Faculty of Eng. & Natural Sci.

PHYS304-202002

Quantum Mechanics II

Instructor(s)

Name	Email	Office	Phone	Web	Office Hours
İnanç Adagideli	adagideli@sabanciuniv.edu	FENS-G054	9605	http://myweb.sabanciuniv.edu/adagideli/	

Course Content

Three dimensional problems. Rotational symmetry, angular momentum, and the angular momentum eigenstates (the quantum numbers l, m). The Hydrogen atom. Atomic and molecular structure and spectra. The matrix formulation of quantum mechanics. Time independent and time dependent perturbation theory. The interaction of radiation with matter. Quantum statistics: bosons- the basic principle of the laser and of superconductivity- superfluidity. Fermions: the Pauli Principle. Scattering. Fundamentals of quantum mechanics and introduction to the concept of quantum computation.

Objectives

To learn the approximation methods commonly used in QM; to learn the applications of QM to fundamental problems.

Recommend or Required Reading

Textbook

Introduction to Quantum Mechanics by David Griffiths

Assessment Methods and Criteria

	Percentage(%)	Number of assessment methods
Final	40.5	
Midterm	40.5	1
Exam		0
Participation	19	

Course Outline

Time independent perturbation theory. The variational principle. The WKB approximation. Path integrals. Time-dependent perturbation theory and its applications to emission and absorption of radiation. The adiabatic approximation and Berry's phase. Quantum conductance.

Learning Outcomes

Upon completion of this course, students will be able:
Solve the Schrödinger equation in two or three dimensions approximately for a range of more realistic problems (such as the Hydrogen atom in weak electromagnetic field) where the system is perturbed weakly.

Use these solutions to predict outcomes of measurements done on more realistic quantum systems. (by calculating e.g. transition rates.)
Calculate expectation values and probabilities for simple observables
Solve the relativistic Dirac equation for a range of selected problems
Describe how a general initial state will evolve with time under various perturbations,
Calculate how a simple initial state will evolve with time under specific perturbations.

Course Policies

Academic Integrity: Cheating is subject to disciplinary action and a zero grade.
Health reports must be endorsed by the SU Health Center.
Letter grades will be given on an individual basis: there will be no curve based on the class average.