PHY 6400 **Quantum Physics 1** **Winter 2018** **Sean Gavin**

office: Room 320 Physics Research Bldg.
email: sean@physics.wayne.edu

TEXT: D. Griffiths, *Introduction to Quantum Mechanics*, 2nd Edition, ISBN-10: 0131118927; ISBN-13: 978-0131118928

REFERENCES: **Same level:** S. Gasiorowicz*, Quantum Physics*
Higher level: R. Shankar, *Principles of Quantum Mechanics*

LEARNING OUTCOMES: After taking this course, you will:

1. Learn about the basic phenomena of the quantum world: stationary states, wave packets, tunneling, entanglement, and spin.
2. Become familiar with the basic problems of quantum mechanics for which exact solutions- of the Schrödinger equations are possible.
3. Be able to translate the physical description of a problem into equations that can be used to answer relevant questions.
4. Build skill in the mathematical methods needed for these problems:
    a. Work with differential equations, delta functions, Fourier transforms, and linear algebra (at the junior level).
    b. Visualize a problem in terms of relevant sketches or graphs.
    c. Recognize when and how to make useful approximations, i.e., which terms in a series expansion are important in a specific physical limit.
    d. Recognize when symmetries such as parity are useful.

MEETING: Physics 177, MWF 1:30 to 2:20 PM

OFFICE HOURS: MWF after class, or by appointment

HOMEWORK: Due in class every 1-2 weeks. Late homework loses 10% per week.

GROUP WORK: In-class exercises – complex problems requiring group discussion. Prep work due on exercise day (40%). Group participation (20%). Write-up due in the next class (40%).

GRADES: There will be two midterm exams and a cumulative final. **Exam dates may change if the class departs from the expected schedule.**

Group Work	30%
Homework	40%
Midterm Exams	20%
Final Exam	10%

FINAL EXAM: **Monday, April 30, 2015, 12:30 – 2:30 PM**

SCHEDULE – subject to change according to the needs and interests of the class

Week of	Chapter	Comments
1/8	1	Wave function, probability, expectation values
1/17	1-2	No class Monday Schrödinger equation in 1D; stationary states, infinite square well
1/22	2	Harmonic oscillator
1/29	2	Free particle, wave packets, delta function potential;
2/5	2	Finite square well
2/12	3	State vectors in Hilbert space Exam 1 on Chapters 1 and 2
2/19	3	Eigenfunctions of Hermitian operators
2/26	3	Uncertainty principle and Dirac Notation
3/5	4	Schrödinger equation in three dimensions; spherical coordinates, hydrogen atom
3/12	4	Winter break – no classes
3/17	4	Angular momentum
3/26	4	Spin
4/2	5	Examples: Spin and Spin-like systems
4/9	5	Identical particles; Bose and Fermi statistics Exam 2 on Chapters 3 and 4
4/16	5	Examples of multi-particle systems
4/23	5	Monday is the final class