PHYS 104: Fundamental Physics II
Syllabus - Spring 2025

Location: Trexler 274 **Time**: MWF 08:30-09:30AM
Instructor: Dr. Fatima **E-mail**: fatima@roanoke.edu
Office: Life Science 401B **Phone**: (540) 375-2057
Office Hours: MW 1:00PM – 2:00PM, Th 1:10PM – 1:40PM, & F 9:40AM-10:30AM
(Life Science 401B /via zoom by appointment.
Make appts at calendly.com/fatima_f)

Course Description: This algebra-based course is the second part of the two-semester introductory physics sequence. During the Spring semester, it introduces fundamental physical principles covering topics in electricity, magnetism, geometric and physical optics, special relativity, and modern and quantum physics.

Course textbook: **Course textbook**: James S. Walker, *Physics*, 5th ed., Pearson, 2016
ISBN-10: 0321976444
ISBN-13: 9780321976444
The textbook is a valuable resource with derivations, example problems, and more. It is recommended that you read the sections associated with each lesson before class.

Prerequisites: PHYS 102 or PHYS 103

Other required materials: You will need a writing utensil and paper as well as a working scientific calculator for class sessions, assignments, and exams. You will also need a bound notebook with graph paper pages for the lab section of this class (see the lab syllabus for more details).

Learning Outcomes: Upon successful completion of the course, students will be able to:
- Identify relevant physical principles which underlie the dynamics of real-world situations
- Manipulate units in order to relate physical models to observations of the physical world
- Construct organized physical analyses that demonstrate logically connected steps of thought
- Synthesize numerical information, physical assumptions, and scientific reasoning to describe physical systems
- Assess the validity and utility of a physical model in new contexts

Required Laboratory Course: You must be enrolled in the laboratory portion *PHYS 104L* of this course. Although PHYS 104L operates as a separate course, it counts as 25% of the course grade for PHYS 104. Please refer to the lab course syllabus for important information about the lab specifics and final grade.

Lecture Periods: The lecture will cover topics outlined in the course schedule and will involve a mixture of traditional lecture, demonstrations, sample problems (worked both individually and in

groups), and other activities designed to underscore the connection between course concepts and the physical world. Any question is welcomed in class at any point!

General Attendance Policy:
You are expected to attend every meeting. If you are going to be absent, I must be notified in advance. You are accountable for all work missed because of an absence. Your third and each additional absence will result in a 0.5-point reduction in your final course grade. You get two freebies so that I don't have to distinguish between excused and unexcused absences. College athletes will be afforded wiggle room; please come see me immediately if you are an athlete. If you should have an emergency that requires you to miss a large chunk of the course, please notify me ASAP.

Problem Sets: Problem sets are due **at the start of class** on the due date. Un-/assigned problems (like those in the problem sets) are "**when and where**" you will learn the course material. For better and for worse, there is no way to learn the depth of the material within the one-hour sessions that we will have together. Due to the nature of problem solving, I expect that you will work together *toward* a solution. However, I also expect that you will create an original solution to each assigned problem. Substitutions and simplifications should **NOT** be left to the "reader" (that's me) to figure out. If necessary, words and phrases need to be properly placed so that I can follow your train of thought.

Exams: There will be three one-hour mid-term exams and a comprehensive final exam, with their dates specified in the course schedule. Exam make-up for excused reasons (family or medical emergencies, and university-recognized commitments) must be discussed and arranged with me at least one week in advance, unless it is an emergency. If your missed exam is unexcused, you will receive a zero on that exam. To limit your time commitment to this class, exams will be held in class. If you receive academic accommodations or you cannot make it to class that day, you can complete the test at a different time, but please communicate this with me ahead of time
The lowest mid-term exam grade will be dropped.

Participation: What it means to "participate" in Physics 104 should include the following: listening (and responding) to lectures, attentive attendance, engagement in question and answer, working on in-class problems, summaries of one MCSP Colloquium Talks, and responsibility for your own learning (office hours, etc.). This course expects you to spend at least 12 hours of work each week inside and outside of class.

Grading: Class grades will be calculated according to the following distribution

- Lab 25%
- Participation 10%
- Homework 20%
- Three Mid-term Exam 12.5% each (i.e. the 2 highest-scoring mid-term exams)
- Final Exam 20%

Furthermore, letter grades will be assigned at the end of the semester according to the following scale

A-	90-92	A	93-100		
B-	80-82	B	83- 86	B+	87-89
C-	70-72	C	73- 76	C+	77-79
D-	60-62	D	63- 66	D+	67-69
F	<60				

You should expect to spend at least 12 hours inside and outside of class each week on this course.

MCSP Conversation Series: You are required to attend ONE talk in the MCSP Conversation Series which and submit a well-written reflection on the talk within one week of the presentation. The submission must present a brief summary of the key ideas of the talk and include a description of the parts of the presentation that were interesting, confusing, and relevant to this course. Your work must be grammatically-correct, typed, double-spaced, and approximately one page in length. Note that a simple summary of the talk is not sufficient to receive credit. Your reflection on the MCSP talk will contribute to your participation grade.

Use of Electronic Devices: Electronic devices are valuable tools; therefore, my general policy is to allow the use of electronic devices in the classroom. Laptops or tablets may be used for note-taking during regular class sessions if this seems useful to you. Scientific calculators may be used during class when needed and during exams.

However, I expect your phones to be on silent mode and out of reach at all times, and I expect that any electronic devices will not be used to browse the internet or communicate with anyone inside or outside of class. A violation of this policy during an exam will be considered violation of Roanoke College's Academic Integrity policy, and I reserve the right to limit the use of electronic devices in the classroom if I feel this policy is being abused.

Subject Tutoring: located on the lower level of Fintel Library (Room 5), is open 4-9 PM, Sunday-Thursday. Subject Tutors are highly trained, current students who offer free, one-on-one (and small group) tutorials in over 80 courses taught at Roanoke College. Check out all available subjects and schedule 30- or 60-minute appointments at www.roanoke.edu/tutoring. If you have a question, feel free to stop by, or contact us at subject_tutoring@roanoke.edu or 540-375-2590. See you soon!

Accessible Education Services (AES): located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Becky Harman, Assistant Director of Academic Services for Accessible Education, at 540-375-2247 or by e-mail at aes@roanoke.edu to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Becky Harman at your earliest convenience to schedule an appointment and/or obtain your accommodation letter for the current semester.

Academic Integrity: Your learning and integrity are at the core of your RC education. For this reason, you must follow the rules outline in the College's AI policies. See https://www.roanoke.edu/inside/a-z_index/academic_affairs/academic_integrity. Collaboration is an important skill that you will be asked to develop in class and in lab, and I would encourage you to extend this practice beyond the classroom as you work on problem sets. However, for the homework in particular, the final write-up should reflect your own understanding of the problem and I ask that you include the names of anyone you collaborated with when you turn in your problem set.

If I become aware of a possible violation of these guidelines, I am contractually obligated to report it to the Academic Integrity committee. The AI policy can be found online at: https://www.roanoke.edu/inside/a-z_index/academic_affairs/academic_integrity/resources_for_students

PHYS 104: Fundamental Physics II, Spring 2024 Daily Schedule

The following schedule outlines the tentative timeline for the covered topics and exam dates:

Day	***Chapter***	***Sections***	***Topic***
13 Jan	3	3.1-3.5	Introductions + Vectors
15 Jan	19	19.1-19.5, 19.7	Electric Charge, Force, and Field
17 Jan			
22 Jan			
24 Jan	20	20.1-20.6	Electric Potential and Energy
27 Jan			
29 Jan			
31 Jan	21	21.1-21.8	Electric Current and Circuits
03 Feb			
05 Feb			
07 Feb	***Test 1***		
10 Feb	22	22.1-22.7	Magnetic Field and Force
12 Feb			
14 Feb			
17 Feb	23	23.1- 23.6	Magnetic Flux and Induction
19 Feb			
21 Feb	25	25.1-25.3	Electromagnetic Spectrum
24 Feb	26	26.1-26.7	Geometrical Optics
26 Feb			
28 Feb			
03-07 MAR – SPRING BREAK			
10 Mar			
12 Mar	27	27.1-27.4	Human Eye and Microscopes
14 Mar	***Test 2***		
17 Mar	28	28.1-28.2, 28.4-28.5	Interference and Diffraction
19 Mar			
21 Mar	31	31.1- 31.7	Atomic Physics
24 Mar			
26 Mar			
28 Mar			
31 Mar	32	32.1-32.8	Nuclear Physics

02 Apr			
04 Apr			
07 Apr	29	29.1-29.7	Relativity
09 Apr	***Test 3***		
11 Apr			
14 Apr			
16 Apr	30	30.1-30.6	Blackbody Radiation, Photoelectric Effect
18 Apr	**Good Friday, No Classes**		
21 Apr			
29 Apr	***02:00-05:00***	***Final Exam: Cumulative***	