Physics 201: Newtonian Mechanics

Spring 2026

Class Mtgs:	MWF 9:40 AM - 10:40 AM	Instructor:	Dr. Fatima
Office:	Trexler 172 A	Phone:	375-2057
Email:	fatima@roanoke.edu	Classroom:	Trexler 273

Student Hours & Location: MoWe11:00AM – 12:00PM & 1:00PM-2:00PM
(Trexler 172 A /via zoom by appointment)

Required Textbook

- *Physics for Scientists and Engineers: Technology Update*, by Serway & Jewett, 9th ed, ISBN-13 978-1305116399
- Access to the Online Learning Platform via Cengage (WebAssign)

Required Prerequisites: Math 118 or 121 (Calculus I)

Components of Learning

This course provides a comprehensive introduction to the core principles of classical mechanics, focusing on the motion of objects and the forces that govern them. Through a combination of theoretical discussions, problem-solving exercises, and hands-on experiments, the course emphasizes the application of mechanics to real-world scenarios.

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;

You will not need to memorize equations in this course. *In fact, you will be given all the equations you need on the tests*! You will learn to think carefully about the situation described in a problem, applying your knowledge of physics concepts to determine a strategy. The equations to use will follow naturally from a correct conceptual analysis of the problem.

Lecture Periods:

The concepts of Newtonian Mechanics are interesting, but can be challenging. This course is designed to provide multiple passes through the material, with opportunities to improve understanding with each pass.

You are expected to do relevant textbook readings *before class*. You are not expected to understand everything in the reading, but you should make an effort and try to identify areas of confusion.

Research has shown that physics students learn better when class time is spent on interactive activities designed to improve conceptual understanding, rather than on direct lecturing. So, I generally will not cover the entire reading during lecture. Instead, I will present the main concept(s), and we'll work several in-class conceptual questions/problems, during which you will both think individually and discuss with your neighbors.

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.

Feedback and Evaluation:

Class grades will be calculated according to the following distribution

Tests:	30% (3 @ 10 % each)	Final Exam:	15%
Lab Grade:	20%	Participation:	5%
Homework:	20%	Quiz:	10%

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				

Tests will be given during class on the dates indicated. *You will be given all needed equations on the test*, though the equations will not be labeled. The final exam will have the same format as the tests and will cover the selected chapters/topics.

Lab grade: Please see the lab class syllabus for information on the lab grade.

Participation will consist mainly of attentive attendance, in-class activities including collective group problem-solving, listening (and responding) to lectures, engagement in question and answer, and working on in-class problems.

Homework assignments will be assigned weekly roughly so that you can have practice applying concepts from class. Learning physics is a bit like learning another language, it's hard to improve without practicing the fundamentals. Homework assignments are due in physical format at the beginning of class.

Quizzes will be given during class on the dates indicated. *You will be given all needed equations*, though the equations will not be labeled.

Expected Hours of Work
You are expected to spend at least 12 hours per week inside and outside of class.

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.

Make-up Tests:
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.

Policy on Late Work:
I will grade an assignment with a 1% lateness deduction if turned in by 5:00PM on the due date. Following that, assignments will receive a further 2% lateness deduction for each successive day late (with days considered to end at 5:00 PM).

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

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, 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!

Tentative Schedule:

Week	Date	Sections		Homework
1	12-Jan 14-Jan	1.1 – 1.6 2.1 – 2.3	Units, Conversions, Dimensional Analysis **Position and Instantaneous Quantities**	
2	16-Jan 21-Jan *23-Jan	2.4 – 2.5 Ch 2 3.1 – 3.3	Motion diagrams Particle analysis under constant accel **Vectors, scalars, and components**	 HW1 (21-Jan)
3	26-Jan 28-Jan 30-Jan	3.3 – 3.4 4.1 – 4.3 4.3	Vector analysis and unit vectors Vectors of motion and projectiles *Projectile motion*	 HW 2 (30-Jan)
4	*02-Feb 04-Feb 06-Feb	4.3	Projectile motion *EXAM 1: IN-CLASS*	
5	09-Feb 11-Feb 13-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	16-Feb *18-Feb 20-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	HW 3 (16-Feb)
7	23-Feb 25-Feb 27-Feb	7.4 – 7.5	Work-Energy theorem and kinetic energy *EXAM 2: IN-CLASS*	HW 4 (24-Feb)
8	03-Mar 05-Mar 07-Mar	Spring Break		
9	09-Mar *11-Mar 13-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 5 (9-Mar)
10	16-Mar 18-Mar *20-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	 HW 6 (18-Mar)
11	23-Mar 25-Mar 27-Mar	10.1 – 10.3	**Angular quantities and kinematics** EXAM 3: IN-CLASS	 HW 7 (25-Mar)
12	30-Mar 01-Apr 03-Apr	10.4 – 10.5 10.8 – 10.9 	Rotational kinetic energy and moments Energy of rolling objects No Classes, Good Friday	
13	06-Apr *08-Apr 10-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 8 (06-Apr)
14	13-Apr *15-Apr 17-Apr	11.4 – 11.5 12.1 – 12.2	Conservation of angular momentum **Objects in Static Equilibrium**	HW 9 (13-Apr)
15	20-Apr 23-Apr		 FINAL EXAM (TH 8:30 AM-11:30 AM)	

Disclaimer: Everything below is subject to change with notice and, where appropriate, your approval.
Note: Class numbers marked with an asterisk will begin with a 10-15-minute quiz.