Physics 611 : Graduate Quantum Mechanics **Instructor Prof. Justin Frantz**

Winter 2010

Office: Edwards Accelerator Lab 216 (Edwards is across the street from Clippinger, going up the hill)
e-mail: frantz@ohiou.edu
Meeting Times: MTWF 1:10PM-2:00PM (Tentative: all 4 days will not be normal lectures)
Location: Clippinger 132A
Office hours: By appointment as needed

Textbooks (required):
Modern Quantum Mechanics , Revised Edition, J.J. Sakurai
Introductory Quantum Mechanics , R.L. Liboff, Addison-Wesley 2003

Additional References:
Quantum Mechanics I and II, A. Messiah (thorough and advanced, esp. Vol. II)
Quantum Mechanics, E. Merzbacher (classic)

Mathematical References:
Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber
Methods of Mathematical Physics, Vol. 1, Courant and Hilbert
Methods of Theoretical Physics, I and II, Morse and Feshbach

Grading (Approximate, to be confirmed/discussed in class)
Problem sets: 33%
Midterm Exam: 26%
Final Exam: 31%
Participation, Quizzes, Special Projects: 10%
Within these approximate guidelines, I may take some weight from certain portions of the grade and apply it towards others, if it is to the students advantage. For example if the midterm performance is especially good, it may count as 31% of the final grade, while then the Final exam may instead count for 26%

Problem Sets
Homework will be assigned once every week or once every two weeks, depending on the amount and length of the problems.

Course Content
-Brief Review of Linear Algebra, Introductory Quantum Mechanics. *Wave Mechanics to Perturbation Theory*
-General Formalism of Quantum Mechanics. *Bra-Ket Notation. Matrix And Other Representations. Position and Momentum Representations—relation to Wave Mechanics. Time Evolution.*
-Simple Harmonic Oscillator. *Different Representations, Approaches, Applications*
-Angular Momentum and Rotational Invariance. *Orbital and Spin. Applications.*
-Selected topics. *Examples: Stationary states of the SHO Solitons, WKB/Approximation methods, Quantum "Philosophy" , Symmetry, Berry's phase, Quantum Entanglement, Introduction to Formal*

Perturbation Theory. What is covered of these will depend on time, and also may be interspersed with above content.

Learning Outcomes

Students will be able to:

-Recall and perform calculations using basic linear algebra and introductory Quantum Mechanics, especially wave mechanics

-Discuss various interpretations of quantum measurement philosophies

-Proficiently perform proofs and calculations of the basic quantum mechanical formalism using the Sakuarai/Dirac convention and notations, and with an emphasis of algebraic properties of associated operators

-Derive the required form and properties of important space, time, and angular transformation operators and discuss and use in calculations/derivations, implications thereof.

-Demonstrate understanding of time evolution in quantum phenomena by using the Sakuarai/Dirac convention and notations to calculate time evolution in simple quantum systems

-Be conversant in discussions of main topics and vocabulary of above special topics

Attendance Policy

Attendance in lectures is expected, but not necessarily required. If you will miss a substantial number of classes, schedule a discussion with me.

Academic Misconduct Policy

I remind you that academic misconduct is a Code A violation of the Ohio University Code of Student Conduct. If you are found to be involved in academic misconduct regarding this course, you will receive F on the pertinent work and possibly for the entire course and/or a referral to the Director of Judiciaries. Procedures for judicial actions may be invoked as described in the Student and Faculty Handbooks.

One thing to be careful of is blatently copying solutions you find on the web, especially without fully understanding them.