

Portal:Biophysics



Biophysics

Useful links

Examination

- Questions for final examination in biophysics (1. LF UK, GM)
- Questions for final examination in biophysics (2. LF UK, GM)
- Biophysics practicals (2. LF UK, GM)
- **Forum:Seminar papers/Biophysics/2. LF** (2. LF UK, GM)

Institutes

- Institute of biophysics and informatics, the First Faculty of Medicine (<http://biof.lf1.cuni.cz/index-en.html>)

General Physics applied in Medicine

Mechanics

Mechanical Waves • Mechanical Wave • Properties of Sound • Ultrasound • Sound wave • Acoustic pressure • Acoustic impedance • Shock-wave • Ultrasound imaging • Doppler ultrasonography • Therapeutic ultrasound applications • Effects of Ultrasound • Doppler Effect

Optics • Spectrum of Electromagnetic Radiation • Photometry • Radiometric and photometric quantities and units (and their correlation) • Spectral sensitivity of the human eye • Photopic and scotopic vision • Light absorption • Lambert's law • Lambert-Beer's law • Lambert's-Beer law (absorption, half-value layer) • Types of Light Sources • Resolution of human eye • Imaging principle of optical microscope • Construction and function of optical microscope • Abbe's theory • Limit of resolution of optical microscope • Magnification of optical microscope • Depth of sharpness of optical microscope • Contrast of optical microscope • Microscopic techniques • Transmitted light microscopy • Reflected light microscopy • Phase microscopy • Inverse microscope • Polarizing microscopy • Interference microscopy

Physics of Microworld • Atomic Models • Common Types of Radiation

Electricity and Magnetism • Electric Current • Physiological effect of electric current (positive and negative effects, factors influencing these effects) • Therapeutic application of electric current • Electrotherapy • Iontophoresis • Electrostimulation • High frequency electrosurgery • Interactions of electromagnetic fields with living matter • Physiological effect of electromagnetic fields • Magnetotherapy • X-rays characteristics (physical nature, spectral band, generation mechanism) • Compton's effect (what is and what does it confirm) • Gamma-rays characteristics (physical nature, spectral band, generation mechanism)

Molecular Physics and Physical Chemistry

Mathematical and Statistical Methods • Princip of Tomography

Basic Principles of Imaging and Diagnostic Methods

Mechanic Waves Sys.: • Ultrasonography • Ultrasound/Diagnostic application • Ultrasound/Terapeutic application

Optical Sys.: • Microscopy • Limit of resolution of optical microscope

Electric Sys.: • EKG

Magnetic Res. Sys.: • Magnetic Resonance Imaging

Nuclear and Radioactive Sys.: • Magnetic Resonance Imaging

source of radiation outside body • X-Ray • Computed Tomography • X-rays characteristics (physical nature, spectral band, generation mechanism) • Physical principle of imaging with X-rays • X-rays imaging (classical methods) • Computer tomography • Hounsfield's units • Angiography

source of radiation inside body • SPECT & Gamma Camera • Positron Emission Tomography • Nuclear medicine

Others: • Principle of Tomography

Biophysics of the Cell and Biophysics in Molecular Biology

Physiology: • Electric Properties of Cell Membrane • Resting Potencial • Action Potencial • Excitable cells • Neural Transmission • Pacemaker cells • Cells of Conduction System of heart • Extracellular Ionts Concentration and Their Effect on Electrical Propeties of Cells

Patophysiology: • Effects of Radiation on Cells
Laboratory Methods: • Flow cytometry
Interventions and Therapy: • Oncological Treatment

Biophysics of Tissues

Effect of Electric Current on Tissues • Electric Injury • Harmonic Oscillator (simple) • Driven harmonic oscillator • Elasticity • Hook's law • Elastic properties of tissues • Young's modulus • Elasticity and stiffness on subcellular level: role of collagen, elastin and intercellular matrix • Mechanical characteristic of muscle, connective tissue, bone and bone connection • Tissue replacement from mechanical point of view

Biosignals: Examined subject as a physical system • Time and physical dimensions of biosignals • Physical nature of different biosignals • Biosignal characteristics • Periodicity and quasiperiodicity • Frequency and power spectra • Biosignal sensors and converters • Polygraphic record • Examples of examination methods • Biofeedback

Methods

Therapy and Intervention Electrocoagulation

Biophysics of Body Systems

Physical Effects on Human Body • Effect of Gravitation on Human Body • Effect of Pressure on Human Body • Effect of Temperature on Human Body • Effect of Radioactivity on Human Body • Effect of Electromagnetic Radiation on Human Body • Electric Injury

Water and Ions Homeostasis

Energetic Homeostasis and Metabolism

Nervous system

Sensory system

• Eye *diagnostic meth.:* • GDx • Optical Coherence Tomography • Fluorescein Angiography • Visual field analysis *therapy:*

• Human Auditory System *diagnostic meth.* • Audiometry

Motoric system

Heart and Cardiovascular system *physiology:* • Mechanism of Heart Action *diagnostic meth.:* • EKG

Respiratory system

Gastrointestinal system

Urinary system

Skin

Reproductive system

Third Faculty of Medicine Biophysics Portal

- Diagnostic Methods (Course is taught at Third Faculty of Medicine)
- Third Faculty Portal