

2024/25 1st semester

Physical foundations of biophysics - elective course				
Duration of the course: 2 <sup>nd</sup> -13 <sup>th</sup> week Time: Tuesdays 18:00-20:15 and Thursdays 18:00-20:15				
Week	Date	Title	Lecturer	Location
2	17, Sept Tuesday	Reference frame, Cartesian coordinate system, scalars, vectors, vector notation and coordinate notation. Position, velocity, acceleration, mass. Linear momentum, force, kinetic energy, work, power. Gravitational force, potential energy. Newton's laws. Conservation of linear momentum and mechanical energy. Elastic and inelastic collision. Example of inelastic collision: Compton-scattering.	GV	IVDI
	19, Sept Thursday			IVDI
3	24, Sept Tuesday	Other types of physical interaction: electric, magnetic, strong. Introduction to wave phenomena.	FZS	IVDI
	26, Sept Thursday			IVDI
4	1, Oct Tuesday	Bohr's model of the atom. Quantum numbers. Quantization of energy levels, absorption and emission spectra of atoms and molecules	NE	IVDI
	3, Oct Thursday			IVDI
5	8, Oct Tuesday 19:00	Longitudinal and transversal waves. Sound, light	BZs	IVDI
	10, Oct Thursday			IVDI
6	15, Oct Tuesday	Differential equations describing radioactive decay, absorption of gamma/X rays. Connection between proton-to-neutron ratio and type of radioactive decay. Mathematical basis of target theory.	HP	IVDI
	17, Oct Thursday			IVDI
7	22, Oct Tuesday	Physical basis of PET, SPECT, gamma-camera: pair production, annihilation.	GK	IVDI
	24, Oct Thursday			LC 0.14.
8	29, Oct Tuesday 19:00	Angular momentum, magnetic momentum, spin. Quantization of angular momenta. Potential energy of a magnetic dipole in a magnetic field, potential energy of an electric dipole in an electric field. Quantization of energy. Bases of NMR and ESR spectroscopy.	KT	IVDI
	31, Oct Thursday			IVDI
9	5, Nov Tuesday 19:00	Various forms of energy. Absolute temperature, the Kelvin scale. Energy storing degrees of freedom, connection between energy and temperature, the equipartition principle. Work and heat. Thermodynamic state functions. Kinetic gas theory, ideal gas, state equation of the ideal gas. The first law of thermodynamics.	GV	IVDI
	7, Nov Thursday			IVDI
10	12, Nov Tuesday	Microstates. Thermodynamic probability. Entropy. The second law of thermodynamics. Chemical and electrochemical potential. Distribution of energy among particles – the Boltzmann distribution.	BL	IVDI
	14, Nov Thursday			IVDI
11	19, Nov Tuesday	Electric charge, electric field and potential of a point charge, Coulomb-force. (Gauss's law.) Electric field and potential in a capacitor. Potential energy of an electric charge in an electric field. Electrochemical potential.	VZ	IVDI
	21, Nov Thursday			IVDI
12	26, Nov Tuesday	Geometrical optics.	VGy	IVDI
	28, Nov Thursday			IVDI
13	3, Dec Tuesday 19:00	Circular motion, angular velocity, centripetal acceleration. Force in a rotating reference frame: centrifugal force. Drag force. Buoyant force. The physics of centrifuging.	NE	IVDI
	5, Dec Thursday			IVDI

**Physical foundations of biophysics (elective course)**

The aim of the course is to provide students with a background in physics, which helps them to understand and learn the material of the biophysics lectures.

Type of the course: seminars and consultation

Requirements of admission: sign up for Biophysics for the same semester

Credit points: 1

Duration of the course: 2nd-13th week

Time: Tuesdays 18-20<sup>15</sup> and Thursdays 18-20<sup>15</sup>

Coordinator: Dr. György Vámosi, Room 1.407, Life Science Bldg.