Syllabus for PHYS 230
Introduction to Modern Physics – Spring 2017

Class Times/Location: Mondays, Wednesdays, and Fridays, 9:00-9:50 AM, JC Long Room 219

Instructor Dr. Mike Larsen
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Office Hours: Mondays, Wednesdays, and Fridays from 7-8 AM and 10-11 AM, as well as Mondays and Fridays from 8-9 AM. If you need help outside of "official office hours", try to find me [my office door has a Dr. Larsen finder that can sometimes be helpful]; most often I'll happily drop what I'm doing to help you).
Office Location: JC Long 217

Course Prerequisites: PHYS 112 or HONS 158
Course Co-requisite or prerequisite: MATH 221 or permission of the instructor
Course Webpage: http://larsenml.people.cofc.edu/phys230_spr17.html
(Please see course page for full description of course, rationale, and supplementary information).

Official Course Description

> An introduction to atomic and nuclear physics. Topics include: relativity, atomic theory, x-rays, wave particle duality and elements of quantum mechanics.

Attendance Policy

It is expected that you will attend class. I will. You are responsible for any material missed in class, including announcements about homework/test date changes, etc.

Honor Code / Code of Conduct

It is expected that you will adhere to the university's honor code and student code of conduct, as can be found in your student handbook.

Textbook and References

The textbook for this course is: Taylor, J.R., C.D. Zafiratos, and M.A. Dubson (2014). *Modern Physics for Scientists and Engineers* (2nd Ed.), University Science Books.

I'd recommend reading the book. I know that your intro sequence may not have required you to use the text all that often, but one of the key indicators of maturing as a student is taking the time to read the textbooks associated with each course. It is a very powerful tool in learning this content.

We may ultimately end up skipping around a bit, but I plan/hope to get to quite a bit of content in the first 11-12 chapters of the text. (Some of this content we may have to cover rather rapidly at the end of the semester). It would be *highly advisable* to read the ideas for the next few sections in the text *before* coming to class. [The idea of reading ahead of lecture is based on a sound learning strategy. Research suggests that new complicated ideas seldom make sense the first time you're hearing about them. By reading the text before the class, you'll come with the ideas kind of in your head but maybe jumbled up a bit. Then, through the lecture, you will hear the ideas again and hopefully clarify any confusions you have. Since you're not hearing it for the first time, a lot of the ideas will crystallize into place easier. If you are still confused after hearing about the ideas in lecture, please ask questions in class! If – after reading about it and hearing about it – you still don't quite understand, then we need to give it more attention. Yes, it is some extra work to read ahead – but I found the technique immensely valuable when I was a student.]

This is the first time in a few years this particular text has been used for this course at CofC. I changed it to this text because there were quite a few complaints about the previous several texts. That being said, the new text isn't perfect, either.

For many of you, this is going to be your first Physics course after the introductory sequence. It is very common once you get to this level to use other texts to help reinforce or explain ideas. Attached to this syllabus is a list of other texts that you may very well want to consult from time to time. No text for this class is "required" (e.g. I will supply homework questions to you directly, so you won't necessarily need any text to complete classwork) – but I think having several resources to go to could be quite useful, and – as mentioned above – you should read ahead if you can.

Classroom Policies

Please treat your classmates and professor with the respect due to them as fellow adults and human beings. Your professor always reserves the right to dismiss you from the room.

Please do not text message, browse the internet, check email, or engage in other non-class-related communications during class.

Cell phones – Few things irritate your professor as much as having his lecture interrupted by a cell phone ring. It totally makes him lose his train of thought. Please be considerate and turn it on vibrate during lectures. Also, all cell phones must be turned off (NOT JUST TO VIBRATE) during all exams.

Final Exam Time Period:
Friday, April 28th, 2017. 8-11 AM

Tentative Midterm Test Dates
(Subject to Change):
Wednesday, February 8th, 2017
Wednesday, March 15th, 2017
Wednesday, April 12th, 2017

Students with Disabilities
The College will make reasonable accommodations for persons with documented disabilities. Students should apply at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying your professor as soon as possible and subsequently contacting your professor again at least one week before any specific accommodation is needed.

Grading

Grading Scale: The formal numerical scale might move around a little bit depending on the class performance, but the final grading scale will be *no more stringent* than:

A	≥91	B+	89	B-	80	C	71-78	D	60 - 69
A-	90	B	81-88	C+	79	C-	70	F	<60

Your course grade will be based on 3 components:

a) Homework and (potentially) Quizzes (40% of course grade). Homework will be assigned most weeks. Homework assignments are to be completed clearly and legibly and turned in on time. Homework solutions typeset using LaTeX (the scientific document preparation system) will earn a modest amount of extra credit. (If you are a Physics major, you will eventually have to learn LaTeX anyway, and here is a chance to practice it and get a little extra credit for using it). Resources to use LaTeX can be found by talking to your professor and/or by visiting http://larsenml.people.cofc.edu/latex.html.

You are encouraged to seek help from your instructor, your classmates, and anyone else who can help you with your homework. However, your answers should not be exact copies of a classmate's work. Cooperation is ok, but everyone should turn in their own solutions! At the end of the semester, I will drop the grade from your lowest homework score.

Quizzes may be announced, they may not be announced. We may have none, we may have 10. (We may also have something between none and 10). The best way to succeed on quizzes is to come to class prepared.

b) Unit Tests (45% of course grade total, split evenly between 3 exams).

c) Final Exam (15% of course grade).

Note that your worst exam score will be dropped so long as you perform better on your final than your lowest test. Because of this, *no make-up tests will be given for any reason.* If you have a known conflict, approach your instructor *well in advance of the test* to arrange to take the exam *before* it is scheduled. If illness or other unexpected conflict develops, you will merely need to replace the score of "0" from the missed exam with your final exam score.

Course Goal (Big Picture)
This course is designed to serve as an introduction to major Physics principles in the 20th century, with a particular emphasis on special relativity and introductory quantum mechanics. This course also serves to transition students in Physics and Astronomy majors from their introductory Physics sequence to the more advanced coursework that will follow at the 300- and 400-levels. A necessary part of this process is to develop your critical thinking and problem solving skills. Please see the course webpage for a more thorough introduction to the content and goals of the course. I hope to complete Chapters 1-7 and at least parts of chapters 8-12, though we may skip around a bit and bypass some topics in the interests of time. We will also be supplementing the content from the text with some material not in the text. In particular, we are expected to introduce some basic computational physics tools and principles potentially including MATLAB, Mathematica, LaTeX, and/or common other tools used by professional scientists.

Specific Course Objectives
Throughout this course, we endeavor to discuss:

- The foundations and applications of Special Relativity (in particular Dynamics and Energetics)
- The failures of classical physics in the late 19th and early 20th century that lead to the development of Quantum Mechanics
- Basic atomic and quantum physics
- The use of computational software as a problem solving and data analysis tool

Student Learning Outcomes At the conclusion of the course, the successful student will be able to:

- successfully solve basic canonical problems associated with Special Relativity, basic Atomic and Nuclear Physics, and introductory quantum mechanics.
- apply fundamental concepts in modern physics.
- apply physical principles to novel situations.
- effectively use MATLAB, Mathematica, IDL, Maple, C/C++, FORTRAN, and/or LabVIEW to analyze and manipulate data, solve equations, and/or plot relationships.