

UNIVERSITY PHYSICS I
COURSE 21:750:213
Fall 2020

Course Description

Physics 213 is the first course of the Physics 213 and Physics 214 calculus-based introductory physics course sequence. In this course will develop both conceptual and mathematical understandings of physical phenomena by replicating the process through which physicists develop new scientific knowledge. You will then apply those understandings to new scenarios and use them to solve problems. Learning is an active process so participation is essential. This course will take place online using a combination of synchronous and asynchronous elements.

Course Goals

1. Develop conceptual and quantitative models of physical phenomena.
2. Apply models to solve problems and understand physical scenarios.
3. Justify your thinking using multiple representations (e.g. equations, graphs, words).
4. Collaborate with others to deepen understandings and improve solutions.
5. Practice scientific habits of mind in investigating new phenomena and solving problems.

Course Website

<https://rutgers.instructure.com/courses/77225>

Instructor:

Dr. Sheehan Ahmed (sheehan.ahmed@rutgers.edu)

Office hours: Wednesdays 1:00PM – 2:20PM

<https://rutgers.zoom.us/j/96966128523>

Required Materials

1. Required textbook: Etkina, E., Planinsic, M., Van Heuvelen, A. College Physics: Explore and Apply, 2nd Edition. Pearson. ISBN: 0134601823 (You can get the ebook from [Pearson](#) for \$55 or rent it from [Amazon](#) for \$27).
2. Supplementary textbook: Hugh D. Young, Roger A. Freedman, *University Physics with Modern Physics, 14th Edition*. It is perfectly acceptable to use an older or digital edition as a reference text.
3. Computer or laptop with internet access.
4. Calculator.

Class Times

Large group meeting: Mondays & Thursdays 1:00PM – 2:20PM

<https://rutgers.zoom.us/j/97673700488>

Small group meeting: Section 01 Tuesdays 11:30AM – 12:50PM

<https://rutgers.zoom.us/j/93651677929>

Section 02 Tuesdays 1:00PM – 2:20PM

<https://rutgers.zoom.us/j/99056477046>

Sequence of Topics:

| | | |
|------|--|-------------------|
| 1. | Introduction to Scientific Thinking..... | Etkina Chapter 01 |
| 2. | Motion in One Dimension..... | Etkina Chapter 02 |
| 3. | Newton's Laws..... | Etkina Chapter 03 |
| 3.1. | Gravitational Force Law..... | Etkina Chapter 03 |
| 4. | Applying Newton's Laws..... | Etkina Chapter 04 |
| 4.1. | Friction..... | Etkina Chapter 04 |
| 4.2. | Projectile Motion..... | Etkina Chapter 04 |
| 5. | Circular Motion..... | Etkina Chapter 05 |
| | EXAM 01 (Week of 10/5) | |
| 6. | Impulse and Linear Momentum..... | Etkina Chapter 06 |
| 7. | Work and Energy..... | Etkina Chapter 07 |
| 8. | Universal Gravitation..... | Etkina Chapter 05 |
| 9. | Collisions..... | Etkina Chapter 07 |
| 10. | Vibrational Motion..... | Etkina Chapter 10 |
| 11. | Extended Bodies at Rest..... | Etkina Chapter 08 |
| | EXAM 02 (Week of 11/23) | |
| 12. | Gases..... | Etkina Chapter 12 |

Course Structure

This course will be taught entirely online. To get the most out of this course, the structure has been changed to best take advantage of this. Each week of instruction will begin with various **learning activities** for you to work through. You will work through these activities on your own (or in small groups) before your **small group meeting**. In small group meeting, groups of students will lead the class in talking about the learning activities and making sense of the new ideas and concepts you encountered in the learning activities. After small group meeting, there will be various **application activities** where you will be able to use what you have learned to solve problems or answer questions. Finally, each week will end with a **module quiz** which will assess your understanding of the material learned that week. There will also be two **large group meetings**, one before small group meeting and one after, which will be used to support your learning as needed.

Learning Activities: Each module will consist of a series of activities in Canvas for you to complete. These activities include things to read or watch as well as activities which will require you to submit answers online or participate in a discussion board on Canvas. Some, but not all of these activities will be graded for participation, however you will not be able to progress through the module unless you complete all activities in order. The purpose of these activities is to help you learn; you do **not** need to worry about correctness, only doing your best. You may work on these activities on your own or in a small group based on your own preferences. Keep in mind that each week groups will be assigned to prepare a presentation one of the activities for Small Group Meeting. Group presentations will be assigned at the end of the previous week's small group meeting, so

you will have a full week to prepare. Even if you are not presenting any activities that week, it is **essential** that you complete these activities before your section's Small Group Meeting.

Small Group Meeting: Small group meetings will be your opportunity to work with an instructor and the other students in your section to make sense of the Learning Activities you have completed up to that point. Groups chosen in advance will lead a discussion about each activity and the instructor will facilitate a discussion about how these activities connect with one another to develop new physics knowledge. This is your opportunity to work closely with your peers and an instructor. Small group meetings will be held via Zoom. Use the links found on Canvas or in this syllabus to join.

Application Activities: After small group meeting, there will be additional activities on Canvas where you can practice using the new knowledge you have developed that week. These will include things like solving algebraic physics problems, using your physics knowledge to explain observations or design solutions to practical problems.

Module Quiz: Each module will end with a module quiz consisting of prepared-response questions (multiple choice/multiple correct, fill in the blank, matching, ranking, etc.) and one open-ended problem. The open-ended problem should be solved on paper with all work shown according to the problem-solving strategy taught in class. For the open-ended problems you may submit either a picture of your work or a short (no longer than 3 minutes) video in which you show your work and explain your process. You may take each module quiz as many times as you like, but the questions will be different each time. Only your highest score will be recorded in the gradebook, so there is no penalty to trying as many times as you want.

Large Group Meeting: Large group meetings will be held twice a week, one before small group meeting and one after. The purpose of these meetings will vary depending on the needs of the class. Some possible uses include reinforcing concepts with which students are struggling, modeling how to solve difficult problems, highlighting important concepts, or connecting concepts together to develop a more holistic view of physics. Large group meetings will be held via Zoom. Use the links on Canvas or in the syllabus to join.

Course Grades:

Grade Category Breakdown

| | % |
|----------------|----------|
| Participation | 20 |
| Module Quizzes | 15 |
| Exams | 40 |
| Final | 25 |

Overall Grade Breakdown

| | % |
|-----------------|-------------|
| A | 90.0+ |
| B+ | 87.0 - 89.9 |
| B | 80.0 – 86.9 |
| C+ | 77.0 – 79.9 |
| C | 70.0 – 76.9 |
| D (not passing) | 60.0 – 69.9 |
| F (not passing) | < 60.0 |

Participation: As has been mentioned many times before, learning is an active process. In order to do well in this course, you must participate fully in all of the activities listed on Canvas. Three kinds of assignments will contribute to your participation grade:

Discussion Assignments: At least once a week there will be a graded discussion assignment on Canvas. Your score for these assignments will be assigned using the Discussion Rubric (check the Rubrics tab in Canvas).

Presentations: Throughout the semester, groups will take turns presenting their work during Small Group Meetings. These presentations will be scored using the Presentation Rubric (check the Rubrics tab in Canvas).

Learning Surveys: At the end of each module you will be asked to take a learning survey to reflect on what and how you learned in that module, as well as to identify any questions you still have. Self-reflection is a vital part of effective learning. Full points are awarded for submitting your learning survey.

Module Quizzes: As noted above, each week will culminate in a module quiz. Prepared-response questions will be scored automatically for correctness while solutions to the open-ended problems will be scored using the problem-solving rubric (check the Rubrics tab in Canvas). Each module quiz can be taken as many times as you want but will be different each time. Only the highest grade will be recorded in the gradebook.

Exams: Two exams will be given to assess what you have learned in the course. You will have 90 minutes to work on each exam from the time you open the exam, but you may start the exam at any point during the week. Exams will consist of prepared-response questions and one open-ended problems which will be different for every student. After each exam has been scored, you may submit exam corrections to earn back half of the points you missed (if you originally got a 70%, complete corrections would move your grade to an 85%). Exam 1 will cover material from the first half of the semester while exam 2 will cover material from the second half of the semester.

Final: A final exam will be given during our regularly scheduled exam block during finals week. You will have 3 hours to complete this exam and the exam must be taken at the scheduled time unless arrangements are made **at least two weeks** in advance. The final will consist of prepared-response questions and two open-ended problems which will be different for every student.

How to be successful in this course

Learning in an online environment can be difficult, but there are things you can do maximize your chances of having a positive experience in this class.

- Take every opportunity to collaborate and share ideas with your classmates. Use the discussions and chat features in Canvas to connect with others. Use Zoom or Webex to set up study or work groups. Especially with everything else going on in the world right now, working online can feel very isolating. We can combat this by supporting one another and building a thriving learning environment.
- Do not hesitate to email your instructor and take advantage of office hours. We understand that not everyone is comfortable learning online and want to help you as best we can. If you have having trouble with something we can only help if we know

there is a problem. We have done what we can to ensure that you are getting reliable feedback about your learning through every step of this course, but it can also be very helpful to go over your work live with an instructor and talk through the process. Office hours allow for this kind of individualized support.

- Always try solving a problem yourself before asking for help. If you come to office hours for help with something, the very first thing we will ask is to see what you've already tried. Even if you think your work is completely wrong, trying something is always better than staring blankly at a problem.
- Read and interrogate the textbook as you learn. Reading a textbook is not like reading a novel. To get the most out of it, question your understanding of every sentence you read. Some questions that are always useful to ask while reading a textbook are "Why is this true?" "How does this relate to what I just read?" "Where did this come from?"
- Study effectively. A lot of the ways students typically study just don't work and only waste time. Simply re-reading old notes or watching informational videos or looking at the solutions to problems generally will not help you apply that knowledge yourself on exams. It is very easy to listen to someone else explain something and trick yourself into thinking that you understand it when you don't. The only way to know what you really know is to test yourself. Some ways to do this include solving problems and then checking your solutions, making flashcards with questions on one side and answers on the other, re-writing notes from memory and checking your accuracy, or having a friend quiz you on concepts or the meanings and uses of certain laws or relationships.
- Review past material. Research has shown that people will consistently forget a large amount of what they learn over time. However, periodic review or practicing of old material can drastically mitigate this loss (Figure 1). Take advantage of this by reviewing past learning activities and re-taking past module quizzes.

Typical Forgetting Curve for Newly Learned Information

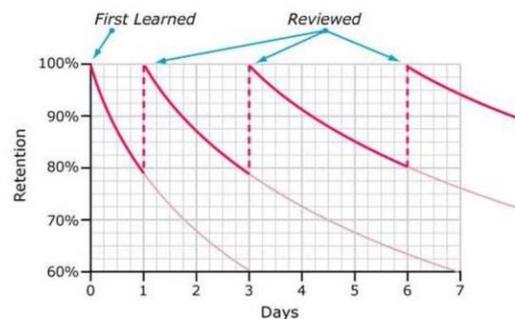


FIG 1. A graph showing the amount of knowledge retained over time. The faint lines represent the continuation of the curve without review or practice. Notice that the forgetting curve gets progressively less steep the more often material is reviewed.

- Do not get discouraged if you don't get something right away. Remember, learning is a process. Nobody learned to ride a bicycle without falling many, many times. There is no professional chef who hasn't burned and ruined hundreds of dishes while learning to cook. When you get something wrong it's not a failure, it's a part of learning. What matters is not how many mistakes you make but that you keep trying until you succeed.

Organization Strategies: You will need to keep your class materials organized. Especially in an online course, it can be easy to overlook this aspect of your preparation. It may be helpful to organize yourself as if this were a physical course like any other. We recommend:

- Have a 3-ring binder to serve as your course notebook which can be separated into sections for each module we cover. Use it for taking notes on lined loose-leaf paper or loose-leaf graph paper.
- Print out pages and activities from Canvas and add them to your notebook alongside your own notes, including quizzes and exams.
- Solve all problems on paper in your notebook. Follow the problem-solving strategy used in class. Always write the full text of the problem you are solving to make your notes easier to understand when you go back.

Attendance & Other Course Policies: You are expected to attend all small group meetings. Attendance at large group meetings is encouraged but not required. All large group meetings will be recorded and uploaded for later viewing. If you are having any issues which may affect your attendance or participation in class, please contact your instructor to work out a solution.

For religious holidays, please report your absence using the Self-Reporting Absence Application: <https://sims.rutgers.edu/ssra/>. Your absence will be excused.

Even if you are absent from a day of class, you are still responsible for all activities and assignments found on Canvas.

Grade disputes must be brought to the instructor within 2 weeks of receiving the grade. For example, a grade complaint about Exam 1 will not be considered at the end of the semester.

Rutgers Academic Integrity Policy

Academic Integrity: As an academic community dedicated to the creation, dissemination, and application of knowledge, Rutgers University is committed to fostering an intellectual and ethical environment based on the principles of academic integrity. Academic integrity is essential to the success of the University's educational and research missions, and violations of academic integrity constitute serious offenses against the entire academic community.

- Academic Integrity Policy: <http://academicintegrity.rutgers.edu/academicintegrity-policy/>

Disability Services

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, you must complete and submit the Registration Form, schedule and complete an intake meeting, and submit appropriate documentation. If your request for reasonable accommodations is approved, you will receive a Letter of Accommodations (LOA), which you should present privately to the instructor as early in the semester as possible. Accommodations are not retroactive and are effective only upon submission of the LOA

to the instructor. Please begin the process by completing and submitting the Registration Form, Applying for Services, available at the website below.

- Applying for Services: <https://ods.rutgers.edu/students/applying-for-services>
- Documentation Guidelines: <https://ods.rutgers.edu/students/documentationguidelines>
- Letter of Accommodations (LOA): <https://ods.rutgers.edu/myaccommodations/letter-of-accommodations>
- Office of Disability Services (ODS) Suite 219, Paul Robeson Campus Center (973) 353-5315 odsnewark@rutgers.edu

Religious Holiday Policy

Students are advised to provide timely notification to instructors about necessary absences for religious observances and are responsible for making up the work or exams according to an agreed-upon schedule.

Counseling Services

Counseling Center Room 101, Blumenthal Hall, (973) 353-5805 or <http://counseling.newark.rutgers.edu/>.

Students with Temporary Conditions/Injuries

Students experiencing a temporary condition or injury that is adversely affecting their ability to fully participate in their courses should submit a request for assistance at: <https://temporaryconditions.rutgers.edu>.

Students Who are Pregnant

The Office of Title IX and ADA Compliance is available to assist students with any concerns or potential accommodations related to pregnancy: (973) 353-1906 or TitleIX@newark.rutgers.edu.

Gender or Sex-Based Discrimination or Harassment

Students experiencing any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, should know that help and support are available. To report an incident, contact the Office of Title IX and ADA Compliance:

- (973) 353-1906 or TitleIX@newark.rutgers.edu.
- To submit an incident report: <http://tinyurl.com/RUNReportingForm>.
- To speak with a staff member who is confidential and does NOT have a reporting responsibility, contact the Office for Violence Prevention and Victim Assistance: (973) 353-1918 or run.vpva@rutgers.edu.