PHYS341: Quantum Mechanics
Fall 2008

Teacher: Dr. Kelly Krieble Office: Room 109, Collier Hall of Science Phone: ext. 1437 e-mail: krieblek@moravian.edu	Classroom: CHS 123 M,W,F 11:30 – 12:20 CHS 124 Th 9:00 --10:00 Lab: CHS 107 Th 12:45 --3:45 Office Hours: By appointment

Course Objectives:

The primary aim of this course is to provide students with a working knowledge of the fundamental concepts of quantum mechanics and to prepare them for graduate school or industry. Students will learn and apply a number of mathematical techniques for calculating and defining wave functions, extracting useful physical information from wave functions, and will be able to associate their results with well known physical phenomena. In the laboratory portion of the course, the students will learn a variety of experimental techniques that will complement the theoretical ideas introduced throughout the course.

Course Text: Introduction to Quantum Mechanics, 2nd ed., Griffiths.

Course Content and Schedule of Topics:

Topic	*Approximate Time Span*	*Readings*
1. The Wave Function a. Probability b. Normalization c. Fourier Series d. Observables	2 weeks	Chapter 1
2. The Schrodinger Equation a. Superposition b. Separation of Variables c. Examples: i. Infinite Well ii. Harmonic Oscillator (1) Algebraic Methods (2) Raising and Lowering Operators (3) Recursion (4) Hermite Polynomials iii. Free Particle iv. Delta Function Potential v. Finite Square Well (1) Barriers (2) Tunneling	4 weeks	Chapter 2
3. Vector Spaces a. Eigenvalues and Eigenfunctions b. Operators c. Uncertainty Principle d. Dirac Notation e. Matirx Theory	3 weeks	Chapter 3
4. 3D Quantum Mechanics a. Coordinate Systems b. Hydrogen Atom c. Angular Momentum d. Spin	3 weeks	Chapter 4
5. Perturbation Theory a. Time Independence b. Degeneracy c. Fine Structure d. Zeeman Effect and Hyperfine Splitting	2 weeks	Chapter 6

Grading Policy:

A = 90%-100%
B = 80%-89%
C = 70%-79%
D = 60%-69%
F = below 60%

Assessment:	% Weight
Homework Problems	30
Lab Project	30
Exams	20
Final Exam	20

Homework Problems:

As illustrated above, the problem sets constitute a major portion of your grade. Your work on these problem sets will be bound by the Moravian College Policy on Academic Honesty in the Student Handbook. The due dates for each assignment will be stated when the assignment is handed out. There will be a 50% deduction for tardy work up until solutions to the homework are posted. Work submitted after that time will receive a zero.

Lab Project:

The lab project for this course will comprise a semester-long examination of a particular advanced physics topic. You will have the opportunity at the beginning of the semester to select a topic that you will research. Your options include but are not limited to:

1. Mossbauer Spectroscopy.
2. Beta Ray spectrum.
3. Fuel Cell experimentation
4. Biophysics Projects
5. 3D kinematics measurements
6. Gel electrophoresis
7. Faraday Effect
8. Particle Scattering.
9. Magneto-Optic Kerr Effect.
10. NMR.
11. Hydraulic Jump
12. Granular Flow
13. Raman Spectroscopy
14. Quantum Tic-tac-toe programming

Assessment for the lab project will include a formal lab report (20%), a poster (5%), and a presentation (5%)

Exams:

Two in-class exams will be given during the semester.

Final comprehensive exam:

An exam on all material covered during the semester.

Attendance Policy:

Students are expected to come to class. To that end, I WILL take attendance, and reserve the right to raise/lower your grade based on your attendance.

Good luck in the coming year. Should you have any comments about the class during the semester, please feel free to discuss them. I will welcome any suggestions for improving the course. Since I am looking for you to do your best work, you should demand excellence from me as well.

Subject to revision