

## Schedule of the lectures on biophysics – Branch General Medicine (2025-2025)

Place: Institute of Experimental Oncology, U Nemocnice 5, Lecture room 097

Week	Date	Lecture
<b>Week 1</b>	Tu 01.10.2024 12,30-13,45 We 02.10.2024 12,30-13,45	<b>Prof. Jiráček: Structure of matter I</b> (Atom, Basic particles, Antiparticles, Force interactions, Energy) <b>MUDr. Štěpánek: Statistical analyses</b> (Error of measurement, Data evaluation)
<b>Week 2</b>	Tue 08.10.2024 12,30-13,45 We 09.10.2024 12,30-13,45	<b>Prof. Jiráček: Quantum Physics I</b> (Corpuscular-wave dualism, Behaviour of a particle, TEM, Quantum numbers) <b>Prof. Jiráček: Quantum Physics II</b> (Spectrum of hydrogen atom, Electron structure of heavy atoms, Emission, Excitation, Ionization, Photoelectric effect, Luminescence, Optical imaging)
<b>Week 3</b>	Tue 15.10.2024 12,30-13,45 We 16. 10.2024 12,30-13,45	<b>Prof. Jiráček: Forces acting among atoms</b> (Forces acting among atoms, Mass spectroscopy, Atomic nucleus, Binding energy, Mass defect, Potential barrier of atomic nucleus) <b>Prof. Jiráček: Bioelectric phenomena I</b> (Electric phenomena, Electric laws, Ohm's law, Resistance, Impedance, Wheatstone bridge, Permittivity, Effects of el. current, Electrotherapy)
<b>Week 4</b>	We 23.10.2024 12,30-13,45	<b>RNDr. Zápotocký: Thermodynamics I</b> (Laws of thermodynamics, Propagation of heat energy, Bioenergetics, Measurement of temperature, Calorimetry, Thermal losses)
<b>Week 5</b>	Tue 29.10.2024 12,30-13,45 We 30.10.2024 12,30-13,45	<b>MUDr. Kyplová: Bioelectric phenomena II</b> (Electrodiagnostic methods and their clinical applications, Heart, Action potential in heart cell, Laser-Clinical applications) <b>Prof. Jiráček: Bioelectric phenomena III</b> (Membrane transport, Membrane potential, Nernst potential, Sodium-Potassium pump ATP-ADP cycle, Action potential, All or none law, Rheobase, Chronaxie, Conduction of action potential, Ion channel, Principle of ECG)
<b>Week 6</b>	Tue 05.11.2024 12,30-13,45 We 06.11.2024 12,30-13,45	<b>Prof. Jiráček: Acoustics</b> (Definition, Basic quantities, Doppler's effect, Ultrasound, Piezoelectric effect, Ultrasound imaging) <b>Assoc. Prof. Stanicová: Bioacoustics</b> (Biophysics of hearing, Weber-Fechner's law, Field of hearing, Complex tones, Principal of hearing)
<b>Week 7</b>	Tue 12.11.2024 12,30-13,45 We 13.11.2024 12,30-13,45	<b>Prof. Jiráček: Molecular biophysics I</b> (Forces acting among molecules, States of matter, Gaseous phase, Kinetic theory of gases, Dalton law, Henry law, Graham law, Equipartition theorem, Real gas) <b>Prof. Jiráček: Molecular biophysics II</b> (Liquid phase, Water, Solid phase, Change of phases, Gibbs rule of phases, Dispersion systems, Colloidal dispersion, Nephelometry)
<b>Week 8</b>	Tue 19.11.2024 12,30-13,45	<b>Prof. Jiráček: Molecular biophysics III</b> (Sedimentation, Dialysis, Electric double-layer of colloidal particles,

	We 20.11.2024 12,30-13,45	Electrophoresis, Transport phenomena, Energy of the moving fluid) <b>RNDr. Zápotocký: Thermodynamics II</b> (Thermodynamic systems, Work and heat, State quantities, Internal energy, Enthalpy, Entropy, Free energy, Free enthalpy, Chemical potential)
<b>Week 9</b>	Tue 26.11.2024 12,30-13,45 We 27.11.2024 12,30-13,45	<b>Prof. Jiráček: Magnetic Resonance I</b> (Magnetic properties of nuclei, Principle of MR) <b>Assoc. Prof. Stanicová: Optics I</b> (Light, Interaction of light with matter, Ray optics, Lens equation, Optical power, Microscope)
<b>Week 10</b>	Tue 03.12.2024 12,30-13,45 We 04.12.2024 12,30-13,45	<b>Assoc. Prof. Stanicová: Optics II</b> (Wave optics, Interference of light, Diffraction of light, Dispersion of light, Rayleigh and Raman scattering, Raman spectroscopy, Polarization of light) <b>Assoc. Prof. Stanicová: Optics III</b> (Biophysics of vision, Eye defects and their correction, Laser)
<b>Week 11</b>	Tue 10.12.2024 12,30-13,45 We 11.12.2024 12,30-13,45	<b>Prof. Jiráček: Magnetic Resonance II</b> (Image formation, MR spectroscopy, Hardware) <b>Prof. Jiráček: Molecular biophysics IV</b> (Law of Laplace, Surfactant, Viscosity, Hagen-Poiseuille law, Reynolds number, Diffusion)
<b>Week 12</b>	Tue 17.12.2024 12,30-13,45 We 18.12.2024 12,30-13,45	<b>Prof. Jiráček: X-ray imaging</b> (X-ray production, principle of X-ray imaging) <b>Prof. Jiráček: CT imaging</b> (principle of Computed tomography), CT image formation, X-ray side effects, Therapy, Contrast agents
<b>Week 13</b>	Tue 07.01.2025 12,30-13,45 We 08.01.2025 12,30-13,45	<b>Prof. Jiráček: Radioactivity</b> (Law of radioactive decay, Radioactive equilibrium, Biological and effective half-life, Kinds of radioactive decay), Therapy - Leksell Gamma Knife <b>Prof. Jiráček: Radioactivity</b> (Gamma camera, SPECT, PET)
<b>Week 14</b>	Tue 14.1.2025 12,30-13,45 We 15.1.2025 12,30-13,45	<b>Prof. Jiráček: Molecular biophysics V</b> (Colligative properties of solutions, Osmotic pressure, Starling hypothesis, Phase border phenomena, Surface tension, Adsorption) <b>Prof. Jiráček: Imaging methods</b> (Contrast agents for ultrasound, computed tomography and magnetic resonance, fMRI, Spectroscopy, Optoacoustic imaging, Diffusion/Perfusion, Thermography, Magnetic Particle imaging)
<b>Week 15</b>		