



<b>Phys 2001</b>	<b>QUANTUM PHYSICS</b>	<b>(CR3)</b>
<b>Preq.</b>	<b>FSc/A-Level (Physics) or equivalent</b>	

### Objectives

*This course gives an elementary introduction to quantum physics, starting with a historical description of the developments of early last century.*

### Syllabus

Experimental basis of quantum physics, black body radiations,, photoelectric effect, Compton effect, photons, pair production, Franck-Hertz experiment, the Bohr atom, X-Rays, X-Ray diffraction, de Broglie waves, electron wave, electron diffraction, Davisson-Germer experiment and the wave-particle duality of matter and light, complementarity, Heisenberg uncertainty principle, probabilistic interpretation, atomic spectra, spontaneous and stimulated transitions, lasers, introduction to wave mechanics, Schrödinger's equation, linearity and superposition, wave functions, wave packets, probability amplitudes, expectation value, operators, Solutions to Schrödinger's equation in one dimension: transmission and reflection at a step, a barrier and a well, barrier penetration, potential wells, quantum tunneling and its applications in technology, quantum harmonic oscillator, space quantization, quantization of angular momentum and energy, hydrogen atom, quantum numbers, principal quantum number, orbital quantum number, magnetic quantum number, electron probability density, radiative transitions, selection rules, Zeeman effect, spinning electrons, spin-orbit coupling, exchange symmetry and exclusion principle.

### Recommended Books

1. *Concepts of Modern Physics*, A. Beiser, McGraw Hill, (6th edition), (2002)
2. *Modern Physics*, R. A. Serway, C. J. Moses, and C. A. Moyer, Cengage, (2004)
3. *Physics (Volume 1 & 2)* by R. Resnick, D. Halliday and K. S. Krane (5<sup>th</sup> Edition), Wiley (2002)
4. *University Physics with Modern Physics* by H. D. Young, R. A. Freedman (14<sup>th</sup> Edition), Addison-Wesley (2015)
5. *Quantum Physics* by E. H. Wichmann, Berkeley Physics Course Volume 4, Berkeley (1965)
6. *Physics for Scientists and Engineers* by R. A. Serway and J. W. Jewett (8<sup>th</sup> Edition), Golden Sunburst Series (2010)
7. *Physics for Scientists and Engineers with Modern Physics* by D. C. Giancoli (4<sup>th</sup> Edition), Addison-Wesley (2008)