KOÇ UNIVERSITY
College of Arts and Sciences
Department of Physics

Course: PHYS401 Quantum Mechanics I
Credits: 3
Semester: Fall 2003
Instructor: Professor **Tekin Dereli**
Office: Science 159, Phone: 1510, E.mail: tdereli@ku.edu.tr
Office hours: By appointment
Lecture hours: Mondays and Wednesdays, 14.00-15.15, Scie 129

Description: Probabilistic interpretation of the wave function. Uncertainty relations. Solutions of 1-dimensional Schrödinger equation: Infinite square well. Harmonic oscillator. Delta function potentials. Tunneling. Formalism of quantum mechanics: Linear vector spaces and self-adjoint operators. Eigenvalue equations. Quantum measurements. 3-dimensional Schrödinger equation. Centrally symmetric potentials. Hydrogen atom eigenfunctions.
Textbook: *Introduction to Quantum Mechanics* D.J.Griffiths (Prentice-Hall, 1994)
Problem book: *Quantum Mechanics* (Schaum Series) Y. Peleg, R. Pnini, E. Zaarur (McGraw Hill, 1998)

Grading: Homework (8 sets) 16%
1. Midterm 24%, November 5, 2003
2. Midterm 24%, December 10, 2003
Final Exam 36%, January 26, 2004.

Remember:

1. Attendance will be taken in the classes. Any student who misses more than 9 lectures with or without excuse automatically fails.

2. In the exams no exchange of information among students should take place. You are expected to hand in your own work in all the exams and HW assignments.

3. For the homework you may discuss the problems, consult your teachers and use the library and internet. However, the submitted work must be totally yours. You must not submit work done in groups, transfer files or copy from a book.

4. Late homework is going to be accepted but you loose half the grade.

Course plan:

Week:1 Wavefunction. Schrödinger equation. Probabilitic concepts. Expectation values.

Week:2 Gaussian wave packet. Momentum operator. Uncertainty relations.

Week:3 Stationary state solutions of 1-dimensional potential problems. Infinite square well. HW1.

Week:4 Simple harmonic oscillator. Free particles. Plane wave solutions. HW1

Week:5 Holiday

Week:6 Fourier transforms. Momentum space. (1. Midterm)

Week:7 δ-function potentials. Bound states and scattering states. Tunneling through potential barriers.

Week:8 Linear vector spaces. Vectors and matrices. Orthonormal bases. Bases change as a linear transformation. HW2

Week:9 Holiday

Week:10 Eigenvalue problems. Matrix diagonalization. HW3

Week:11 (2. Midterm) Hilbert space of state vectors. Hermitian and unitary operators.

Week:12 Postulates of quantum mechanics. Measurement hypothesis. Uncertainty products. HW4

Week:13 3-dimensional Schrödinger equation . Separation of variables in centrally symmetric potentials.

Week:14 Hydrogen atom problem.

Week:15 Solutions of the angular equation. Radial equation. Radial probability distribution functions. HW5