

Topics of Biophysics lectures 2012-2013/I  
1-5. weeks

Light

Geometrical optics (light-rays)

Fermat principle, application of the Fermat principle for curved surfaces

Optical imaging, refractive strength

Fundamentals of physical or wave optics

Huygens-Fresnel principle, characterization of a wave

Coherent light waves, interference of light, Young's double slit experiment.

Diffraction through an optical lattice

Fundamentals of diffraction methods

Light as electromagnetic wave

Optical anisotropy and polarization of light

Doubly refractive materials

Light as photon radiation of light particles

Photoelectric effect

Basics of radiometry

Emitted power, intensity, (flux density)

Source, radiation, irradiated target

Spherical (point-like isotropic radiator), cylindrical and planar symmetry

Decrease in radiation intensity while passing through matter

Attenuation coefficient, layer thickness for half-intensity

Structure of atoms

Atoms, electrons, nuclei, Rutherford's scattering experiment

Franck-Hertz experiment, Bohr's model

Electron as a wave, state function

Propagation law of free electrons, Heisenberg uncertainty relation

Bound state electron and atomic states

Discrete atomic energy levels, quantum numbers

Spin and associated magnetic momentum of an electron