

LECTURES ON SUPERCONDUCTIVITY

- **25 January**

- LECTURE 1**

- Phenomenology. Meissner-Effect. Ginzburg-Landau Theory. Critical Current. Flux Quantisation. Critical Field.*

- **27 January**

- LECTURE 2**

- NS surface energy. Type I and Type II Superconductivity. Intermediate State. Abrikosov Vortex and Mixed state. Phase Diagram.*

- **1 February**

- LECTURE 3**

- Cooper Effect, Bogoliubov Transformation. Thermodynamics.*

- **3 February**

- LECTURE 4**

- Superconductivity in Heterogeneous conditions. Functional integral for Fermions. Gorkov Equations. Bogoliubov - de Gennes Equation.*

- **8 February**

- LECTURE 5**

- Andreev Reflection. Derivation of G-L from BCS*

- **10 February**

- LECTURE 6**

- Shapoval - de Gennes Path Integral Representation.*

- **15 February**
LECTURE 7
Effect of Disorder on Superconductivity. Anderson Theorem. Effect of Magnetic Impurities. Gapless Superconductivity
- **17 February**
LECTURE 8
Semiclassical Approximation. Eilenberg and Usadel Equations.
- **22 February**
LECTURE 9
Josephson Effect. GL Theory and Dynamical Equation. Shapiro steps. Effect of Magnetic Field. SQUID. SIS, SNS and SCS junctions.
- **24 February**
LECTURE 10
Step back: Phonons and Coulomb Interactions. Eliashberg Equations. Gap function.
- **1 March**
LECTURE 11
Properties of Layered Superconductors
- **3 March**
LECTURE 12
Phase Slippage and Resistance of Superconducting Wires.
- **8 March**
LECTURE 13
Superconductor-Insulator Transition in Granulated Films

- **10 March**
LECTURE 14
Fluctuations. Para-conductivity
- **15 March**
LECTURE 15
Non-equilibrium Superconductivity