# PHYSICS 2620: Modern Physics

## Syllabus

September 2, 2019

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| Lecture Sessions: | MWF 12:00-12:50 pm | Rm. 204, Physics Building |
| Instructor: | Xiaochao Zheng | email: xz5y@virginia.edu |
| Instructor | W 1-2pm and 3-4pm | Office 135, Physics Building |
| Office Hours: | Th 1:30-3:30pm | same |
| | and by appointment | |
| Discussion Sessions | W 2:00-2:50pm | Rm.177, Ruffner Hall |
| | Th 3:30-4:20pm | Rm 105, Dell 1 |
| Teaching Assistant | Cheng Chen | email: cc9rj@virginia.edu |
| TA Office Hours: | T 9-11am | Rm.220, Physics Building |
| | Th 4:30-6:30pm | same |
| | F 10am-12pm | same |
| Grader | Kristen Galban | email: kmg4ue@virginia.edu |

Prerequisites: PHYS2415 or 1720 and MATH2310. Basic knowledge of differential equations is strongly recommended.

### Course Organization

The student is expected to achieve a quantitative understanding of the foundations of modern physics, and a working knowledge of the subject in solving practical problems. We will cover: special relativity, photoelectric effect, quantum mechanics (Schrodinger equation), the atomic hydrogen, nuclear physics, particle physics and standard model, and cosmology.

The course comprises lecture sessions, discussion sessions (with graded quizzes), weekly homework assignments, two in-class midterm exams, and one final exam. Each lecture session will include introduction and explanation of new concepts, and working examples. The separate discussion session (administrated by the TA) will include Q&A session on concepts learned and previous homework problems, followed by in-class quizzes that will be graded. Quizzes will be open-book and worked in groups. The midterm and the final exams will be close-book and pledged. The exams may include 1-2 problems that are only slight variations of the quiz problems.

Iclickers are required to complete in-lecture short questions and discussions. Iclicker will start on the second day of lecture and will be counted towards the final grade the following week. If you use an iclicker remote, please register the remote ID on Collab (under this course's site). One can also use smartphone app for the clicker. Iclicker grades will be posted on Collab weekly.

Homework assignments will be posted on Collab (under "Resources") every Friday and due the following Friday. Students may turn in homework during the Friday lecture or to the grader's box after the lecture, but no later than the due time shown on the assignment. No late homework will be accepted unless a prior arrangement is made with the instructor. Students are encouraged

to discuss problems with others while completing homework assignments. However, it is unlikely the student will gain a passing proficiency on the course material without working out most or all of the homework problems. Thus, each student is required to work out the final solution on their own. Copying homework solutions without thinking is prohibited.

Important: In previous years, different textbooks were used and different sub-fields of physics were emphasized. Similarly, this time we will not be able to cover all chapters of the textbook, and will focus on material that the instructor finds important and/or is familiar with.

While there is increasing interest in quantum computing, the preliminary quantum mechanics covered in this course will be based on Schrodinger's representation. Therefore it will unlikely serve as the quantum mechanics preliminary required to study quantum computing (which is best learned in Heisenberg's representation).

### Textbook and Reading Material

The **textbook** for the course is "Modern Physics", by Kenneth Krane, third edition, published by John Wiley & Sons, Inc., ISBN-13: 978-1118061145, ISBN-10: 1118061144. Both hard and electronic copies would be okay.

For each chapter there may be extra reading materials. These materials, as well as weekly assignments, will be posted on Collab. Some homework problems may be based on the reading material.

### Exams

There will be two midterm exams during class hours and one final exam. Study guides will be provide in advance, listing important concepts and equations. All exams will be close-book with a formula sheet provided by the instructor. This means you will not be able to prepare your own formula sheet. However, the formula sheet will be provided one week in advance of each exam and you may suggest additional equations or information that should be added to the formula sheet. Whether your suggestion can be accommodated will be decided by the instructor.

### Solutions and Other Printed Material

Material that will available on Collab and as hard copies upon request:

- Course syllabus, calendar, and each week's homework assignment;
- Solutions to weekly discussion quizzes;
- Solutions to homework;
- Practice exams along with solutions: will be provided 1-2 weeks before each exam.

Material that will available as hard copies only, in class:

- Solutions to the actual exams.

## Grading

The final grade will be determined as follows:

- Iclicker questions, in lecture: 6%
- Discussion session quizzez: 10%
- Homework assignments: 20%
- Two in-class midterm: 12% each
- Final Exam: 40%

Homeworks and exams will be graded based on clarity, logical structure, physical insight, in addition to mathematical manipulation. Spelling, grammar, and neatness contribute to the overall assessment. Please use this opportunity to practice scientific writing. Typically, every solution should include at least:

- a diagram or figure to illustrate the problem or your solution, if applicable
- definitions of variables
- physical laws applied and relevant equations
- clear statements of any assumptions made
- (for numerical answers) a clearly boxed answer with appropriate significant figures and units

Keep in mind that solutions of too short or too long lengths are both ditriminal to the clarity of expressing your ideas. In other words, explain clearly, not repeatedly. You must also practice common sense when presenting your answers. If you have any question regarding how to write a good solution, feel free to ask the instructor, the TA, or the grader.

For those who fill out the course evaluation towards the end of the semester, the lowest HW score will be exempt from the final grade. Do not use this opportunity too early.

## Important Dates

- first lecture: Wednesday August 28;
- first discussion sessions: Wednesday September 4 and Thursday September 5;
- last day to add a course (College of A&S): Tuesday September 10;
- last day to drop a course (College of A&S): Tuesday, September 10;
- **first midterm exam will be held in class on Friday, October 4;**
- no lecture on Monday October 7 (reading day);

- last Day to withdraw from a course (College of A&S): Tuesday, October 22
- **second midterm exam will be held in class on Friday, November 8;**
- no lecture or discussion session from Wednesday November 27 through Friday November 29 (Thanksgiving recess);
- last discussion sessions: Wednesday December 4 and Thursday December 5;
- last lecture: Friday December 6;
- **final exam: Saturday, December 14, 2-5pm.**

## Class Calendar

The course calendar will be provided in a separate document.