

**PHYSICS 215**  
**Elementary Modern Physics**  
Monday Wednesday Friday 1:00-1:50, Olin 107

**Instructor** Eric Carlson  
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**Text:** Tipler and Llewellyn, "Modern Physics," 6<sup>th</sup> edition.  
**Virtual:** [Zoom link](#) by permission only

**Description:** Physics 215 is an introduction to two great ideas of 20<sup>th</sup> century physics: Einstein's Special Theory of Relativity, and Quantum Mechanics. By the time you have completed the course, you should be convinced that everything you learned before this class is a lie, and the world is a much stranger place than you have imagined. Once we have completed an introduction to these two topics, we will go on to a variety of interesting applications of these topics.

**Materials:** In addition to the text, a scientific calculator is a necessity, and should be brought to class every day. Also, you will need to purchase access to Webassign, which is used for both reading quizzes and homework. Naturally, you will need a computer.

**Covid and Attendance:** You are expected to follow all university regulations regarding precautions for Covid-19. At present, this requires that you wear a mask to class. To help minimize the spread of germs, if you have any symptoms of a communicable disease, **do not come to class**. Instead, email me and your absence will be considered excused (you don't need a doctor's note, unless it is a test date). I will arrange a [Zoom option](#) for those participating virtually; you may use this in lieu of attending class in person if you have any symptoms. If you are too sick to attend virtually, you can watch a Zoom recording. There may be other reasons besides illness for missing class; you should check these in advance with me. Other than illness or other excused absences, you are allowed two unexcused absences without penalty. If you have more than two unexcused absences, I reserve the right to penalize your grade.

**Seating Assignments:** On Friday, August 27 I will ask everyone to place their name on a sheet indicating which seat you are in. That will be your assigned seat for the rest of the semester. If you choose to change seats at a later date, for whatever reason, please let me know. I will use seating assignments to accelerate taking attendance.

**Class Participation:** I encourage you to ask questions about anything you cannot understand in class. If you don't ask me questions, I will ask you questions. You have been warned. Class participation counts towards your grade.

**World-Wide-Web:** Materials for this course can be found on our home page at <http://users.wfu.edu/ecarlson/modern>. In addition, we will be using Webassign for reading quizzes and homework, at <http://www.webassign.net>.

**Reading assignments/Quizzes:** There will be reading assignments before almost every lecture. You will also have to take a short quiz about the reading assignment. These can be found on the Webassign pages for this course, under assignments. This quiz must be taken by 12:30 pm.

These will normally consist of three multiple choice questions on the chapter you have read for class that day. You will have one chance to get these problems right

**Homework:** There will be homework assignments nearly every class period, due at 12:30 pm before class, which can also be found on Webassign. With rare exceptions, these will be submitted electronically. You generally have eight chances to get the problems right (sometimes fewer). Your answers will be graded immediately (except for essay questions). If you are having trouble with Webassign, let me know, and I will be glad to help. After the homework has been completed, solutions to all homework will also appear on Webassign.

**Exams:** There will be three tests and a final. These tests will include both qualitative and quantitative questions. The tests are closed book, though calculators are allowed. The tests are currently scheduled for September 15, October 15, and November 3, with the final on Monday, December 6 at 2:00 PM. Should you miss a test for any reason, contact me immediately.

**Laboratory:** Although there is no lab section of this course, the course is designed to be taken in parallel with PHY 265, which is taught by Keith Bonin. Lab starts immediately at the beginning of the semester.

**Grading:** The two tables at right are a not necessarily accurate guess as to what my grading scheme will be. In particular, I reserve the right to grade on a sliding scale.

<u>Grading Breakdown</u>		<u>Grading Scale</u>	
Homework:	30%	94% A	73% C
Quizzes:	5%	90% A-	70% C-
Class Particip.:	5%	87% B+	67% D+
Three Tests:	36%	83% B	63% D
Final:	24%	80% B-	60% D-
<b>TOTAL:</b>	<b>100%</b>	77% C+	<60% F

**Pandemic Plans:** In the event of catastrophic shutdown of the university, we will make every attempt to continue and complete the course remotely. Check the website for further information. If the web is down, call my home number, or if that doesn't work, try my cell phone, listed on the front of this form.

**Schedule:** The schedule below is only an approximate estimate of when we will be studying different topics

August	23	25	27	Changing coordinates, distance formula, time as 4th dimension
Aug/Sep	30	1	3	Lorentz Transformations, effects of relativity, paradoxes
September	6	8	10	Momentum and energy in special relativity, invariant mass
September	13	15	17	Quantization of charge, black body rad., <b>Test 1</b> , Photoelectric effect
September	20	22	24	Atoms, Bohr model, Franck-Hertz exp., de Broglie hypothesis
Sep/Oct	27	29	1	Waves, particles as waves, uncertainty, wave function and probability
October	4	6		Schrödinger's equation, {Fall break}
October	11	13	15	<b>Test 2</b> , time independent problems, harmonic oscillator
October	18	20	22	Operators, unbound problems, tunneling, weirdness of quantum mech.
October	25	27	29	Quantum mechanics in 3D, hydrogen atom, spin
November	1	3	5	The periodic table, <b>Test 3</b> , nuclei
November	8	10	12	Nuclear physics
November	15	17	19	Advanced Topic #1
November	22			Advanced Topic #1, {Thanksgiving break}
Nov/Dec	29	1	3	Advanced Topic #2
December	6			<b>Final 2:00 PM</b>