PHYSICS 6336
Quantum Mechanics
SPRING 2020

INSTRUCTOR	Roberto Vega Office: 105 Fondren Science Bldg email: vega@mail.physics.smu.edu Telephone: 214-768-2498
OFFICE HOURS	By arrangement.
SUGGESTED TEXTS	*Quantum Mechanics* by Eugene Merzbacher. Other's: *Quantum Mechanics* by Claude Cohen-Tannoudji; *Quantum Mechanics* by Ernest S. Abers; *Principles of Quantum Mechanics* by K. Shankar, Lectures in Quantum Mechanics by Steve Weinberg, Quantum Mechanics by J.J. Sakurai
GRADING	The final course grade will be determined as follows. Homework 50%, exams 25%, final exam 25%.

Objectives:

This course will continue with a rigorous exposition to the principles of Quantum mechanics. We will continue with discussions on the central role of symmetry in Quantum Mechanics. In particular the rotational symmetry, will be more deeply explored. Several approximations methods for bound and unbound state (Scattering) solutions of the Schrodinger equation will also be discussed. Finally, if time permits we will have an introduction to relativistic Quantum Mechanics and the Quantum theory of light.

Learning Outcomes:

Upon completion of this course students shoud able to:

- Understand the superposition principle and its applications to analyze any quantum system.
- Be able to determine when to use, and how to apply, approximation methods to solve the Shrodinger equation in one, two, or three dimensions for both bound and unbound state solutions.

- Be able to use first and second order pertubation theory to compute scattering cross sections.
- Be able to to combine states with various components of angular momentum.
- Be able to apply the Wigner-Eckart theorem for determination of matrix elements involving tensor operators.

Topics to be covered

1. Review of Symmetries in Quantum Mechanics
2. Spin and the Transformation of Quantum states under rotations
3. Angular Momentum addition, the Wigner-Eckart Theorem
4. Approximation Methods (Time Independent Pertubation Theory)
5. Scattering
6. Transitions (Time Dependent Pertubation Theory)
7. Identicle Particles
8. Further Topics in Quantum Dynamics
   (a) Density Matrix
   (b) The Helicity Method
9. The Quantized Electromagnetic Field