

Schedule of the lectures on biophysics – Branch General Medicine 2023-2024

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

Week	Date	Lecture
Week 1	Tu 3.10.2023 12,30-13,45 We 4.10.2023 12,30-13,45	Doc. Jiráček: Structure of matter I (Atom, Basic particles, Antiparticles, Force interactions, Energy) MUDr. Štěpánek: Statistical analyses (Error of measurement, Data evaluation)
Week 2	Tue 10.10.2023 12,30-13,45 We 11.10.2023 12,30-13,45	Doc. Jiráček: Quantum Physics I (Corpuscular-wave dualism, Behaviour of a particle, TEM, Quantum numbers) Doc. Jiráček: Quantum Physics II (Spectrum of hydrogen atom, Electron structure of heavy atoms, Emission, Excitation, Ionization, Photoelectric effect, Luminescence, Optical imaging)
Week 3	Tue 17.10.2023 12,30-13,45 We 18. 10.2023 12,30-13,45	Doc. Jiráček: Forces acting among atoms (Forces acting among atoms, Mass spectroscopy, Atomic nucleus, Binding energy, Mass defect, Potential barrier of atomic nucleus) Doc. Jiráček: Bioelectric phenomena I (Electric phenomena, Electric laws, Ohm's law, Resistance, Impedance, Wheatstone bridge, Permittivity, Effects of el. current, Electrotherapy)
Week 4	Tue 24.10.2023 12,30-13,45 We 25.10.2023 12,30-13,45	RNDr. Zápotocký: Thermodynamics I (Laws of thermodynamics, Propagation of heat energy, Bioenergetics, Measurement of temperature, Calorimetry, Thermal losses) RNDr. Zápotocký: Thermodynamics II (Thermodynamic systems, Work and heat, State quantities, Internal energy, Enthalpy, Entropy, Free energy, Free enthalpy, Chemical potential)
Week 5	Tue 31.10.2023 12,30-13,45 We 1.11.2023 12,30-13,45	MUDr. Kyplová: Bioelectric phenomena II (Electrodiagnostic methods and their clinical applications, Heart, Action potential in heart cell, Laser-Clinical applications) Doc. Jiráček: Bioelectric phenomena III (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)
Week 6	Tue 7.11.2023 12,30-13,45 We 8.11.2023 12,30-13,45	Doc. Jiráček: Acoustics (Definition, Basic quantities, Doppler's effect, Ultrasound, Piezoelectric effect, Ultrasound imaging) Doc. Stanicová: Bioacoustics (Biophysics of hearing, Weber-Fechner's law, Field of hearing, Complex tones, Principal of hearing)
Week 7	Tue 14.11.2023 12,30-13,45 We 15.11.2023 12,30-13,45	Doc. Jiráček: Molecular biophysics I (Forces acting among molecules, States of matter, Gaseous phase, Kinetic theory of gases, Dalton law, Henry law, Graham law, Equipartition theorem, Real gas) Doc. Jiráček: Molecular biophysics II (Liquid phase, Water, Solid phase, Change of phases, Gibbs rule of phases, Dispersion systems, Colloidal dispersion, Nephelometry)

Week 8	Tue 21.11.2023 12,30-13,45 We 22.11.2023 12,30-13,45	Doc. Jirák: Molecular biophysics III (Sedimentation, Dialysis, Electric double-layer of colloidal particles, Electrophoresis, Transport phenomena, Energy of the moving fluid) Doc. Jirák: Magnetic Resonance I (Magnetic properties of nuclei, Principle of MR)
Week 9	Tue 28.11.2023 12,30-13,45 We 29.11.2023 12,30-13,45	Doc. Jirák: Magnetic Resonance II (Image formation, MR spectroscopy, Hardware) Doc. Stanicová: Optics I (Light, Interaction of light with matter, Ray optics, Lens equation, Optical power, Microscope)
Week 10	Tue 5.12.2023 12,30-13,45 We 6.12.2023 12,30-13,45	Doc. Stanicová: Optics II (Wave optics, Interference of light, Diffraction of light, Dispersion of light, Rayleigh and Raman scattering, Raman spectroscopy, Polarization of light) Doc. Stanicová: Optics III (Biophysics of vision, Eye defects and their correction, Laser)
Week 11	Tue 12.12.2023 12,30-13,45 We 13.12.2023 12,30-13,45	Doc. Jirák: Molecular biophysics IV (Law of Laplace, Surfactant, Viscosity, Hagen-Poiseuille law, Reynolds number, Diffusion) Doc. Jirák: Molecular biophysics V (Colligative properties of solutions, Osmotic pressure, Starling hypothesis, Phase border phenomena, Surface tension, Adsorption)
Week 12	Tue 19.12.2023 12,30-13,45 We 20.12.2023 12,30-13,45	Doc. Jirák: X-ray imaging (X-ray production, principle of X-ray imaging) Doc. Jirák: CT imaging (principle of Computed tomography), CT image formation, X-ray side effects, Therapy, Contrast agents
Week 13	Tue 2.01.2024 12,30-13,45 We 3.01.2024 12,30-13,45	Doc. Jirák: Radioactivity (Law of radioactive decay, Radioactive equilibrium, Biological and effective half-life, Kinds of radioactive decay), Therapy - Leksell Gamma Knife Doc. Jirák: Radioactivity (Gamma camera, SPECT, PET)
Week 14	Tue 9.1.2024 12,30-13,45 We 10.1.2024 12,30-13,45	Doc. Jirák: Imaging methods (Contrast agents for ultrasound, computed tomography and magnetic resonance, fMRI, Spectroscopy, Optoacoustic imaging, Diffusion/Perfusion, Thermography, Magnetic Particle imaging) Doc. Jirák: Extra seminar (molecular imaging)
Week 15		