PHYS 4353 Quantum Physics

Department: Mathematics, Physics and Engineering
Credit Hours: 3

Required or Elective (circle one)

Current Catalog Description:
The Schrödinger equation; one dimensional systems; the Heisenberg uncertainty principle; magnetic moments and angular momentum; two and three dimensional systems; approximation methods; scattering theory.

Course Schedule:
3 lecture hr/week, 0 lab hr/week

Textbook(s):
Introductory Quantum Mechanics, 4th Ed., Richard Liboff, 2003.
Schaum's Outlines Quantum Mechanics, Yoav Peleg, et al., 1998
Schaum's Outlines Mathematical Handbook, 2nd Ed., Murray Spiegel, 1998

Coordinator:
Dr. Daniel K. Marble
email: marble@tarleton.edu
office: SCPL 213E
phone: 254-968-9880
office hours: MWF 10:30-12:00, T,TR 8:15-9:15

Course Web Page:
http://www.tarleton.edu/physics/

Prerequisites by Topic:
Phys 3343 – Modern Physics I

Course Grading:

Program Outcome and Course Learning Goals Map:
The Program Outcomes for Engineering Physics are:

A. an ability to apply knowledge of math, engineering & science
B. an ability to design and conduct experiments, as well as to analyze and interpret data
C. an ability to design system, component or process to meet needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
D. an ability to function on multi-disciplinary teams
E. an ability to identify, formulate, and solve engineering problems
F. an understanding of professional and ethical responsibility
G. an ability to communicate effectively
H. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
I. a recognition of need for, and ability to engage in life-long learning
J. a knowledge of contemporary issues
K. an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
L. a depth and breadth of knowledge in engineering and physics necessary to work in a multidisciplinary environment

Course Goals Upon completion of this course, students will	**Program Outcome(s):**
1. be able to state the four postulates of quantum mechanics.	A, L
2. be able to recall the relationship between eigenvalues, expectation values, and experimental measurements.	A, L
3. be able to recall the definitions of introductory quantum mechanical terms such as wave function, eigenstate, stationary state, angular momentum, parity, and compatible observables.	A, L
4. be able to apply Schrodinger equation to analyze simple 1-D, 2-D, and 3-D quantum mechanical systems including the particle in a box, finite well, rigid rotator, harmonic oscillator, and the hydrogen atom.	A, L
5. be able to apply the definition of probability current density and the Schrodinger equation to analyze problems involving one or more 1-D step potentials or delta potentials including the derivation of the reflection and transmission coefficients for the system.	A, L
6. be able to solve quantum mechanical problems involving the determination of the commutation relation between two operators which represent physical quantities.	A, L
7. be able to determine if a physical quantity is a constant of the motion.	A, L
8. be able to analyze simple quantum mechanical systems using approximation techniques including time-independent perturbation analysis.	A, L
9. be able to calculate the allowed energy and momentum values for a periodic potential using the Kroning-Penney model.	A, L
10. be able to analyze quantum mechanical problems involving the addition of generalized angular momentum including transforming between the coupled and un-coupled representations.	A, L

Academic Honesty:

Cheating, plagiarism (submitting another person's materials or ideas as one's own), or doing work for another person who will receive academic credit are all-impermissible. This includes the use of unauthorized books, notebooks, or other sources in order to secure of give help during an examination, the unauthorized copying of examinations, assignments, reports, or term papers, or the presentation of unacknowledged material as if it were the student's own work. Disciplinary action may be taken beyond the academic discipline administered by the faculty member who teaches the course in which the cheating took place.

Students With Disabilities Policy:

It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (ADA) and other federal, state, and local laws relative to the provision of disability services. Students with disabilities attending Tarleton State University may contact the Office of Disability Services at (254) 968-9478 to request appropriate accommodation. Furthermore, formal accommodation requests cannot be made until the student has been officially admitted to Tarleton State University.

Contribution of Course to Meeting the Professional Requirement:
Math/Science Topics: 100%

Status of Continuous Improvement Review of this Course:
Prepared by: Dr. Daniel K. Marble
Date: 3/12/2008

Reviewed by: Jim McCoy
Date: 3/26/2008