Kennesaw State University
College of Science and Mathematics
Department of Physics

Course: PHYS 4210: Quantum Physics
Term: Fall 2024
Meeting Times: Tuesdays and Thursdays, 5:00 PM– 6:15 PM
Credit Hours: 3
Modality: In-person lecture
Location: Academic Building, Room H-250, Marietta Campus

Instructor: Kiran Prasai
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Office: Norton Hall R2-323,
Office Hours: MWF, 9 AM-10 AM in my office, or by appointment

Course Description

This course presents a systematic development of quantum mechanical laws. Students will be introduced to Dirac's notation and will learn about the theory of angular momentum quantization and will use the operator formalism to solve the Schrödinger's equation in 3-dimensions for a particle in a central force field, and the simple harmonic oscillator.

Prerequisites

A grade of "C" or better in PHYS 3710, PHYS 3260, MATH 2203, and MATH 2306

Textbook

Introduction to Quantum Mechanics, D.J. Griffiths and D.F. Schroeter, 3rd Edition

Poll Everywhere app is required

The lectures are designed to be interactive -- we will use a classroom interactive response system, called Poll Everywhere.
Download Poll Everywhere for iOS
Download Poll Everywhere for Android

Learning Outcomes

(1) Students can solve the Schrödinger equation for harmonic oscillator.
(2) Students can apply the solutions of Schrödinger equation to the free particle, and the hydrogen atom.
(3) Students have a working knowledge of the uncertainty principle, and time dependence.
(4) Students can solve problems with angular momentum and spin.
(5) Students will have a working knowledge of Dirac notation.

Communication

All communication will be conducted through your student email address or D2L. Announcements, course materials and grades will be posted on D2L. Email is the preferred way to contact me. When sending an email, please include 'PHYS 4210' in the subject line, along with the topic of your message. Be sure to use your official KSU email.

Grading

Your grade will be determined by your performance in the following:

Three In-Class Midterms: 45 points; weighted {20,15,10} for {max, med, min}
Final Exam: 25 points
Homework: 20 points
Class activities: 10 points

Grading Scale:

A   90% or above
B   80% - less than 90%
C   70% - less than 80%
D   60% - less than 70%
F   less than 60%

KSU's grade appeal policy can be found here: KSU Grade Appeal

Exams

This class will have three midterms and a final. The exam schedule is:

MIDTERM 1: Thursday, September 12
MIDTERM 2: Tuesday, October 15
MIDTERM 3: Thursday, November 14
FINAL EXAM: Tuesday, December 3, 6 PM to 8 PM

If you know in advance that you have a conflict with an exam, please inform me as soon as possible. If you miss an exam due to illness or an unforeseen event, contact me at your earliest convenience. I may require documentation to verify the reason for your absence. Make-up exams will be provided for students with valid excuses, as determined by the instructor. These make-up exams must be completed within a week of the missed midterm. For final exams, make-ups are only permitted in cases of death, hospitalization, or scheduling conflicts with other finals.

During exams, the use of any mobile device that transmits or receives signals is strictly prohibited. Please ensure that your devices are deactivated before the exam begins. No student will be allowed to leave the exam room to answer calls or messages. If you need to answer a phone call or text due to a family emergency, please inform me in advance. Late arrivals will not be permitted to enter the exam room once other students have completed their exams and left.

Homework

Homework, assigned weekly and posted on D2L, is the primary learning tool in this course. While reading and lectures introduce and clarify concepts, true understanding comes from applying these concepts independently to solve problems. Homework submissions should be made through D2L's assignment tab, and they will be graded and returned within 10 days with instructor feedback.

The best way to succeed in homework is to start early, regularly refer to your lecture notes, and make use of office hours to clarify any confusing topics. Collaborating in study groups is encouraged, as discussing and debating problems can be an effective way to learn. However, the homework you submit must be your own work. If you can't solve the homework problems on your own before the test, you are hoping for a miracle.

Class Activities

Regular class attendance is strongly encouraged, as classes are designed to be engaging and interactive. Actively participating in class is the most effective way to grasp the material in this course. While attendance itself is not graded, 10% of your grade will be based on your participation in in-class activities.

Academic Honesty Policy

Don't cheat – the work you turn in must be your own. Click here for more information on KSU's academic dishonesty policies.

Withdrawals

Students are solely responsible for managing their enrollment status in a class; non-attendance does not constitute a withdrawal. The last day to withdraw without academic penalty is October 25, 2024, 11:45 PM. This and other important dates can be found on the Academic Calendar. Additional information can be found here. If you are thinking about dropping the course, please talk to me first. Most importantly, we want to find a way for you to succeed.

Students with Disabilities

KSU is here to help. Any student with a documented disability or medical condition needing academic accommodation of class-related activities should contact the Office of Student Disability Services. More information can be found here.

Required Weblinks

Federal, BOR, and KSU student policies:
https://cia.kennesaw.edu/instructional-resources/syllabus-policy.php

KSU student Resources:
https://cia.kennesaw.edu/instructional-resources/syllabus-resources.php

Tentative Schedule			
Class	Date	Day	Topic
1	13-Aug	T	Particles as waves / Schrödinger Eq.
2	15-Aug	Th	Probability & normalization
3	20-Aug	T	Momentum & uncertainty
4	22-Aug	Th	TISE and the infinite square well (I)
5	27-Aug	T	The infinite square well (II)
6	29-Aug	Th	The quantum harmonic oscillator
7	3-Sep	T	The Free particle
8	5-Sep	Th	The delta function potential
9	10-Sep	T	The finite square well
10	12-Sep	Th	Exam 1
11	17-Sep	T	Hilbert spaces and operators
12	19-Sep	Th	Eigenfunctions of Hermitian operators
13	24-Sep	T	Statistics and uncertainty principle
14	26-Sep	Th	Vectors and operators
15	1-Oct	T	The 3D Schrödinger Equation
16	3-Oct	Th	The hydrogen atom (I)
17	8-Oct	T	The hydrogen atom (II)
18	10-Oct	Th	Angular momentum
19	15-Oct	T	Exam 2
20	17-Oct	Th	Spin and electromagnetic interactions
21	22-Oct	T	2-particle systems
22	24-Oct	Th	Atoms
23	29-Oct	T	Solids
24	31-Oct	Th	Symmetry & spatial translations
25	5-Nov	T	Conservation laws & parity
26	7-Nov	Th	Rotational symmetry
27	12-Nov	T	Rotation selection rules
28	14-Nov	Th	Exam 3
29	19-Nov	T	Temporal translations
30	21-Nov	Th	Final Exam Review
	26-Nov	T	BREAK
	28-Nov	Th	BREAK
	3-Dec	T	FINAL EXAM, Time: 6 PM to 8 PM