Phys 4310	QUNTUM ELECTRONICS	(CR3)
Preq.	Phys 3402, 3702/ ADP (Physics)	

Objective

Develop a basis for understanding the quantum mechanical aspects of modern electronics (lasers, quantized Hall effect, field effect transistors, optical tweezers, etc.)

Syllabus

Time-independent Schrodinger equation, quantum mechanical tunneling, bound states and scattering transmission electron microscopy, the energy spectrum of diatomic and aromatic molecules, the band structure of one-dimensional crystalline and disordered solids, the scattering time for electron transport

in a crystal, the quantized and fractional Hall effect in a two-dimensional electron gas, perturbation theory and field quantization, two-state lasers, light pressure forces on atoms, quantization of LC circuits, Casimir forces, field effect transisters, optical tweezers, quantum devices, single electron transister,

Spontaneous and stimulated transitions, Einstein coefficients, coherence of stimulated emission, Light matter interaction, transition probability Spectral line shape, inhomogeneous and homogeneous broa dening Absorption and amplification, gain medium, saturation Laser oscillations, feedback, lasing th reshold, resonant conditions interaction of electromagnetic radiations with resonant atomic transitions, density matrix treatment, Rabi oscillations.

Recommended Books

1. *Quantum Theory Of The Optical And Electronic Properties Of Semiconductors (5Th Edition), H. Haug and S. W. Koch, World Scientific, (2009)*
2. *Quantum Electronics, by A. Yariv,Wiley, (2013)*
3. *Principles of Quantum Electronics, D. Marcuse, Academic Press, (2012).*