Course Profile - Department of Physics

Course Number : PHYS 334	**Course Title :** Quantum Mechanics II
Required / Elective : Required	**Pre / Co-requisites :** PHYS 333
Catalog Description: Spin and angular momentum, time-independent perturbation theory, time-dependent perturbation theory, many particle systems, scattering theory, variational principle, WKB approximation, basics of quantum computations.	**Textbook / Required Material :** 1. David J. Griffiths, *Introduction to Quantum Mechanics, 2nd ed.* Prentice-Hall, 2005. 2. Gasiorowicz, S. *Quantum Physics, 3rd edition*, Wiley, 2003.
Course Structure / Schedule : (3+0+2) 4 / 8 ECTS	
Extended Description : Spin and Angular Momentum. Time-Independent Perturbation Theory. Corrections in the Hydrogen Atom Problem. Many Particle Systems: Identical Particles, Atoms and Molecules. Variational Principle and WKB Approximation. Time-Dependent Perturbation Theory. Charged Particles in an Electromagnetic Field. Scattering Theory. Basics of Quantum Computations	
Design content : None	**Computer usage**: Students use computational and graphics software in studying the WKB approximation and the time-dependent perturbation theory.
Course Learning Outcomes [relevant program outcomes in brackets]**:** On successful completion of this course students will be able to 1. visualize the concept of spin and discuss spin-spin and spin-orbit interactions [1]; 2. recognize and apply special approximation techniques such as the perturbation theory, the WKB approximation, the variational principle to solve realistic problems [1,2, 5]; 3. analyze the behavior of many-particle systems and develope an understanding of the concept of identical particles [1, 6, 7]; 4. establish a conncetion between the atomic structure of the chemical elements and the theory of quantum mechanics [1, 6]; 5. make a distinction between classical and quantum mechanical scattering of particles [1]; 6. develope an understanding of the basic concepts of quantum computing [7] .	

Recommended reading:

1. Shankar, R. *Principles of Quantum Mechanics, 2nd edition*, New York: Plenum, 1994.
2. Feynman, R.P., Leighton, R.B., Sands, M. *The Feynman Lectures on Physics, Volume III*, Addison Wesley, 1966.

Teaching methods:

Lectures and exercise sessions of approximately 5 hours per week; pre-readings and homework problems.

Assessment methods:

Two mid-term examinations, a final examination, weekly homework assignments, and quizzes.

Student workload:

Pre-reading	7 hrs
Lectures, discussions	45 hrs
Exercise sessions	30 hrs
Homework	40 hrs
Independent work	73 hrs
Laboratory work	0 hrs
Examinations	5 hrs
TOTAL …… 200 hrs … to match 25 x 8 ECTS	

Prepared by : İsmail Karakurt , 01.02.2010	**Revision Date :**