Physics 651: Quantum Mechanics
Syllabus - Fall 2020

CRN: 75963, F01

Lecture:

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2. To learn advanced mathematical methods that are useful trough-out physics.

3. To develop and sharpen high-level problem solving skills.

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 Schroedinger equation, and its application to simple systems.
4. Apply Schroedinger 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.

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 first 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

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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 result in a grade of zero for the assignment.**

Examinations:
There will be a midterm examination (October , Friday 1:00-2:00) and a final comprehensive examination (December 9, Wednesday, 11:15 am-2:15) for this course. Examinations will consist of, in most part, problems similar to those in the homework and those worked out in class. Midterm will cover the material covered in class and homework up to the date of test, and the final will be comprehensive and will include material covered during the entire semester. All exams will be held in class and solutions have to be uploaded on the blackboard.

Paper:
For most graduate courses, it is customary that a paper is required to explore the field a little more than it is done in classroom setting. Quantum mechanics is continuously evolving and is being employed in many other fields outside physics. To explore its contemporary development, you will be required to write a paper that adds something outside the scope of this course. You can delve into some exciting development of quantum mechanics in medicine, in biotechnology, in nanotechnology, computer computing, etc., and pick your topic. You could also choose an advanced topic in quantum mechanics or any related field. This paper does not have to original piece of work, but has to be part of some work that ongoing or some work that has been published in reputable scientific journals. The paper should be limited to 5-6 pages

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Tentative Schedule

Lecture, Reading, Paper and Exam

Week	Date	Topics	Reading Assignment
1	8/24-8/28	classical vs. quantum,	

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13	11/16-11/20	rotational invariance and angular momentum **Paper due this Friday**	Shankar chapter 12
14	11/23-11/27	eigenvalue problems of angular of angular momentum **Thanksgiving Break Nov. 25-29**	Shankar chapter 12
15	11/30-12/4	angular momentum in two and Three dimensions	Shankar chapter 12
16	12/9	**FINAL**: 11:15-2:15 …….All the best…	