

Solid State Physics II – FİZ 436E – Prof.Dr. Ferid Salehli

Quiz – 25%, Home work – 10%, Midterm – 25%, Final Exam – 40%

Syllabus

I. Dielectric and Optical Properties of Solids

Basic formulas. The dielectric constant and polarizability. The local field. Sources of polarizability. Dipolar polarizability. Dipolar dispersion. Dipolar polarization in solids. Ionic polarizability. Electronic polarizability. Piezoelectricity. Ferroelectricity.

II. Magnetism and Magnetic Resonances

Basic formulas. Magnetic susceptibility. Classification of materials. Langevin diamagnetism. Paramagnetism. Magnetism in metals. Ferromagnetism in insulators. Antiferromagnetism and ferrimagnetism. Ferromagnetism in metals. Ferromagnetic domains. Paramagnetic resonance. The maser. Nuclear magnetic resonance. Ferromagnetic resonance. Spin waves.

III. Superconductivity

Zero resistance. Perfect diamagnetism. The Meissner effect. The critical field. Thermodynamics of the superconducting transition. Electrodynamics of superconductors. Theory of superconductivity. Tunneling and Josephson effect. The intermediate state. Critical field in small specimen. Type II superconductors.

IV. Solid-State Biophysics

Biological applications of delocalization in molecules. Nucleic acids. Proteins. Radiation damage. Myoglobin and hemoglobin molecules. Enzyme studies. Carcinogenic activity.

Books:

- M. Ali Omar – Elementary Solid State Physics: Principles and Applications. Addison-Wesley Publishing Company, 1993
- N.W. Ashcroft, N.D. Mermin – Solid State Physics