**BIOPHYSICS (10h)**

**VETERINARY MEDICINE**

**Person responsible**: Izabela Świetlicka, PhD

Department of Physics

**Lectures’ schedule**

1. **Work, force and mechanical energy. Muscles and levers in living organisms**: basic concepts of dynamics, rigid body concept, moment of force (torque), moment of inertia and angular momentum, dynamic’s laws for circular motion, statics, centre of gravity (mass) and equilibrium, levers and mechanical advantage, biomechanical levers with examples, work and power of muscles, (1h).
2. **Thermodynamic look on living organisms:** thermodynamic system and thermodynamic parameters, state functions, temperature as a measure of energy, equilibrium states, I law of thermodynamics – heat, work and internal energy, enthalpy – I law of thermodynamics in biological processes, metabolism, II law of thermodynamics, entropy in thermodynamics and living organisms, free energy and free enthalpy, egzo- and endoenergectic processes, chemical potential, non-equilibrium states and flows (2h).
3. **Transport phenomena: matter, energy and momentum exchange:** transport phenomena,fluid flows, continuity equation and Bernoulli’s principle, Magnus effect, viscosity, Newton’s law of hydrodynamics and viscosity coefficient, Hagen-Poiseuille equation and Stocks law – viscosity measurements, blood circulation system, heat transfer – thermal conductivity, convection and radiation, thermoregulation, flow of electric charge, electric potential, resistance and conductivity, electrolytic dissociation, I and II Faraday’s laws of electrolysis, electrochemical potential, neuron structure, resting and action potential, bio-potentials and methods of their measurements (2h).
4. **Oscillations and mechanical waves. Elements of acoustics**: Oscillations; simple harmonic motion basic concepts; harmonic motion equation, velocity, acceleration, force and energy in harmonic motion, dampen and driven oscillations, resonance, particles and waves, mechanical waves, wave equation, velocity of mechanical waves, interference, diffraction and other wave phenomena, acoustic waves, standing waves, ultrasounds, Doppler effect, peripheral auditory system , sound intensity and sound intensity level, (2h).
5. **Geometrical and physical optics. Visual effects**: Wave–particle duality; EM radiation as a particle; Maxwell’s laws; electromagnetic spectrum; polarization – types and methods; diffraction and interference; spectrophotometry; reflection and refraction, Snell's law; refractive indexes; total internal reflection and critical angle; dispersion; lenses types and imaging; eye and the process of eye-sight (2h).
6. **Nuclear physics and radioactive decay.** Rutherford experiments; atomic model evolution, Bohr’s atom, atom structure; ionizing radiation – sources and types; exponential decay; exponential decay constant and half-life; radioactive decay rates; dosimetry; nuclear reactions (1h).
7. **Information theory and control**: information theory, information link, unit and amount of information, entropy in information theory, coding and decoding, bandwidth and information capacity, information processing in receptors, regulation and control, homeostasis (1h).