

General Physics III

Spring 2020 PHYS 283

Physics 283 Fall 2020 Syllabus

Instructor:

Professor George Coutrakon

Office: Faraday Hall (FH) Room 218

Office hours: 3:30 – 4:30 pm on Tuesdays or by appointment via BB Collaborate

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Course Type: This is a hybrid course due to the Covid-19 pandemic. This means that we will only meet once per week, online, on Tuesdays, through Black Board (BB) Collaborate. This time will be used to answer questions regarding reading assignments, homework (HW) questions, HW due dates, exam dates, and material that will be covered on the exams. In addition, we will discuss course material as time permits, but the bulk of the lectures will be on YouTube. (See link below for YouTube videos.) Finally, there will be 4 in-class exams given in the Carl Sandburg Auditorium (Holmes Student Center) during a Tuesday or Thursday class period. These dates and times are listed below. They are the only dates that you must be on campus for the course.

Course description:

Classical optics, special relativity, theory of quantum mechanics (QM) using calculus and simple differential equations. Applications of QM to atomic and solid state physics will also be included.

Lectures and Course Meeting time:

All lectures are pre-recorded and are required viewing on YouTube. Tuesdays 2:00PM - 3:15 PM Via BlackBoard Collaborate

Textbook: *Physics for Scientists and Engineers with Modern Physics* by Debora Katz, 1st edition. Chapters 35-42 (excluding Ch 37 and 38) will be the focus of this course. The course will end with a chapter on semiconductors, diodes, and transistors. This is not in the textbook, but this material has been copied from another text (Giancoli) and is placed in a Black board folder under Weekly Materials.

Pre-recorded Video Lectures on You Tube

All lectures are available and required for viewing on YouTube. The address is

<https://www.youtube.com/channel/UCNYVnFVjfCyuwzUafdROMQ>

They are labelled by lecture number (1 -24) and by Chapter (35-42) but not by specific content. The lectures are called “Phys 283 Lectures Coutrakon”.

Class Notes and Power Point Slides

All class notes are in folders within Weekly Materials and they are labelled by chapter number. Also, the Power point slides for Ch 35 and 36 and Solid State Physics are posted in Weekly Materials. The other chapters are given using the white board and are reproduced in the lecture notes folders, also in Weekly Materials.

Web site for online HW:

General course information is available on the NIU Black Board web site. This course will be using an on-line homework (HW) system provided by Cengage Learning called WebAssign. The WebAssign is integrated with Black Board so that you can create your account and access the WebAssign HW within Black Board. Cengage recommends going to the 3 video links listed below to see how to get started. A representative from Cengage will come to the first class to explain your purchase options. Note that Cengage Unlimited is only \$20 more than the other options and gives you much more access to other books including calculus books that you may want for your math courses. If you have already purchased the multi-term access to Katz's book, you should be all set. The 3 video links are listed here. Also, WebAssign will not be ready for enrollment until the first class period.

1. Brief walk through of Cengage Unlimited
2. <https://play.vidyard.com/ATYF5Ek5Y9qdXJC93MJkEz>
3. Multi-Term Access Video through Cengage Unlimited
4. <https://play.vidyard.com/Rs3xALgreFAviR8xgp2qn7>
5. Accessing your Print Option through Cengage Unlimited
6. <https://play.vidyard.com/tCmahZqerofRy6v3HZiSve>

In order to use WebAssign, you need to either purchase an access code that includes an electronic version of the text book (for about \$96, for the single term version) or use the access code that came with your textbook. Once you have an access code you need to enroll in this class within WebAssign through Black Board. Note there is also a 2 week grace period that allows you to start using WebAssign for HW before you make the purchase. That 2 week grace period will end at the end of the 2nd week of the course.

Prerequisites:

Math 230 (Calculus II), and Phys 273 (General Physics II, Electricity and Magnetism)

Homework (HW):

There will be weekly homework assignments through WebAssign that you can access from the NIU Black Board website. Homework will generally not be accepted late without a very good reason. Students biggest mistake is waiting to the last day to start the HW or forgetting to check due dates. For consistency, I will make all due dates either on Tuesday night or Friday night. Occasionally, the student may have given the correct answer which WebAssign did not recognize. These are reviewable by me. Do not panic. I will allow for corrected HW scores. Students are also expected to read the chapter or section from the textbook as stated in Black Board (or in class) under Weekly Materials for the week it is being covered. It is never a good idea to attempt problems without reading the material first or waiting until the due date to start HW. Remember, HW counts for 50% of your grade.

Grading:

The approximate weighting of grades is given below.

| | |
|---------------------------|-----|
| Homework (HW) | 50% |
| Exams (3): | 30% |
| Comprehensive Final Exam: | 20% |

Final grades will use the +/- system and will be based on the Weighted Total point score in Black Board which includes all HW and three exams. In past semesters the grading curve had the break point between B- and C+ at or near the mean of all the Weighted Total scores for the class. For example, one semester the mean Total Weighted score was 70 out of 100 total weighted points and this mean score was at the border between B- and C+. One final important point, In order to receive a B- or higher, you must have an average score from all exams that is above 50%. In order to get a C grade or higher, one must average at least 38% or higher. No exceptions. The exam problems ask similar questions as the homework questions and use the same equations. All equations, and constants, will be provided to you before and during the exam. You also can bring one sheet of notes, 8.5" x 11", to the exam containing any information.

Exams and final exam:

The exam dates will be posted on this syllabus and in the Announcements in Blackboard. Only material covered up to the exam date will be included. Students should bring a calculator and #2 pencil(s) to all exams. Cell phone calculators are not acceptable. Students may also bring one page of handwritten notes single sided for midterm exams, double sided for the final exam. All relevant equations will be supplied at the time of the test. No other materials are allowed. Students who miss an exam with a valid written excuse from a doctor, ROTC officer or sports coach may take a make-up exam. Make-up exams may not be the same exam the rest of the class took.

Final exam:

The final exam will cover all topics for the semester and will be given at the time assigned by the university. In the past, this has been at 2:00 to 3:50 pm on the Tuesday of final exam week. Check MyNIU for exact time and date.

Cheating:

Students found to have cheated on exams will receive a grade of F for that exam. All incidents or suspected incidents of cheating will be reported to the university judicial office.

Incomplete grades:

Incompletes will only be given under extraordinary circumstances such as extended illness or call-up to active military duty.

Students with disabilities:

Academic accommodation will be provided as detailed on the Disability Resource Center web page: http://niu.edu/disability/accessibility_statement/index.shtml. In addition,

students requesting accommodation are strongly encouraged to contact me early in the semester.

| | Tuesday | Thursday |
|---------|--------------------------------------|----------------------------|
| Week 1 | Introductions and Optics (Ch.35) | Optics (Ch. 35) |
| Week 2 | Optics (Ch. 35) | Optics (Ch. 35) |
| Week 3 | Optics (Ch. 36) | Optics (ch. 36) |
| Week 4 | Optics (Ch 36) | Optics (Ch. 36) |
| Week 5 | Relativity (Ch. 39) | 1st Midterm Exam (Sept.24) |
| Week 6 | Relativity (Ch.39) | Relativity (Ch.39) |
| Week 7 | Relativity And Energy units | Early Quantum (Ch.40) |
| Week 8 | Early Quantum (Ch. 40) | Early Quantum (Ch. 40) |
| Week 9 | Early Quantum(Ch.40) | Quantum (Ch 40) |
| Week 10 | Quantum (Ch. 41) | 2nd Midterm Exam (Oct 29) |
| Week 11 | Quantum (Ch. 41) | Quantum (Ch.41) |
| Week 12 | atomic physics (Ch. 42) | atomic physics(ch.42) |
| Week 13 | atomic physics(Ch.42) | atomic physics(Ch.42) |
| Week 14 | 3 rd Midterm Exam(Nov.24) | Theory of Conductors |
| Week 15 | Theory of semi-conductors/diodes | Transistors and amplifiers |
| Week 16 | Final Exam (Dec. 8) | |

How to Succeed in the Course

Study textbook/class notes and work problems. Plan to study 6 hours per week in addition to the video lectures. These are difficult topics which cover over a dozen Nobel Prize winning experiments and theories. It takes concentration and time to get the concepts and then apply them to problem solving. Study examples in the text and work on problems with a partner only after trying them yourself. Work some extra odd number problems that have solutions in the textbook. Use the help desk, FH Room 251, or see me if you are having trouble with concepts or problems. The test questions will be similar in nature to the HW problems and/or book examples, so they are good to review before tests.

Your goals for the course should be:

- 1) To understand the concepts which form the basis of modern physics; specifically relativity and quantum mechanics.
- 2) To understand the applications of these concepts to particles, nuclei, atoms, molecules and solids.
- 3) To obtain ability to set up the conceptual picture for problem solving and perform numerical calculations of quantities related to these concepts.
- 4) To use critical thinking to solve problems related to modern physics.

The lectures, textbook readings, and homework problems are all designed to help you achieve these goals. Homework counts for 50% of your grade and is the most important part of learning and comprehension. It is also the best preparation for exams. Late homework will only be accepted with a medical excuse signed by a physician with appropriate dates.

The hardest part of this course is mastering goal 4. Here are a few hints:

- 1) Don't just read the book; understand what you are reading. This means reading a little and then stopping and thinking about what you just read. Make notes of your own on paper and re-derive equations on paper to test your comprehension.
- 2) Study the examples, either from the textbook or from class notes. Similar problems are likely to appear on exams, just like HW problems.
- 3) Read assigned chapter sections twice. You will be amazed at how much easier the chapter seems the second time you read it through.
- 4) Give yourself enough time. You should expect to spend a minimum of 6 hours a week in addition to class lectures: 50% time reading/studying the material and 50% time solving assigned problems.
- 5) Persevere and study with classmates; After reading the textbook and starting or working problems by yourself, work with a class mate to discuss the more difficult problems and how to solve them.