

**Biophysics lecture curriculum**  
Autumn semester, 2024/25

Week	Date	Number	Title	Lecturer	Seminar		
					Topic	Teacher1	Teacher2
1	9 Sept (Med) 11, Sept (Dent)	1	Introduction. Electromagnetic waves , the properties of light (interference, photoelectric effect, photon theory). Matter waves. Thermal radiation.	NP	Intro	NE	FZS
	9, Sept (Med) 13, Sept (Dent)	2	Generation and absorption of X-ray, X-ray crystallography.	JA			
2	16, Sept (Med) 18, Sept (Dent)	3	Molecular spectra, Jablonski diagram, fluorescence, fluorescence applications.	JA	1-2	JA	VáGy
	16, Sept (Med) 20, Sept (Dent)	4	Sedimentation and electrophoresis. Mass spectrometry.	SZGT			
3	23, Sept (Med) 25, Sept (Dent)	5	Lasers and their application in biology and medicine.	VGy	3-4	JA	SzGT
	23, Sept (Med) 27, Sept (Dent)	6	Optics, optical microscopy, electron microscopy.	VGy			
4	30, Sept (Med) 2, Oct (Dent)	7	Physical properties of sound, ultrasound. Doppler effect. Medical and biological applications of ultrasound.	GK	5-6	VGy	SzJ
	30, Sept (Med) 4, Oct (Dent)	8	Nuclear physics. Nuclear binding energy, radioactivity, law of radioactive decay, radioactive series.	HP			
5	7, Oct (Med) 9, Oct (Dent)	9	Features of nuclear radiation and its interaction with absorbing material. Detection of radiation.	SzJ	7-8	GK	HP
	7, Oct (Med) 11, Oct (Dent)	10	Radiation biophysics: target theory, direct and indirect action of radiation. Dosimetry. Biological effects of radiation.	KT			
6	14, Oct (Med) 16, Oct (Dent)	11	Experimental, diagnostic and therapeutic application of isotopes. Accelerators.	DBA	9-10 for MB_E: 1-10	KT	VGy MB_E: FZs
	14, Oct (Med) 18, Oct (Dent)	12	Basic principles of nuclear magnetic resonance, NMR spectroscopy in biology and medicine.	DBA			
<b>1st SCT</b> <b>Lectures 1-10.</b> <b>week7, 21 October</b>							
7	21, Oct (Med) <b>23, Oct (Dent)</b>	13	Principles of tomographic methods. X-ray absorption CT. PET.	NP	11-12	DBA	NP
	21 Oct (Med) 25, Oct (Dent)	14	Magnetic resonance imaging (MRI). Gamma camera, SPECT.	NP			
8	28, Oct (MED, DENT)	15	Chemical potential. Brownian motion. Diffusion at the molecular level, statistical interpretation. Fick's laws. Osmosis.	VáGy	13-14	NP	BZs
	28, Oct (MED, DENT)	16	The structure of biological membranes. Membrane transport.	VáGy			
9	4, NOV (Med, Dent)	17	Thermodynamic equilibrium potentials (Nernst, Donnan). Diffusion potential, Goldman-Hodgkin-Katz equation.	VZ	15-16	VáGy	SzöÁ
	4, NOV (Med, Dent)	18	Ion channels (gating, selectivity), the "patch clamp" technique.	VZ			
10	11, Nov (Med, Dent)	19	Resting potential, action potential, and electrical excitability. Measurement of membrane potential.	PGy	17-18 for MB_E: 11-18	VZ MB_E: FZs	PF
	11, Nov (Med, Dent)	20	The physical background of ECG and EEG.	PGy			
<b>2nd SCT</b> <b>Lectures 1-18, approx. 90% of the questions will focus on topics not included in the 1st SCT.</b> <b>Week11, 18 November</b>							
11	18, Nov (Med, Dent)	21	The human ear. Mechanism of hearing. The Weber-Fechner law.	NP	19-20	VZ	PGy
	18, Nov (Med, Dent)	22	The human eye. Photoreceptors. The molecular mechanism of vision.	SzG			
12	25, Nov (Med, Dent)	23	Fluid mechanics, blood circulation.	ZF	21-22	SzG	PGy
	25, Nov (Med, Dent)	24	Flow cytometry. Confocal laser scanning microscopy.	ML			
13	2, Dec (Med, Dent)	25	Biophysics of respiration. (not compulsory for dentistry students)	SzöÁ	23-24	ML	ZF
	2, Dec (Med, Dent)	26	Biomechanics. (not compulsory for dentistry students)	BZs			
14	9, Dec (Med)	27	Modern microscopic techniques (atomic force microscopy, super resolution microscopy). (not compulsory for dentistry students)	ML	25-26 for MB_E: 19-27	DBA MB_E: FZs	ML
	9, Dec (Med)	28	Research in the Institute. (not compulsory for dentistry students)	PGy			

**Biophysics Lecture:**

**GM, MB\_E:** Monday, 12:00-14:00 (LSB F.015-016)

**Dent:** Wednesday, 14:00-15:00, (LSB F 003-004) (weeks 1-7), Friday, 10:00-11:00 (LSB F.003-004) (weeks 1-7),

**Dent:** , Monday, 12:00-13:00 (LSB F.015-016) (weeks 8-14) Monday, 13:00-14:00 (LSB F.015-016) (weeks 8-14)