

Spring 2019 Physics 231 Modern Physics CRN 44727

Professor

Dr. Jared Workman

Class Location

WS 160

Class Hours

2:00-3:15 Tuesday & Thursday

Text Book

“Modern Physics for Scientist and Engineers”, Thornton and Rex 1-133-10372-3

Course Website

<http://myhome.coloradomesa.edu/~jworkman/teaching/spring19/231/syllabus231.pdf>

A copy of this syllabus will be posted on this site. If you ever forget this site's link go to www.jaredworkman.com and scroll down to the “My Colorado Mesa Webpage” link.

Welcome to Physics 231, Modern Physics

This syllabus is your guide to class policies and procedures as well as a tool for planning. Each student is encouraged to work with the instructor and their peers. This course provides an introduction to quantum mechanics and the structure and behavior of atoms. Quantum mechanics is an important subject for working physicists and electrical engineers. These topics are essential for understanding chemistry and form the foundation of electronics, optical technologies, and material science. Specific topics explored in this course include the experimental foundations of quantum mechanics, early quantum theory, Schrödinger's wave equation with applications to one-dimensional quantum mechanics, the wave equation in three dimensions with applications to the hydrogen atom and atomic physics, molecular physics, nuclear physics and elementary particle physics. If we have the time, I will discuss big-bang nucleosynthesis as well.

What We Will Cover

- Quantization of Light
- The Nuclear Atom
- Wavelike Properties of Particles
- Schrödinger's Equation
- The Hydrogen Atom
- Atomic Physics
- Molecular Physics
- Nuclear Physics
- Particle Physics

Here is CMU's course catalog description:

PHYS 231 Fundamental Mechanics (3)

Quantum theory in the examination of blackbody radiation, the photoelectric effect, and energy quantization of atoms. The Schrodinger wave equation used to analyze simple quantum systems. Applications drawn from atomic and molecular physics, solid-state physics, nuclear and high-energy physics, and astrophysics.

Prerequisites: PHYS 132, 132L, and MATH 253

Physics can be a very daunting subject when first encountered, the notions can appear strange and different students learn in different ways. If you do not understand something please come by and ask me for more help. You are also encouraged to work with you peers. We will be going over some math you will not have seen before in this course. Feel free to come by my office for help.

What to look for in this syllabus

- How to contact me
- Evaluation (grades)
- Late Work Policy
- Attendance Policy
- Homework
- Exams
- Schedule
- Class Notes
- Resources for student assistance
- Student Conduct
- Important Dates
- Course Learning Objectives
- Workload Expectations
- Student Learning Objectives

How to Contact Your Instructor

Visit my office: WS 230C

Office Hours: Mon/Wed 10:00-11:00, Tue/Thu 1:00–2:00, & Fri 12:00-1:00

Leave me a message at: (970)-248-1327

Email me at: jworkman@coloradomesa.edu

Email is the fastest way to contact me

Evaluation

Homework 25%

Exams 45%

Final Exam 30%

Grading

Grades will be assigned as follows:

Excellent	A	> 90%
Good	B	80%-90%
Average	C	70%-80%

Deficient	D	60%-70%
Failing	F	< 60%

A curve may be used at the end of the semester. I generally normalize the entire class's grade by the highest non-outlier score. I can be contacted at any time to give you an update of your current grade.

Late or Missed Work/Exams

Late Work is not accepted. Missed exams will be automatically assigned a grade of zero. I can be contacted PRIOR to an assignment/exam date if flexibility is needed however any missed work will require documentation to be excused.

Homework

Homework will be assigned every one to two weeks on the course website, it is your responsibility to keep up.

Homework is essential to mastering the material. Readings are laid out in the tentative schedule portion of this syllabus. You are expected to have read the weeks chapters by the beginning of the week they are listed under. I may post or hand out partial solutions to homeworks after they are turned in. You are encouraged to re-work incorrect homework problems.

Copying has become almost ubiquitous in analytical classes. As a result, I grade homework very cursorily but if you copy, you'll fail. A good indication that you are copying is high homework grades and low test grades.

All homework must be done on only one side of a standard 8"x11" sheet of paper. Homework done on both sides of a sheet of paper may be refused or result in a significant grade reduction.

Failure to staple homework will result in a 10 percent per assignment penalty.

Failure to use units will result in a 15 percent penalty.

Exams

There will be three exams including the final. Each exam will be worth 15% of your grade except the final which will be worth 30% of your grade. You may fill out both sides of an 8"x11" sheet of paper and bring it to the exam. The Final Exam will be on Tuesday, May 14th from 1:00-2:50.

Resources for Students

Your instructor: I am here to help you learn; please let me know if you are having trouble with anything! My contact information is at the top of the syllabus, or you can talk to me after class or during my office hours.

The Course Website: Contains all class information and several helpful (and some just fun) links.

Tutorial Learning Center: HH113 <http://www.coloradomesa.edu/tutoring/index.html>

Students With Disabilities: Students with disabilities have certain privileges extended to them including but not limited to extended exam time. It is your responsibility to contact the EAS (Educational Access Services) At Houston Hall, Room 108, 1-970.248.1856 <http://www.coloradomesa.edu/eas/links.html> and bring me the necessary forms for any special dispensations received.

Class Policies

All students expected to follow the Student Code of Conduct. Violations of the Student Code of Conduct may result in disciplinary action. The code of conduct is here here

http://www.coloradomesa.edu/academics/policies/academic_integrity.html. Some specific items that are important in this class are:

1. Don't call me mister, it's Dr. Workman.
2. Create and sustain a respectful and quiet learning environment. Allow your fellow students to learn and the instructor to teach. Disrespectful, disruptive or abusive behavior toward an individual or group is unacceptable. If you are disruptive to your classmates or to me, I will dis-enroll you from the course.
3. Due to the rapid pace of this course, late work is generally not accepted. In the event of illness, family emergency or other special circumstances, you must contact me BEFORE the deadline to make arrangements for late work or early tests. At the instructor's discretion, you may then turn in the work within 1 week of the deadline.
4. I encourage participation, ask questions, email me, ask for reading material for your own edification after the course is over, provide me with feedback. I am not directly grading you on participation but it will play a factor in the end of the semester grade. This is an interesting topic and I want you to be involved in learning it.
5. Turn off your cell phone.
6. No smart phones, ipads, earphones, etc during class time, no texting or web browsing. You all get one freebie phone ring then I may ask you to leave. I reserve the right to temporarily or permanently remove a student for the continued disruptive use of electronic equipment.
7. Laptops are fine for note taking but please do not web surf during class. If I find you surfing the web you forfeit your laptop privileges. Students using laptops are required to sit at the front of the class.
8. I will turn any students I find cheating, copying each other's work, or plagiarizing material over to the department chair, no exceptions. If you are unsure if something is prohibited, ask me. You are encouraged to work together but please do not hand in identical assignments, they will not be accepted.
9. Please arrive to class on time and wait until class is over to leave. I will remove students who regularly arrive late from the course.
10. It is your responsibility to learn of any missed work.
11. Don't talk during class, raise your hand whenever you want to but don't talk. I reserve the right to remove you from the class for the day or completely dis-enroll you from the course for talking during lecture.
12. I do not answer emails where the information can be found on the course website or in this syllabus.

Important dates:

<http://www.coloradomesa.edu/registrar/dates.html>

Course Learning Objectives

A student who has taken this course will demonstrate the ability to:

1. Translate between verbal and mathematical descriptions of physical situations. Apply mathematical reasoning, using algebra, trigonometry, and calculus to analyze these situations.
2. Articulate the arguments, verbal and mathematical, used to analyze physical situations.
3. Represent physical processes graphically and describe given graphical representations in physical terms.

4. Use the mathematics of vectors, vector algebra, and vector components to analyze physical situations.
5. Apply an understanding of the historical development of the transition from classical to quantum mechanics.
6. Apply Schroedinger's equation to 1, 2, & 3 dimensional systems.
7. Apply the concepts used in atomic, molecular, and nuclear physics to quantify the physical properties of these systems.
8. Distinguish between and relate concepts and quantities used to describe fermionic, classical, and bosonic systems of particles.
9. Apply the concept of blackbody radiation to multi-level laser systems.
10. Demonstrate an understanding of elementary particle physics and their states and interactions.
11. Apply an understanding of nuclear reactions and the methods by which particles react, annihilate, and change.
12. Apply the concepts of modern physics to various historical experiments
13. Apply the concepts of special relativity to situations in which classical mechanics fails to yield the correct results.

Work Load Expectations:

An undergraduate student should expect to spend on this course a minimum of two hours outside the classroom for every hour in the classroom. The outside hours may vary depending on the number of credit hours or type of course. More details are available from the faculty member or department office and in CMU's Curriculum Policies and Procedures Manual.

Student Learning Outcomes:

- 1) Articulate the knowledge base and show fluency with the ideas and techniques of the major fields of physics (classical mechanics, electromagnetism, statistical physics and quantum theory).
- 2) Translate physical problems into mathematical problems, solve these using appropriate mathematics and extract physically meaningful statements from the solutions.

Disclaimer: The instructor reserves the right to modify this syllabus and schedule.