Physics 201: Newtonian Mechanics
Spring 2024

Class Mtgs:	MWF 9:40 AM - 10:40 AM	Instructor:	Dr. Fatima
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Student Hours & Location: M/W 10.50AM - 12 PM & F 10.50 AM – 11:30 AM (Trexler 266D/via zoom by appointment)

Required Textbook: Physics for Scientists and Engineers, Technology Update**,** Serway & Jewett, Edition 009

ISBN: 9781305116399
Required Prerequisites: Math 118 or 121 (Calculus I)

I. Components of Learning

There are several factors that make a course "good" (by good, I mean a healthy combination of the intellectual and the affective). Good courses are also clear about their essential components. Below is an attempt to be clear about how will I operate within PHYS 201, as well as my expectations of a student who is enrolled in PHYS 201.

Aspiration: Physics is a framework for observing and appreciating the physical universe, in as much as it is a manner of explaining the phenomena within it. Therefore, a few different levels of interpretation exist for the sentence, "I understand physics." My approach in this course is a 'both/and' mentality, where both the conceptual understanding (and dare I say, appreciation) and the analytical problem-solving approach can mutually coexist. Arguably, if you don't have both an interest in the conceptual and the mathematical, then eventually neither will deepen. I will provide the proper atmosphere and avenues so that neither of these necessary levels of understanding need to be sacrificed. My goal for you is that you will walk away with a deeper understanding in each of these contexts.

Newtonian mechanics implies that we will focus primarily on describing the motion of macroscopic objects that we can tangibly see and touch. One of the amazing things about the physical world is that there are many parallels between the visible macroscopic world and the world of fields and microscopic phenomena. Therefore, we should not take lightly the lessons learned within the mundane world of the everyday since it will serve us well in the future when more intriguing phenomena are introduced.

Expected Learning Objectives:

Successful students will –

1. demonstrate a proficiency with the use of units and estimation;
2. display a working knowledge between the various kinematic quantities and their graphical representation;
3. manipulate common problems utilizing forces and free-body diagrams utilizing Newton's laws of motion;
4. analyze different contributions of the total energy of a system and comment on how the energy is conserved;

5. determine the centripetal force for uniform circular and show that the net force is not equal to zero;
6. calculate the velocities for a two-body system using the conservation of linear momentum;
7. analyze the linear and rotational counterparts in general kinematics;
8. demonstrate an understanding of the effect of inertial moments on the conservation of mechanical energy;
9. describe oscillatory motion and superposition using three different physical models.

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 2-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.

Student Hours:

Please take advantage of the student hours prescribed above, or make an appointment with me.

Inquire (NQR):

I use the NQR environment extensively to place notes, announcements, assignments, *proofs*, *solutions*, links, and other course documents. Please do NOT forget to check NQR before you come to class or if you have a question about previous assignments.

Academic Integrity:

I want to foster a mutual respect for the classroom hours that we have together. In light of this, please remember to silence cell phones, electronic devices, laptops, etc. during class and come prepared. Please ask if you want to use these devices for educational purposes in class. Refer to the "Academic Integrity" page on the RC website– https://www.roanoke.edu/inside/a-z_index/academic_affairs/academic_integrity

Disability Support Services:

Accessible Education Services (AES) is 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.

Subject Tutoring: located on the lower level of Fintel Library (Room 5), is open 4-9 PM, SundayThursday. 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!

Grades: Standard letter grades (A–F) are assigned according to the following scale for this course: "A"(93– 100), "A$^-$"(90– 92), "B+"(87–89), "B"(83–86), "B–"(80–82), "C+"(77–79), "C"(73–76), "C–"(70-72), "D$^+$"(67– 69), "D"(63– 66), "D$^-$"(60– 62), "F"(< 60).

II. Modes of Learning

Your grade is determined according to the following distribution:

Exams (4)	30%	Homework	25%
		Participation	15%
Lab (201L)	20%	Quiz (weekly)	10%

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.

Quizzes: Weekly quizzes are completed individually or as a small group (my discretion). The quiz will consist of two/three problems from the class discussion, which contain the *more* important concepts and/or phenomena.

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.

Labs: Physics exists because there is a connection between the mathematical world of symbols and the empirical world of measurement. Verifying the mathematical results of physical theory is an important component of the course. Creating words and sentences that express the results of experimentation is an extremely underrated (yet important) component of carrying out the enterprise of science.

Participation: What it means to "participate" in Physics 201 should include the following: quiz completion, listening (and responding) to lectures, attentive attendance, engagement in question and answer, working on in-class problems, summaries of two 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.

Policy on Late Work:
I will grade an assignment with a 5% lateness deduction if turned in by 5:00PM on the due date. Following that, assignments will receive a further 5% lateness deduction for each successive day late (with days considered to end at 5:00 PM).

Tentative Schedule: Disclaimer: Everything below is subject to change with notice and, where appropriate, your approval.

Week	Date	Sections		Homework
1	17-Jan 19-Jan	1.1 – 1.6 2.1 – 2.3	Units, Conversions, Dimensional Analysis **Position and Instantaneous Quantities**	
2	22-Jan 24-Jan 26-Jan	2.4 – 2.5 Ch 2 3.1 – 3.3	Motion diagrams Particle analysis under constant accel **Vectors, scalars, and components**	HW1
3	29-Jan 31-Jan 2-Feb	3.3 – 3.4 4.1 – 4.3 4.3	Vector analysis and unit vectors Vectors of motion and projectiles *Projectile motion*	
4	5-Feb 7-Feb 9-Feb	4.3	Projectile motion *EXAM 1: IN-CLASS*	HW2 Review
5	12-Feb 14-Feb 16-Feb	5.1 – 5.3 5.4 – 5.5 5.4 – 5.5	**Force, inertia, and mass** Newton's second law and weight Newton's third and analysis	
6	19-Feb 21-Feb 23-Feb	5.6 – 5.7 6.1—6.2 7.1 – 7.3	Frictional Forces and analysis **Circular motion and forces** Work completed by a constant force	HW3
7	26-Feb 28-Feb 1-Mar	7.4 – 7.5	Work-Energy theorem and kinetic energy *EXAM 2: IN-CLASS*	Review

8	4-Mar 6-Mar 8-Mar	Spring Break		
9	11-Mar 13-Mar 15-Mar	7.6 – 7.9 8.1 – 8.2 8.3 – 8.4	**Potential energy and conservative forces** Conservation of energy problems Conservation of energy with friction	 HW 4
10	18-Mar 20-Mar 22-Mar	9.1 – 9.2 9.3 – 9.4 9.3 – 9.5	Linear momentum and 1-D collisions 2- D collisions and conservation Linear momentum conservation	
11	25-Mar	10.1 – 10.3	**Angular quantities and kinematics**	
	27-Mar			Review
	29-Mar		No Classes, Good Friday	
12	1-Apr 3-Apr 5-Apr	 10.4 – 10.5 10.8 – 10.9	EXAM 3: IN-CLASS Rotational kinetic energy and moments Energy of rolling objects	
13	8-Apr 10-Apr 12-Apr	10.6 – 10.7 11.1 – 11.3 11.4 – 11.5	Energy of rolling objects Torque and Analysis Vector product and angular momentum	 HW 5
14	15-Apr 17-Apr 19-Apr	11.4 – 11.5 12.1 – 12.2 12.3	Conservation of angular momentum **Objects in Static Equilibrium** Examples of Static Equilibrium	
15	22-Apr 25-Apr		FINAL EXAM (8:30 AM-11:30 AM)	HW 6 & Review