

# BIOPHYSICS

Pharmacy

## Division of Biophysics

Subject: **BIOPHYSICS**

Year, Semester: 1st year/2nd semester

The number of teaching hours:

Lecture: **14**

Practical: **15**

### 1st week:

Lecture: Introduction to the course. Generation and absorption of X-rays. X-ray contrast materials.

Lecture: Fluorescence spectroscopy, fluorescence techniques.

Practical: Introduction.

### 2nd week:

Lecture: Lasers and their biomedical applications. Photodynamic therapy.

Lecture: Optical and electron microscopy.

Practical: P1: Measurement of nuclear radiation

### 3rd week:

Lecture: Ionizing radiations and their interaction with materials. Dosimetry, tissue effects, detection of radiation.

Lecture: Research, diagnostic, and therapeutic application of stable and radioactive isotopes. Contrast materials, radiopharmaceutical.

Practical: P2: Spectrofluorimetry

### 4th week:

Lecture: Medical imaging (CT, PET, SPECT, MRI)

Lecture: Diffusion at the molecular level, statistical interpretation. Fick's 1st law. Thermo-diffusion. Osmosis

Practical: P3: Determination of diffusion constant

### 5th week:

Lecture: Structure of biological membranes. Membrane transport.

Lecture: Pharmacology of ion channels (gating, selectivity). Patch-clamp technique.

Practical: P4: Refractometry

### 6th week:

Lecture: Origin of membrane potential Resting potential, action potential, electric excitability.

Lecture: Fluid mechanics, blood circulation. Newtonian fluids, viscosity, creams, and emulsions.

Practical: P5: Light microscopy, Optical measurements

**7h week:**

Lecture: Methods of pharmacological research.  
Gel electrophoresis, isoelectric focusing, blotting.  
Detecting molecular interactions (SPR, FCS, FRET)

Lecture: Biophysics of drug delivery.  
Nanotechnology approaches.

Practical: Spare practical(s)

**8<sup>th</sup> week:**

Practical: Spare practical(s)

**9<sup>th</sup> week:**

Practical: Practical exam

**10<sup>th</sup> week**

Self-control and grade offering test.

**Online materials:**

Department: <https://biophys.med.unideb.hu/en>

Physics: <http://hyperphysics.phy-astr.gsu.edu/hbase/index.html>.

Society: <http://> <https://www.biophysics.org/>

## Requirements

**Compulsory reading:**

Lecture materials and description of lab practical (published on the department web page).  
Medical Biophysics (Editors.: S. Damjanovich, J. Fidy, J. Szöllösi, Medicina, Budapest, 2009, ISBN: 978-963-226-127-0)

**Condition for signing the lecture book:**

- All labs have been done (if one is missed, only one repetition option is available)
- Lab exam attended (no make-up is available)
- 
- Signing up for the electronic course PHARM-Biophysics at the exam.unideb.hu website by the end of week 3 (the site can only be reached from inside the University network)
- Lecture attendance is strongly recommended.

**Practical requirements**

Students write a short quiz (may contain test questions and short calculation problem(s)) before each lab topic. At least 50% must be earned in this test to be eligible for doing the lab. Students failing the quiz need to repeat it and then do the practicals within the frame of spare practicals. A laboratory logbook (into a booklet with stable pages) should be written in the laboratory practical to make the measurements' conditions repeatable according to the notes. Students must be prepared for the lab. One part of this preparation is a summary of the theoretical part of the lab exercises to be performed. Each lab is graded from 1 to 5. The average score of 4 or 5 of all labs is rewarded with a +1 exam point. That is added to the laboratory practical exam result. In case of unpreparedness, the lab exercise should be repeated, where a maximum of 2 points can be obtained for the make-up lab. The student's responsibility is to immediately organize the make-up lab by obtaining written permission from the tutor at the end of the logbook.

**Exams and grading:**

- **Lab exam (see the actual timetable) – 10+1 points max**
- **Exemption test (electronic) in biophysics, or written exam (electronic) in the final exam - 90 points max**

**Total: 100+1 points.**

**Grades:**

- 50< pass (2)
  - 60< satisfactory (3)
  - 70< good (4)
  - 80< excellent (5)
- Please note that lab and biostatistics work during the semester constitutes a compulsory part of the final score, which cannot be changed during the exam period, so take your studies seriously throughout the semester.

**Repeaters**

The signature obtained for the subject earlier is preventing students from attending labs.

Exempted students can choose to keep their scores from last year or take the exams with the rest of the class during the semester. Exemption-related decisions must be made before the end of the third week of education, and the study advisor at [biophysedu@med.unideb.hu](mailto:biophysedu@med.unideb.hu) is notified about it.

Without written notification, we automatically assume that the last year's score is kept and no further changes will be possible later. Lab exemptions, scores, and exams are independent of each other.

**Course Coordinator:** Zsolt Bacso M.D., Ph.D.