materials:

No materials need to be purchased for this course. A workbook with readings and practice problems is provided for you in class. You will be provided with video resources and recommended readings from freely available online textbooks.

Grading:

Expectations		<u>Stars</u>	Final Grade
Quizzes	***	14-15	А
Portfolio	\therefore	13	A-
Projects	***	12	B+
Labs	\overleftrightarrow	10-11	В
Engagement	\overleftrightarrow	9	В-
Office Exam	\heartsuit	8	C+

Class Format:

We will typically meet for class in Science Center G040, a typical lecture hall. During in-class time, we will engage in group problem solving, polling, discussion of homework and major concepts, and students will occasionally give presentations. Lecture will hopefully be kept to a minimum, as necessary.

We will occasionally meet in the lab space, Science Center G032, as a full class or some students taking turns, to complete mini-experiments or to give presentations.

Attendance:

Attendance is highly encouraged. Hopefully you will consider the classroom experience worthy of attending. You will not be able to earn all stars for the Engagement portion of the class grade without regular attendance.

Quizzes:

- There will not be a traditional midterm and final exam.
- Instead, each week you will take a short **Quiz** that assesses your comprehension of the core topics that we are learning in class.
- Quizzes will either be administered as a timed assignment to be completed at home or during lab time.
- The types of questions will be variable, including multiple-choice, computational, short answer.
- Memorization is not necessary. Therefore, you will be permitted to use a sheet of notes.

Portfolio:

• The **Portfolio** component of the course grade is focused on a collection of responses to reading questions, solved problems, quiz corrections, and reflections on successes and challenges in the course,

***	Missed 0 or 1 assignments
**	Missed 2 or 3 assignments
$\stackrel{\frown}{\simeq}$	Missed 4 or more assignments

Average quiz score = 94-100%

Average quiz score = 86-93%

Average quiz score = 85% or less

- For each Unit in the course, you will be provided with a list of items that your Portfolio must include.
 - Portfolio submissions will be uploaded to a Google Drive that you share with the instructor and grader. You should create a folder for the course and separate folders for each unit within that folder.
 - Each portfolio item is worth 1 point. Each item that you submit will be graded Pass/Fail.
 - Pass = The submitted work demonstrates high quality effort and attention to detail.
 - Fail = The work was not submitted, the work was submitted late (unexcused), or the work demonstrates low quality effort and little attention to detail.
- Note that the P/F criteria focus on quality effort and attention to detail; not correct answers. Although you should strive to answer each question correctly and/or completely, incorrect answers will often receive full credit.
- Metacognition (thinking about your thinking) plays a critical role in the portfolio. You will reflect on successes
 and challenges you faced in each unit, make corrections to incorrect quiz problems, and make steps to improve
 your performance in the class. You will even make thoughtful recommendations for your own letter grade,
 providing written evidence for your recommendation, citing the work in your portfolio.

Projects:

- The **Projects** component of the course grade is focused on a collection of researched and presented work.
 - Each project will have a grade rubric composed of a series of check points (criteria). Each check point is Pass/Fail.



- <u>Quick Reviews</u>: You will be assigned two Quick Review projects during the semester. With your group consisting of either 2 or 3 members, you will report on a topic of physics recently discussed in class that directly relates to the field of health and medicine and is of particular interest to members of your group.
 - Presentations will be short; about 5 minutes. The specific example you choose does not have to be physics that has been covered in PHYS 100 or 105, although it can be. You will select a contemporary journal article OR measurement technique/apparatus and present your findings to the class in a short talk.
 - Quick Review presentations will tentatively be held Friday, February 11th and Friday, April 15th.
 - A presentation description and grade rubric are provided on Blackboard.
- <u>Project: Physics in Medicine</u>: Your group, consisting of either 2 or 3 members, will report on a topic in physics that directly relates to the field of health and medicine. The topic does not have to be physics that has been covered in PHYS 100 or 105, although it can be. You will select a contemporary journal article OR experimental technique/apparatus and present your findings to the class.
 - Here's the catch you CANNOT do a typical stand-and-talk-in-front-of-slides presentation. You must find another creative way to share your findings.
 - Topic selection and a project abstract will be due Friday, February 26th.
 - Lab time during the weeks of Feb. 21-25 and Feb. 28-Mar. 4 will be tentatively dedicated to working on your project.
 - Presentations will be during the lab period on the week of March 7-11 (week before Spring Break).
 - Each group will have 15 minutes for their presentation, plus additional time for questions.
 - A presentation description and grade rubric are provided on Blackboard.
- <u>Project: MCAT-style Passage Problem</u>: You will pair with a partner to create and submit a passage-style question, similar to those employed on the MCAT. Passage content and questions should be related to fluid or optical phenomena in medical physics, biophysics, or a measurement technique in your field of study. If you choose a topic that has been (or will be) covered in class, you need to explore a particular feature in greater depth. Multiple groups may duplicate topics if interest is high, but you cannot write a passage based on one of your earlier projects.
 - The passage text must be 400 600 words (typically 3 or 4 paragraphs), and you must write 5 multiplechoice questions (which include 4 or 5 choices, each).
 - Your passage problem is due the night before the PHYS 105 final exam period.
 - During the final exam period, you will complete the passage problems from two fellow groups and evaluate those passages and problems based on the grade rubric. Then you will reflect on your own passage and "grade it" based on the rubric.
 - A full description and grade rubric are provided on Blackboard.
- Oral Communication Center
 - You are encouraged to use the Oral Communication Center at any point in the process of preparing for these assignments.
 - The Oral Communication Center offers peer consulting on a variety of assignments and co-curricular speaking opportunities. Consultants can work with you on developing content for presentations, organizing ideas for oral delivery, polishing presentations, or finessing visual aids. The OCC is in Kirner-Johnson 222 and can be reached at www.hamilton.edu/occ or oralcomm@hamilton.edu. You can book appointments via their website. For Spring 2021, appointments are offered both in person and virtually via Zoom.

- **Research Support**
 - Ask a librarian or research tutor for help with your research for this class. You can drop by the Research and Design Studio in Burke Library or contact your library liaison. They will be able to help you find and evaluate relevant sources, find high quality graphics and images, effectively cite sources according to our discipline and copyright standards, and successfully make use of library resources and services.

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No Star

Labs:

- Students from PHYS 105 and 205 are co-mingled in the same lab • sections. Most of the time, students from both courses will share the same lab experience.
- The PHYS 105 curriculum deviates from 205 during the middle of the semester. As a member of PHYS 105, you will work with a group of students from 105 on either a different set of labs than the 205 students, or on a project that you will present.
- The Labs component of the course grade is focused on the weekly completion of each lab's required in-class activities, the submission of answers for all pre-lab and post-lab questions, and a lab practical.

Engagement:

Class engagement is an opportunity for you to showcase the kind of learning and thinking that will be valuable throughout your life, such as growth in critical thinking, active learning, and development of listening and speaking skills that are necessary for career success. Engagement, however, is not limited to verbal participation only. A student who verbally participates in

minor ways in class might still be a very engaged student. Engagement also includes having a positive attitude toward the class, hard work on assignments, seeking extra help when needed, demonstrating interest in the material, and working well with your peers.

Your class engagement will be observed throughout the course using the rubric provided on Blackboard. At the end of the semester, you will receive Stars as outlined.

Office Exam:

- Twice during the semester before spring break and at the end of the term you will meet one-on-one with • your instructor for a brief 5-10 minute "office exam."
- You will be asked to describe the physics of or solve mathematical problems for a handful of key ideas from the semester.
- You will be given a list of possible topics that you can prepare for. You may also use your quiz note sheet during the Office Exam.

$\mathcal{A}\mathcal{A}$	Demonstrated proficiency with core topics in the course
$\overset{\wedge}{\searrow}$	Demonstrated some understanding of core topics, but some gaps in knowledge
No Star	Demonstrated minimal proficiency with core topics in the course

Tokens:

- Tokens: You begin the semester with 2 tokens. If you receive a Failing grade on a portfolio submission or on a Project check point, you can submit a token, which allows you to rework and resubmit for a new grade.
- As a reward for reading the syllabus before the first day of class, I will give you a 3rd token for the semester if you do the following: Email a quick greeting to me and share a physics topic or application that you are eager to learn about in Physics II. You must send this email by 11:00 am on Wednesday, January 19th.

$\overline{\Im}$	$\frac{1}{\sqrt{2}}$	Actively engaged
\mathbf{x}	S	Somewhat engaged
No St	ar 1	Minimally engaged

Average lab score = 94-100%

Average lab score = 86-93%

Average lab score = 85% or less

Personal Support Resources:

- <u>Students with a disability:</u> Hamilton College will make reasonable accommodations for students with properly documented disabilities. If you are eligible to receive an accommodation and would like to request it for this course, please discuss it with me during the first two weeks of class. You will need to provide Allen Harrison, Associate Dean of Students (aharriso@hamilton.edu), with appropriate documentation of your disability.
- <u>Resources when you feel depressed or anxious</u>: There are times that each of us may feel overwhelmed, anxious, or depressed. There are many resources available on campus to help and support you:
 - Counseling Center (<u>www.hamilton.edu/offices/counselingcenter</u>, 315-859-4340) located at 100 College Hill Road offers individual and group therapy, peer counselors, psychiatric treatment, and a 24-hour hotline. If you need immediate assistance, phoning the Counseling Center and selecting option 2 will connect you with a counselor, 24 hours a day, 7 days a week.
 - Associate Dean for Student Support, Sarah Solomon (315-859-4600; ssolomon@hamilton.edu)
 - o Associate Dean of Students for Academics, Tara McKee (315-859-4600; tmckee@hamilton.edu)
 - Your faculty advisor
 - Your RA and Area Director in your residence hall

If at any time you feel suicidal or in danger of harming yourself or others, please reach out for support! The Hamilton community cares and is available to help. Campus Safety is available 24/7 for urgent concerns at 315-859-4000.

Week #	Торіс		Lab	Quiz
1 Jan. 19 - 21	Intro	Intro to IPLS Gauss Gun activity	NO LAB	
2 Jan. 24-28	Unit 1	Electric Charge & Force	Electroscope	Unit 0 Quiz
3 Jan. 31 - Feb. 4	Unit 2	Electric Field and Potential	Coulomb's Law	Unit 1 Quiz
4 Feb. 7-11	Unit 3	Electric Current	TBA	Unit 2 Quiz
5 Feb. 14-18	Unit 4	Circuit Applications	Potential Mapping	Unit 3 Quiz
6 Feb. 21-25		Finish Electricity units	Lab Practical	Unit 4 Quiz
7 Feb. 28 - Mar. 4	Unit 5	Hydrostatic Pressure	Circuits	
8 Mar. 7-11	Unit 6	Pressure and Volume	Physics in Medicine Presentations	Unit 5 Quiz
		Spring Break		
9 Mar. 28 - Apr. 1	Unit 7	Dynamic Pressure	Fluids I	Unit 6 Quiz
10 Apr. 4-8	Unit 8	Pressure Applications	Fluids II	Unit 7 Quiz
11 Apr. 11-15	Unit 9	Geometric Optics	Snell's Law	Unit 8 Quiz
12 Apr. 18-22	Unit 10	Image Formation	Lenses	Unit 9 Quiz
13 Apr. 25-29		Finish optics and images	Interference	Unit 10 Quiz
14 May 2-6	Unit 11	Wave Optics	Hydrogen Atom	
15 May 9 May 14		Last Day of Class Final Exam (2:00-5:00pm)		

Physics 105 - Spring 2022 MWF Tentative Schedule