Physics 421 - Quantum mechanics - Fall 2021

Instructor	Renate Wackerbauer, Office Location: REIC 106 phone: 474-6108 Welcome !! and have a great semester !! e-mail: rawackerbauer@alaska.edu
Open Office hours	Due to Covid19 there are no walk-in office hours unless the situation improves; discussions after class work well; meeting via zoom works; email is effective for straight-forward questions. additional recitation classes can be scheduled on request.
Course Info	Phys421, 4 credits
Prerequisites	Phys213, 220, 301, 341; or permission of instructor.
Lectures	MWF 10:30 to 11:30 am, M 3:30-4:30, REIC 207. Lectures are face to face 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.
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.
Text	Required text: *Introduction to Quantum Mechanics*, by D.J. Griffiths and D. F. Schroeter, Cambridge University Press (3rd edition, 2018) Supplementary readings: *Quantum Physics*, by R. Eisberg and R. Resnick, Wiley (1985) --This book represents a detailed introduction into modern quantum physics, tells also about the history and experiments in QM. *Lectures on Quantum mechanics*, by G. Baym, Benjamin/Cumings (1973) --for further reading, usually at graduate level *Quantum Mechanics*, by F. Schwabl, Springer (2001) --clearly written introduction; good basis for the author's book on advanced quantum mechanics. *The infinite well and Dirac delta function potentials as pedagogical, mathematical and physical models in QM*, M. Belloni and RW. Robinett, Physics Reports, 2014 -- for further reading with interesting applications *There are many books on introductory quantum mechanics in the library that almost all cover the material presented in the lectures. Please explore them to see different approaches to our topics.*
Course Content **Tentative course calendar**	Schroedinger's equation, Born interpretation, operator formalism, measurement and projection, stationary states, one-dimensional systems, hydrogen atom, states of definite angular momentum, perturbation theory
Course Goals	This course provides an introduction into quantum mechanics, the physics of the microscopic particles like electrons, protons, atoms, etc. The Schroedinger equation - the quantum mechanical equation of motion is studied in very detail for different physical systems. Where does Heisenberg's uncertainty relation really come from, is there just one or are there many?
Student	Students learn,

Learning Outcomes

--how particle behavior in the microscopic world differs from the macroscopic world
--how to describe and solve problems in theoretical quantum mechanics
--some limitations of classical analogons in quantum mechanics
--how measurement processes are different in quantum mechanics and classical physics

Homework

homework

Homework (10 assignments, each counting 100pts) will be assigned weekly via "google classroom" and will be due by **2:00 pm** on the following Friday, unless explicitely altered at the time of assignment. Late homework will not be accepted. Finished homework should be uploaded to "google classroom" in a single pdf-file. You can earn 100 bonus points in the homework by giving a 10min presentation to class on a topic related to class, for example the life of a quantum physicist, an application of quantum mechanics, experiments on quantum mechanics, etc.
in case of issues with the homework link use: ffden-2.phys.uaf.edu/wacker/CLASS/421.html

Examinations

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 8	Griffiths: approx. chapt. 1-3
Exam 2 (in class)	Fri, Nov 12	Griffiths: approx. chapt. 4-6
Final Exam	Wednesday, Dec 8, 10:15am-12:15	Griffiths: approx. chapt. 1-9

Grading

The maximum score for each homework will be 100 points. *Illegible work will not be graded*. 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 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	20%
Exam 1	25%
Exam 2	25%
Final Exam	30%

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.

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.”

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. *Plagiarism on homework or on an exam will result in a failing grade.*

	Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this website: *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.*
Student protection and services statement	**Student protections statement:** UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site: https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/. **Disability services statement:** I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities. **Student Academic Support:** Speaking Center (907-474-5470, uaf-speakingcenter@alaska.edu, Gruening 507) Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Gruening 8th floor) UAF Math Services, uafmathstatlab@gmail.com, Chapman Building Developmental Math Lab, Gruening 406 The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, https://www.ctc.uaf.edu/student-services/student-success-center/) For more information and resources, please see the Academic Advising Resource List (https://www.uaf.edu/advising/lr/SKM_364e19011717281.pdf) **Student Resources:** Disability Services (907-474-5655, uaf-disability-services@alaska.edu, Whitaker 208) Student Health & Counseling [6 free counseling sessions] (907-474-7043, https://www.uaf.edu/chc/appointments.php, Whitaker 203) Center for Student Rights and Responsibilities (907-474-7317, uaf-studentrights@alaska.edu, Eielson 110) Associated Students of the University of Alaska Fairbanks (ASUAF) or ASUAF Student Government (907-474-7355, asuaf.office@alaska.edu, Wood Center 119) **Nondiscrimination statement:** The University of Alaska is an affirmative action/equal opportunity employer and educational institution. The University of Alaska does not discriminate on the basis of race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender identity, political affiliation or belief, genetic information, or other legally protected status. The University's commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at www.alaska.edu/nondiscrimination. For more information, contact: UAF Department of Equity and Compliance, 355 Duckering Building, 907-474-7300, uaf-deo@alaska.edu