

Physics 213X- Elementary Modern Physics - Fall 2020

Instructor	Renate Wackerbauer, Office Location: REIC 106 phone: 474-6108 e-mail: rawackerbauer@alaska.edu
Open Office hours	Due to Covid19 there are no walk-in office hours unless the situation improves; meeting via zoom works; email is effective for straight-forward questions. additional recitation classes can be scheduled on request.
Course Info	Phys213X, 4 credits (3+1+0)
Prerequisites	Wrtg 111X, Phys211X, 212X, and Math 253X; or permission of instructor. The Laboratory portion is integrated into the course, thus Phys213L needs to be taken as a co-requisite
Noyes Lab	Access to the Noyes Computer Lab (REIC 101) is provided to all students enrolled in a Physics course. Your polar express card lets you in.
Lectures	MWF 1 to 2 pm, REIC 165. Lectures will be/start f2f; they will be recorded, uploaded to "google classroom", and shared with all students in class. Due to the fluid situation with covid, the course modality can change throughout the semester. In the case of online course delivery, lectures would be offered synchronously (tablet with whiteboard), recorded, and uploaded into google classroom.
Labs <u>Tentative course calendar</u>	R 9:30am-12:30pm, REIC 253 All labs and reports must be completed to pass the lab portion of this class; passing the LAB portion is necessary for passing the course. Your lab manual provides the information about the laboratory component of this course. Questions about the lab should be directed to your teaching assistant (TBD), our lab supervisor Zak Tourville (REIC 114; ztourville@alaska.edu; 474-7857), or - as last resort - to me.
Text	<u>Required texts:</u> <i>Physics for Scientists and Engineers</i> , by R.D. Knight, Pearson Press (4th edition, 2017); this is the same book that is used in PHYS 211/212; so you should have that book already <i>Modern Physics</i> , by K.S. Krane, Wiley Press (4th edition, 2020) <u>Supplementary readings:</u> <i>Quantum Physics</i> , by R. Eisberg and R. Resnick, Wiley (1985) --This book represents a detailed introduction into modern quantum physics, including the history and experiments in QM. somewhat more theoretical as the required texts <i>There are many books on introductory modern physics in the library that almost all cover the material presented in the lectures. Please explore them to see different approaches to our topics.</i>
Course Content <u>Tentative course calendar</u>	Geometrical and physical optics, elementary-level modern physics including special relativity, atomic physics, nuclear physics, solid-state physics, elementary particles, simple transport theory, kinetic theory and concepts of wave mechanics.
Course Goals	Modern physics refers to physics developed in the 20th century including the special theory of relativity, quantum mechanics, atomic and nuclear physics. Physics 213 starts with a review of optics. Waves are a fundamental concept in modern physics and allow us to nicely transition to the physics of the 20th century. Basic concepts of modern physics are explored.
Student Learning	Students gain an understanding in --how particle behavior in the microscopic world differs from the macroscopic world --basic properties of light and optics and the relevance of these concepts for modern physics

Outcomes	--the two main theoretical advances, relativity and quantum mechanics, and their applications --the history of modern physics and its implications for society.		
Homework homework	Homework (11 assignments, each counting 100pts) will be assigned weekly via "google classroom" and will be due by 2:00 pm on the following friday unless explicitly altered at the time of assignment. Late homework will not be accepted. Finished homework should be uploaded to "google classroom" . in case of issues with the homework link use: ffden-2.phys.uaf.edu/wacker/CLASS/213.html		
Exams	Two one-hour in-term examinations and a two hour final examination will be held during the semester. In-term exams will be held in the classroom. Upon request, an additional review class may be scheduled before each exam. The exams will be closed books and closed notes. No calculators, computers, or communication devices are allowed.		
	Exam 1 (in class)	Fri, Oct 2	Knight, 33-35; Krane, 1-2, approx
	Exam 2 (in class)	Fri, Nov 6	Krane, approx. chapters 2-7
	Final Exam	Fri, Dec 11, 1-3pm	Knight, 33-35; Krane, 1-13 approx
Web Project	Explore the fun of modern physics in a web project. The topic can be an application of quantum mechanics in medicine, in nanotechnology, biology. It can be on relativity in astrophysics, the biography of a scientist in modern physics, the relevance or dilemma of a modern physics concept for society many other topics are possible, follow your own interest. The topic must be submitted for approval on Oct. 5. This includes the title, main literature source, and 5 possible keywords you could address in your project. The final project must be submitted on Nov. 23. It must consist of 6-8 web pages, an additional title page (title, your name) and an additional page with at least 3 references that you used. The physics should be well explained, and understandable to a typical highschool senior. An introduction to web software and design will be given in class. The project will be graded both for presentation (40%) and content (60%). The content part includes "correct physics, level covered, how explained, how introduced, understanding, terms defined". The style part includes organization and structure, design, references given, figures referenced, writing style.		
Grading	The maximum score for each homework will be 100 points. <i>Illegible work will not be graded.</i> To pass the course with a grade higher than "F", you need 40% of the total credits. Grades A to D are assigned equal weight for total credits between 40% and 100%. So, A+ (>97.5), A(>87.5), A-(>85), B+(>82.5), B(>72.5), B-(>70), C+ (>67.5), C(>57.5), C-(>55), D+(>52.5), D(>42.5), D-(>40). If this class is in your physics major you need at least a grade C- for passing the course and fulfilling prerequisites. For the final grade, homework, exams, etc. will be weighted as follows:		
	Homework	15%	
	Lab	20%	
	Web project	10%	
	Exam 1	15%	
	Exam 2	15%	
	Final Exam	25%	
Course policies	Attendance at lectures is expected. Active class participation, questions are extremely welcome in the lectures. A missed exam will receive 0 credit unless the instructor is notified by email, phone, etc before the exam starts. Make-up exams will be individually scheduled with the student.		
Student Obligations	As students of UAF, you are bound by the policies and regulations of the University of Alaska, UAF rules and procedures, and the Student Honor Code. You are obligated to make yourselves familiar with all conditions presented in the UAF Catalog. <i>Plagiarism on homework or on an exam will result in a failing grade.</i> <i>Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this website:</i> <i>Further, students are expected to adhere to the university's policies, practices, and mandates and are subject to disciplinary actions if they do not comply.</i>		

**Student
protection
and services
statement**

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/.

UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: <https://alaska.edu/nondiscrimination/>.

Your instructor follows the University of Alaska Fairbanks Incomplete Grade Policy: "The letter "I"(Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student's control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an "I" grade."

Effective communication: Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication's Speaking Center (907-474-5470, speak@uaf.edu) and the UAF English Department's Writing Center (907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette Street, 907-455- 2860).

Tentative weekly course calendar for Phys213

Week	Date	Topics covered
1	aug 24-28	geometrical optics: reflection, refraction No HW due this week No Lab this week
2	aug 31-4	lenses; optical instruments HW#1 due friday No Lab this week Sept 4: Last day to drop
3	sept 7-11	optical instruments; wave optics HW#2 due friday LAB 0: Introduction to the oscilloscope and measuring the frequency of a tuning fork
4	sept 14-18	wave optics: interference; diffraction HW#3 due friday LAB 1: Reflection and Refraction
5	sept 21-25	deficiencies of classical physics; special relativity HW#4 due friday LAB 2: Thin Lenses
6	sept 28-2	special theory of relativity no HW due this week LAB 3: Polarization EXAM1: Friday, Oct 2
7	oct 5-9	particle properties of em radiation: photoelectric effect; compton effect; thermal radiation HW#5 due friday LAB 4: Interference and Diffraction Topic for web project due: Friday, Oct 5
8	oct 12-16	wavelike properties of particles: deBroglie; uncertainty; wave packet HW#6 due friday LAB 5: Bragg Diffraction of Microwaves
9	oct 19-23	Schroedinger equation and applications HW#7 due friday LAB 6: Oscilloscopes and the Speed of Light
10	oct 26-30	Bohr model and Hydrogen atom HW#8 due friday LAB 7: Blackbody Radiation and Stefan Boltzman's Law Oct 30: Last day to withdraw
11	nov 2-6	atomic physics and Pauli's exclusion principle HW, see next week LAB 8: Photoelectric Effect EXAM2: Friday, Nov 6

12	nov 9-13	nuclear structure and radioactivity HW#9 due friday LAB 9: Hydrogen Balmer Series
13	nov 16-20	nuclear reactions HW#10 due friday LAB 10: One Photon at a time / The Hubble Constant and the Age of the Universe
14	nov 23-27	particle physics No HW due this week No Lab this week Web project due: monday, nov 23 FinallyThanksgiving break: Nov 25-27
15	nov 30-4	cosmology HW#11 due TUESday No Lab this week, but recitation Last day of instruction: Dec 4
16	dec 7-11	FINAL: Friday Dec 11, 1-3pm GOOD SUCCESS