Syllabus Physics 4803 Introduction to Quantum Mechanics II Fall 2012

Instructor. K. A. Milton

Class Meetings. M W F: 1:30–2:20, NH 103

Office. NH 325, x36325

Office Hours. MWF 11:30am–1:00 pm, by appointment, or any other time you can catch me in my office.

Prerequisites. It is expected that you have taken Physics 3803, Introduction to Quantum Mechanics I, or its equivalent. Some familiarity with the following subjects will be assumed:

Classical mechanics, Newton's laws, and a bit of Hamiltonian and Lagrangian physics Electrodynamics, including Maxwell's equations Thermodynamics and Boltzmann factors Spin-1/2, including Pauli matrices State vectors, probability amplitudes, and wavefunctions Matrices and determinants Eigenvalue problems Unitary transformations and transformation functions Time-dependent Schrödinger equation

Textbook. (both optional)

Quantum Mechanics: Symbolism of Atomic Measurement, by Julian Schwinger, ed. by B.-G. Englert (Springer, Berlin, 2001).

Quantum Mechanics, by David H. McIntyre (Pearson, Boston, 2012).

The first book is closer to the spirit of my approach, but it is definitely at too high a level for this course, so I am suggesting the second book, which is considerably more user-friendly, this term. The course will actually be based on my own notes, which will be posted online, based in part on Schwinger's courses at Harvard and UCLA.

References on reserve in the physics library.

- G. Baym: Lectures on Quantum Mechanics
- D. Bohm: Quantum Theory
- C. Cohen-Tannoudji et al.: Quantum Mechanics, Vol. I
- R. Dicke: Introduction to Quantum Mechanics
- P. A. M. Dirac: Quantum Mechanics
- D. J. Griffiths: Introduction to Quantum Mechanics
- R. L. Liboff: Introductory Quantum Mechanics
- E. Merzbacher: Quantum Mechanics
- M. Morrison: Understanding Quantum Physics: A User Manual
- D. Saxon: Elementary Quantum Mechanics

Lecture notes. Will be available on the web, at

https://learn.ou.edu/index.asp

or at the course website,

http://www.nhn.ou.edu/%7Emilton/p4803-12.html

The webpage for Quantum Mechanics I, Physics 3803, last semester is here:

http://www.nhn.ou.edu/ milton/p3803-12.html

which includes the lecture notes from last semester.

Grading.

Homework	30%
Hour Exams $(2 \times 20\%)$	40%
Final Exam	30%

I will also be giving weekly short (10 minute) quizzes which will count as bonus points for the midterm exam grades.

Homework. Will be assigned roughly weekly. Solving the problems will be the most significant learning aspect of the course, and is essential for success in the examinations. Late homework will not be accepted.

Exams. In-class examinations will all be of the closed-book variety—no crib sheets may be used. Make-up examinations will not be given.

Exam schedule.

Exam I	Monday, October 8
Exam II	Monday, November 19
Final Exam	Thursday, December 13, 8:00am–10:00am

Assistance. May be had from instructor at any time.

TENTATIVE COURSE OUTLINE

Topic

Review of construction of Quantum Mechanics
Position and momentum
Gaussian wavefunctions
Time evolution
The Hamiltonian
The Schrödinger equation
Symmetries: Rotations
Properties of angular momentum
From angular momentum to the harmonic oscillator
Addition of angular momenta
Rotation matrices and spherical harmonics
Displacements and Galilean relativity
Momentum and position
The Hamiltonian revisited
The Hydrogen atom

Perturbation theory Fermions and Bosons

"The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Disability Resource Center prior to receiving accommodations in this course. The Disability Resource Center is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173."

"It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays."