ABET syllabus for PHGN320

1. Department, number, and title of course
Physics, PHGN320, Modern Physics II: Quantum Mechanics

2. Course (catalog) description
Introduction to the Schrödinger theory of quantum mechanics. Topics include Shrödinger's equation, quantum theory of measurement, the uncertainty principle, eigenfunctions and energy spectra, angular momentum, perturbation theory, and the treatment of identical particles. Example applications taken from atomic, molecular, solid state, or nuclear systems.
4 hours lecture; 4 semester hours,

3. Prerequisites
PHGN300 or 310 and MAGN 327.

4. Textbook(s) and/or other required material
Introduction to Quantum Mechanics, second edition, by *David J. Griffiths***,** Prentice Hall, 2005

5. Course objectives
a) to develop a modern understanding of quantum mechanics, building a solid foundation for more advanced courses.
b) to understanding the applications of quantum mechanics to other areas of the physics and engineering curriculum, as well as in technological applications in society.
c) to develop solid problem solving skills in these areas.

6. Topics covered

a) The wave function, the time-independent Schroedinger equation and description of states.
b) Statistical interpretation
c) Interference, superposition, wave equation and the double-slit experiment.
d) Harmonic oscillator, free particle, square well (finite and infinite)
e) Hilbert space, eigenfunctions of Hermitian operators, Dirac notation
f) Fourier Transform, wave packets, group velocity, momentum measurements.
g) Physical quantities and measurement: the measurement procedure:
physical quantities and observables, eigenfunctions and eigenvalues of an observable.
h) Coherence, probability current quantization of energy in simple systems: bound and scattering states.
i) Quantum mechanics in three dimensions: hydrogen atom, angular momentum, spin
j) Identical particles: two particle system, atoms, solids, quantum statistics
k) Applications (depending on time): adiabatic approximation, time-independent perturbation theory, variational principle, Bell's theorem and the EPR paradox.

7. Class/laboratory schedule
Three 65-minute lectures weekly.

8. Contribution of course to meeting the professional component

Four credit hours of engineering science.

9. Relationship of course to program outcomes

Provides a junior level introduction to quantum mechanics necessary to meet Engineering Physics program outcomes 1(a,b). Emphasizes student teamwork and communication skills secondarily supporting Engineering Physics program outcomes 2(a) and 3(a).

10. Person(s) who prepared this description and date of preparation

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