

SUBJECTS FOR THE THIRD MIDTERM TEST MEDICAL BIOPHYSICS 2012-2013.

Medical signal processing

Classification of the signals, signal-to-noise ratio, decreasing the noise

Signal level, concept of decibel

Fourier's theorem

High-pass and low-pass filter circuits

Amplifier (transfer characteristics, feed-back)

Digitalization of signals, Nyquist-Shannon sampling theorem

Discriminators

Ultrasound imaging: Sonography

- ultrasound, description as a wave, characteristic parameters, ranges used in diagnostics and therapy.

Intensity of ultrasound beams.

- ultrasound sources (direct and inverse piezoelectric effect)

- ultrasound absorption, frequency dependence

- ultrasound reflection, acoustic impedance

- distance determination of a reflecting object

- ultrasound imaging techniques (A-image, two-dimensional B-imaging, M-image)

- Doppler effect, color-coding, duplex sonography

- 3D, 4D imaging

Biophysics of biological motion

The cytoskeletal system

Motor proteins

Biomechanics

Biomechanics at the cellular level (collagen, tooth enamel, dentin), visco-elasticity

Biomechanics of elastic arteries, muscle biomechanics

Biopolymer mechanics, parameters of elastic polymers

Biological logic behind mechanical stability

Thermodynamics

Basic concepts (system, state parameters, state functions)

Quasistatic, reversible processes

Extensive and intensive parameters

Zeroth law of thermodynamics

Extended form of the first law of thermodynamics

Chemical potential (standard chemical potential), electrochemical potential

Second law of thermodynamics, equilibrium; spontaneous processes (direction, equilibrium)

Third law of thermodynamics (zero point of entropy)

Topics from laboratory practices

Dosimetry

Coulter-counter

Amplifier

Gamma energy

X-ray

Chapters: *Damjanovich-Fidy-Szöllösi:* I/5.3, II/2.4, III/3.2, III/3.3, III/3.4, V/1.1, V/1.2, V/2.1, VII/1.1, VII/1.2, VII/1.4, VII/1.5, VIII/4.2, IX/5.1

Lab. manual: 11, 13b, 14, 17, 20

Problems:, 33, 34, 35, 36, 37, 38, 45, 55, 62, 65