Physics 652: Quantum Mechanics
Syllabus - Spring 2021

CRN: 34945, F01

Lecture: **MWF 1:00-2:00 PM, REIC 207**

Instructor: Ataur R. Chowdhury

Office: REIC 118

Office Hours: MW 4:00-5:30 pm, and any other time I am in my office.

Contact: Phone (907) 474-6109
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Email archowdhury@alaska.edu

Prerequisites:.39 lp0000912 5hysics 65

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4. To be able to apply the knowledge learned in this course to real-world problems in quantum mechanics and related fields.

Student Learning Outcomes:

1. Understand the basic postulates of quantum mechanics.
2. Apply quantum formalism to solving physical problems.
3. Learn the art of Schrodinger equation, and its application to simple systems.
4. Apply Schrodinger equation to solve problems involving two and three dimensions.
4. Exploit the symmetry in quantum formalism.
5. Understand the rotational symmetry and its consequences.
6. Learn angular momentum based on symmetry.
7. Learn approximation methods of solving quantum problems.
8. Understand the physics of particle scattering.
9. Learn rudimentary theory of EM radiation.

Instructional methods: Interactive lecture based instruction

Mode of Instruction: Face-to face live lectures in class

Credits: 3 credits: 3 hr. of lecture per week.

Course Requirements/ Policies:

Class Attednence/Participation:
For a better understanding of the course material, attendance and participation in classroom activities are very important. For many of you this will be the second graduate physics course that deals with the fundamentals of advanced concepts in quantum mechanics and many of you may find this course a little difficult and mathematically intense. However, if you attend classes and work out all the assignments, you will learn and possibly master the material. This is why it is highly expected that the students will commit themselves to attend the class regularly. There will be supplemental materials for this course and the students will be held responsible for all the materials that will be brought in from outside the text. The students will be expected to participate in class activities, and take part in meaningful discussion and ask questions to better comprehend the subject material. Because of COVID-19, a regular class attendance will be recorded.

Homework:
Homework is the single most important aspect of this course. The best possible way to learn physics, and perhaps any science, is through doing problems. This is a graduate course and you may find homework challenging. However, if you find your homework difficult, please come

and ask me for help. On the average, 5-8 problems will be assigned on most Fridays. The homework will be due back at the beginning of class the following Friday. NO LATE HOMEWORK WILL BE ACCEPTED. NO EXCEPTIONS (barring emergencies and extreme situations). The homework will be posted on the blackboard, and your solutions need to be submitted on the blackboard.
Group work is extremely effective in achieving a greater understanding of the subject material, and it is highly encouraged for solving problems. For additional help with the homework the students are most welcome to consult the instructor during the office hour or any other time by prior appointment. Any homework you submit should reflect you own best effort. **Copying of homework from your friend or any online sources is absolutely not acceptable and will**

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Total	100%

The final grading for this course will be based on a curve. For a given score, your letter grade will not be lower than what it would be expected based on standard grading scale (90-100 = A, 80-90 = B, etc.). Allowed grades are limited to letter grades A,B,C,D,F,I,BN, and no plus-minus grades will be given for this course.

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."

Academic Honesty

UAF expects and requires academic honesty from all members of the University community, and takes any act of plagiarism and cheating seriously. It is expected that all assignments, including homework and reports, that are turned in for this course must the original work of the individual student. Failure to comply with this policy will result in penalty as stipulated under UAF regulations.

Student Protections and Services:

COVID-19 Essentials:

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

Services:

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's Department's Writing Center (907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette st, 907-455-2860).

Disabilities Services

The UAF Office of Disability Services implements the Americas with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. Any student who may need assistance with disabilities, should feel free to contact the instructor or directly to insm0 g -47(insm0 g -47(insm0 g -4 insf(bil)-he)-47.6 m0 g -47(insm0 g -4 insf(bil)-he)-47.f 0 0 1 8 0

The UAF Offices:

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Tentative Schedule

Lecture, Reading, Paper and Exam

Week	Date	Topics	Reading Assignment
1	1/11-1/15	angular momentum in two and three dimensions	Shankar chapter 12
2	1/18-1/22	Hydrogen atom, comparison with experiments **Civil Rights Day 1/18 (no class)**	Shankar chapter 13 Shankar chapter 13
3	1/25-1/29	many electron atoms, periodic table	Shankar chapter 13
4	2/1-2/5	kinematics of spin, rotational operators	Shankar chapter 14
5	2/8-2/12	spin dynamics, EPR, Stern-Gerlach experiment **Outline for paper due Monday**	Shankar chapter 14
6	2/15-2/19	addition of angular momenta, Clebsch_Gordon coefficients, **Midterm Friday 2/19**	Shankar chapter 15
7	2/22-2/26	Approximation methods, variational principle,	Shankar chapter 16
8	3/1-3/5	WKB approximation, Time-independent perturbation	Shankar chapter 16 Shankar chapter 17
9	3/8-3/12	degenerate perturbation with examples	Shankar chapter 17
10	3/15-3/19	time-dependent perturbation, first order approximation	Shankar chapter 18
11	3/22-3/		

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12	3/29-4/2	one dimensional scattering, time-dependent Born dependent Born approximation	Shankar chapter 19
13	4/5-4/9	time-independent Born approximation, partial wave expansion **Paper due this Friday**	Shankar chapter 19
14	4/12-4/16	free particle Dirac	

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