

INTRODUCTION TO MODERN PHYSICS
COURSE 21:750:316
FALL 2020

Instructor: Dr. Claudiu Stan; claudiu.stan@rutgers.edu; 369 Smith Hall
Office Hours: Tuesday 2:30-3:30pm. *Held over Zoom. See Canvas for the link.*

Class Time & Location:

Lecture: Tuesday & Thursday 11:30am-12:50pm,
Classes will start with an online format. *Done using Conferences in Canvas.*

Final Exam Time & Location:

The exam period is on Tuesday Dec 22, 11:45am – 2:45 pm.

Note: Students must bring final exam conflicts to the attention of their dean of students at least two weeks before the first final exam day

Textbook:

R. A. Serway, C. J. Moses and L. A. Moyer, Modern Physics, 3rd ed., Thompson, 2005.
(You can get the ebook from Amazon for \$70; rent from Amazon for \$30.)

Other Required Materials:

- 1) Laptop or tablet for attending online classes, accessing Canvas materials and doing quizzes in class
- 2) Personal device(s) (smartphone, etc.) for generating and uploading written assignment files as scanned or photographed files. Please note that the files must be in one of these formats: pdf, doc, jpg, tif, bmp.
- 3) Pocket calculator (smartphone, tablets, computers, etc. may not be used on exams)
- 4) This is optional but will be helpful: Printer for certain assignments.

Course Description: Physics 316 will introduce students to some of the most important physics developed since ~1900, such as relativity and quantum physics. Also covered are the phenomena and experiments that triggered the development of modern physics. Along with the introductory 200-level Physics courses, this course will give students the preparation needed to take more advanced courses in Physics.

Learning Goals: The primary learning goals are:

1. Learn a range of new physical phenomena, concepts and laws that are the core of Modern Physics.
2. Develop a physical understanding of Modern Physics concepts, which are less intuitive than those covered in General Physics.
3. Learn how to apply physical laws and mathematical tools to solve problems in the subject area of the course.

Topics:

1. Special relativity 1(Serway *et al.* Chapter 1)
2. Special relativity 2(Serway *et al.* Chapter 2)
Test 1: Chapters 1-2
3. The quantum theory of light. (Serway *et al.* Chapter 3)
4. The particle nature of matter (Serway *et al.* Chapter 4)
5. Matter waves (Serway *et al.* Chapter 5)
Midterm: Chapters 1-5
6. Quantum mechanics in one dimension (Serway *et al.* Chapter 6)
7. Tunneling phenomena (Serway *et al.* Chapter 7)
Test 2: Chapters 6-7
8. Quantum mechanics in three dimensions (Serway *et al.* Chapter 6)
9. Atomic structure(Serway *et al.* Chapter 8)
10. Statistical mechanics (Serway *et al.* Chapter 10)
11. Molecular structure(Serway *et al.* Chapter 11)
Final Exam: All the covered material

Course Structure:

Assigned readings: Readings from the textbook will be assigned and must be completed before lectures. The readings will be posted on Canvas (approximately one week in advance). You are required to read the material to familiarize yourselves with the topic. Try to identify the most important concepts by paying attention to the items highlighted in the textbook: figures, highlighted statements, equations. You are not required to work out examples or problems. These readings will help you understand better the lectures, and you will need the reading to answer one question at the beginning at the lectures.

Lectures: *Before the lectures you must do the assigned reading.* The lecture material will be presented both on slides and as worked examples at the blackboard; the slides will be posted on Canvas after the lecture.

The lecture will typically include two graded quizzes. They both count for the grade, and will be submitted using the Canvas app. The first quiz will be a short question on the assigned reading, and the second quiz will be based on the material covered in class. For the second quiz you may team up with 1-2 of your colleagues.

Homework: *Late homework will not be accepted.* Homework will be posted on Canvas at least one week in advance and is due in Canvas, typically Tuesdays before class; the posting will specify the exact deadline. Homework will primarily consist in solving problems but may include derivation of

certain formula, or special problems. You are encouraged to form study groups but every student must present their homework independently.

Special assignments: Special assignments, such as a problem-solving session in class, may be assigned instead of standard lecture covering new material.

Synchronous vs asynchronous learning: The lectures can be attended asynchronously by watching the Canvas BigBlueButton recordings. You still need to do all the class activities (pre-lecture reading, quizzes), although the quizzed will not be graded. Keep in mind that the synchronous lectures are more effective for learning. If you do the lectures asynchronously, you will have to work more to learn as much.

If you want to take classes asynchronously, you must let me know before the class, otherwise if you don't show up for the lecture it will be considered an absence.

Course grades:

In class quizzes: You must be attending the class to take the quizzes. The in-class quizzes are also a measure of your participation in the class, therefore if you are present you will receive partial credit for an incorrect answer.

Homework: You must show how your thinking leads to your response (diagrams, equations, mathematical derivation, etc.) to get full credit. Your reasoning or rationale is the “meat” of the answer. It is your responsibility to clearly present the thinking that leads to the answer.

Tests: The two tests, each 30-40 minutes long, will be given during class, at the end of the class. Make-up tests will not be administered. If you have an excused absence (with documentation) on the day of a test, the other test score will count twice.

Midterm exam: The midterm exam will be given during class and will take the whole duration of the lecture. Make-up midterm exams will not be administered. If you have an excused absence (with documentation) on the day of a midterm exam, your Final Exam score will be counted with the combined weight of the Midterm and the Final (i.e. 50% of the grade).

Grading for exams and tests: For open-ended questions on exams, you must show the derivation to get full credit, same as in the homework (see the homework section above). For multiple-choice questions, partial credit may be given if you show the derivation but pick the incorrect answer.

Grading Scheme:

In class quizzes:	20%
Homework	10%
Tests	10% each
Midterm exam	20%
Final exam	30%

Attendance & Other Course Policies: You are expected to attend all classes. Only absences due to significant special circumstances **with documentation** are excused, such as death in the family or illness with doctors note. Unfortunately, we are unable to accommodate lateness or absences due to traffic.

Because issues do arise, students are permitted two lecture absences. This means that at the end of the semester I will drop four *in-class quizzes* (to account for technical difficulties as well) and one *homework*, no questions asked. If you have no absences, I will drop your lowest grade.

For religious holidays, please report your absence using the Self-Reporting Absence Application: <https://sims.rutgers.edu/ssra/>. Your absence will be excused and your daily grade (*in-class quiz* or *homework*) will be dropped.

If you are absent from a day of class, you should keep up with the course content by doing the assigned reading, reading the posted course slides, and doing the homework.

Student attendance is recorded via the in-class quizzes. **Students with more than four absences will automatically receive a failing grade.** If you think attendance may be a problem for you due to outside obligations, please meet with the instructor at the beginning of the semester or prior to your absences to discuss possible accommodations or solutions.

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

Rutgers Academic Integrity Policy: 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. The entire Academic Integrity Policy can be found here: <http://academicintegrity.rutgers.edu/academic-integrity-policy/>

Religious Holiday Policy and Accommodations: 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. The Division of Student Affairs is available to verify absences for religious observance, as needed: (973) 353-5063 or DeanofStudents@newark.rutgers.edu.

Accommodation and Support Statement

Rutgers University Newark (RU-N) is committed to the creation of an inclusive and safe learning environment for all students and the University as a whole. RU-N has identified the following resources to further the mission of access and support:

For Individuals with Disabilities: The Office of Disability Services (ODS) is responsible for the determination of appropriate accommodations for students who encounter barriers due to disability. Once a student has completed the ODS process (registration, initial appointment, and submitted documentation) and reasonable accommodations are determined to be necessary and appropriate, a Letter of Accommodation (LOA) will be provided. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at ods.rutgers.edu. Contact ODS at (973)353-5375 or via email at ods@newark.rutgers.edu.

For Individuals who are Pregnant: The Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy. Students may contact the Office of Title IX and ADA Compliance at (973) 353-1906 or email TitleIX@newark.rutgers.edu.

For Absence Verification: The Office of the Dean of Students can provide assistance for absences related to religious observance, emergency or unavoidable conflict (e.g., illness, personal or family emergency, etc.). Students should refer to [University Policy 10.2.7](#) for information about expectations and responsibilities. The Office of the Dean of Students can be contacted by calling (973) 353-5063 or emailing deanofstudents@newark.rutgers.edu.

For Individuals with temporary conditions/injuries: The Office of the Dean of Students can assist students who are experiencing a temporary condition or injury (e.g., broken or sprained limbs, concussions, or recovery from surgery). Students experiencing a temporary condition or injury should submit a request using the following link: <https://temporaryconditions.rutgers.edu>.

For English as a Second Language (ESL): The Program in American Language Studies (PALS) can support students experiencing difficulty in courses due to English as a Second Language (ESL) and can be reached by emailing PALS@newark.rutgers.edu to discuss potential supports.

For Gender or Sex-Based Discrimination or Harassment: The Office of Title IX and ADA Compliance can assist students who are experiencing any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking. Students can report an incident to the Office of Title IX and ADA Compliance by calling (973) 353-1906 or emailing TitleIX@newark.rutgers.edu. Incidents may also be reported by using this link: tinyurl.com/RUNReportingForm. For more information, students should refer to the University's Student Policy Prohibiting Sexual Harassment, Sexual Violence, Relationship Violence, Stalking and Related Misconduct located at <http://compliance.rutgers.edu/title-ix/about-title-ix/title-ix-policies/>.

For support related to interpersonal violence: The Office for Violence Prevention and Victim Assistance can provide any student with confidential support. The office is a **confidential resource** and does *not* have an obligation to report information to the University's Title IX Coordinator. Students can contact the office by calling (973) 353-1918 or emailing run.vpva@rutgers.edu. There is a confidential text-based line available to students; students can text (973) 339-0734 for support.

For Crisis and Concerns: The Campus Awareness Response and Education (CARE) Team works with students in crisis to develop a support plan to address personal situations that might impact their academic performance. Students, faculty and staff may contact the CARE Team by using the following link: tinyurl.com/RUNCARE or emailing careteam@rutgers.edu.

For Stress, Worry, or Concerns about Well-being: The Counseling Center has confidential therapists available to support students. Students should reach out to the Counseling Center to schedule an appointment: counseling@newark.rutgers.edu or (973) 353-5805. If you are not quite ready to make an appointment with a therapist but are interested in self-help, check out *TAO at Rutgers-Newark* for an easy, web-based approach to self-care and support: <https://tinyurl.com/RUN-TAO>.

For emergencies, call 911 or contact Rutgers University Police Department (RUPD) by calling (973) 353-5111.