

## CAMOSUN COLLEGE

PHYSICS DEPARTMENT

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**PHYS 215 Introduction To Quantum Physics**

An introduction to selected topics in modern physics. Topics include quantum theory of light, atomic structure, matter waves, quantum mechanics in one dimension and three dimensions..

OFFERED:	Winter
CREDIT:	4
IN-CLASS WORKLOAD:	4 lec, 2 lab
OUT-OF-CLASS WORKLOAD:	6
PREREQUISITES:	Phys 200, Math 220, Math 235 B
COREQUISITES:	Math 225

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**OUTLINE**

- I. Review of Wave Motion
  - A. The wave equation
  - B. Superposition and interference
  
- II. Quantum Theory of Light  
(Text Chapter 2)
  - A. Blackbody radiation
  - B. Photoelectric effect
  - C. Compton effect
  - D. Pair production
  
- III. Particle Nature of Matter  
(Text Chapter 3)
  - A. Rutherford scattering
    - 1. Derivation of alpha particle scattering formula
    - 2. Derivation of Rutherford's scattering formula
  - B. Bohr atom
    - 1. Energy levels
    - 2. Spectra
  
- IV. Matter waves  
(Text Chapter 4)
  - A. de Broglie waves
  - B. Davison-Germer Experiment
  - C. Wave packets
  - D. Heisenberg's Uncertainty Principle

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- V. Quantum mechanics in one dimension (Text Chapter 5 & 6)
- A. Postulates of quantum mechanics
  - B. Schroedinger's equation
    - 1. Time dependent form
    - 2. Time independent form
  - C. Particle in a box
    - 1. Energy levels
    - 2. Expectation values
    - 3. Probability density
  - D. Finite squarewell and harmonic oscillator
  - E. Barrier tunneling
    - 1. Transmission coefficient
    - 2. Square barrier
- VI. Quantum Mechanics in three dimensions (Text Chapter 7)
- A. Particle in a 3-dimension box
  - B. Schroedinger's eqn for the H atom
    - 1. Wave functions
    - 2. Radial probability density
    - 3. Quantum numbers
    - 4. Selection rules
- VII. Atomic structure  
(Text Chapter 8)
- A. Zeeman effect
  - B. Spin
  - C. Pauli's exclusion principle
  - D. Periodic table
- VIII. Particle physics  
(Text Chapter 15)
- A. Classification of Particles
  - B. Four forces
  - C. Standard Model

TEXT:

Serway, R.A. Moses, C.J., and Moyer, C.A. Modern Physics, 2<sup>nd</sup> Edition (1997)

ADDITIONAL REFERENCES:

Beiser, A., Concepts of Modern Physics 5<sup>th</sup> Edition

Serway, R.A., Physics for Scientists and Engineers with Modern Physics: 3<sup>rd</sup> Edition

***It is the policy of the physics department that instructors are not required to give make-up tests. At their discretion, instructors may give make-up tests in the case of documented excuses.***