

Ph.D. Course Work
Subject: PHYSICS
Paper IV : Advanced Topics in Physics

16
SS 919
SS. 1201
2018-15
2018

Polymerization, Quantum size effect, Electron-confinement in infinitely deep square-well, Confinement in one and two-dimensional well, Idea of quantum structure, Quantum dots and wires.

Growth of Crystals from the solutions and melts (Kyropolous, Czochralski, Bridgmann, float zone Methods), Gel method, Epitaxial growth, Idea of MBE, LPE and CVD techniques.

Evaporation theory : Kinetic energy of gases - mean free path and impingement rates of molecules, evaporation theory - evaporation rates, evaporation mechanisms, directionality of evaporating molecules, Nucleation and Growth: Condensation process and nucleation, Capillary theory of nucleation-various stages of growth (qualitative treatment).

X-ray spectrometers, Raman spectrometer, Mass spectrometer, IR and UV Spectrophotometer, ESCA and STEM microscopy, Environment, Pollution measuring instruments.

Interacting electron gas, concept of many electron system, Thomas-Fermi Theory, Hartree and Hartree-Fock approximation, Correlation energy, Hume-Rothery rule, Phase rule, Lever rule,

Periodic potentials, Bloch theorem and Born-von Kramer boundary conditions, General remarks about Bloch theorem, Fermi surface, Electron density of states, Kronig-Penny model, Equation for electron wave in a periodic potential : solution of central equation, approximate solution near zone boundary, Construction of Fermi surfaces, The tight binding approximation for band structure, Effective mass in solids

Books Recommended :

1. Introduction to Plasma Physics by S.S. Chen
2. Plasma Physics by Uman
3. X-ray Structure Determination by M.M. Woolfson
4. Crystal growth Process and Methods by P. Santhanaraghawan and Ramaswami
5. Thin film Phenomenon by K.L. Chopra
6. Solid State Physics by Kittel
7. Solid State Physics by S.O. Pillai
8. Elements of Solid State Physics by Omar
9. Solid State Physics by Wahab
10. Solid State Physics by Ashcroft and Mermin

2014