

REQUIREMENTS

Semmelweis University, Faculty of Medicine Name(s) of the Institute(s) teaching the subject: Department of Biophysics and Radiation Biology
Name of the subject: Medical biophysics I. Credits: 4 Total number of hours: 56 lectures: 21 practices: 35 seminars: - Type of the course (mandatory/elective): mandatory
Academic year: 2022-2023
Code of the course¹: AOKFIZ668_1A
Course director (tutor): Prof. Dr. Miklós Kellermayer Contact details: Department of Biophysics and Radiation Biology phone: +36-1-459-1500/60200 Position: professor, head of the department Date of habilitation and reference number: 2004 PTE ÁOK 7/2004/habil
Aim of the subject and its place in the curriculum: Aim is to give the knowledge and way of thinking necessary for exact and quantitative understanding of working mechanism of biological systems and the human organism.
Location of the course (lecture hall, practice room, etc.): EOK Szent-Györgyi Albert lecture hall and student laboratories of the department.
Competencies gained upon the successful completion of the subject: Understanding the physical background of life processes and the environmental factors influencing the organism (radiations). Doing and evaluation of measurements individually, production of laboratory reports.
Prerequisite(s) for admission to the subject:-
Minimum and maximum number of students registering for the course: Maximum: the number of students in the 1 st year. Student selection method in case of oversubscription: -
How to register for the course: Registration in the Neptun system

Detailed thematic of the course²:

Lectures

Introduction. Radiations in medicine. Quantities and laws for characterization of common properties of radiations (Dr. Herényi)

Phenomena related to light and geometrical optics. Fermat principle. Light reflection and refraction on planar and curved surfaces, medical optical devices, geometrical optics of the human eye. (Dr. Kellermayer)

Wave optics as a model. Huygens–Fresnel-principle. the most simple experiment for light interference and its consequences. Resolving power. Light polarization. Color mixing, color vision. Light as electromagnetic wave and as particle. How these two completely different properties can be proven? (Dr. Kellermayer)

Structure of matter, matter wave, atomic and molecular interactions. Atomic force microscopy. (Dr. Kiss)

Boltzmann distribution, examples. Structural categories of many-particle materials: gas-, liquid-, solid (crystalline)-state of matter, general characteristics. Liquid crystalline (mesomorphous) materials. (Dr. Kellermayer)

Electronic states in (crystalline) solid materials. Insulators, conductors, semi-conductors. Electric, thermal and optical properties, electro-optical applications. (Dr. Kellermayer)

Interactions of light with matter. Light scattering, light absorption. Basic principles of absorption spectrometry. (Dr. Kellermayer)

Laws of thermal radiation and luminescence. Examples for application of them. (Dr. Mártonfalvi)

Fundamentals of light amplification. Laser oscillator and its conditions. Properties and medical applications of laser radiation (Dr. Kaposi)

Atomic nucleus, radioactivity, nuclear radiations. Interactions of nuclear radiations with matter. Radioactive isotopes, physical basis of radioisotope tracing. (Dr. Smeller)

Dosimetry, radiation protection. Nuclear measurement techniques (Dr. Smeller)

Main problems of nuclear medicine. Radioactive radiations in medical practice. Diagnostic and therapeutic applications of ionizing radiations. Gamma camera. (dr. Voszka)

Signal processing. Classification of signals. Fourier decomposition. Basic electronic circuits. Semiconductor elements in the circuits. Signal conversion and selection, displays. (Dr. Kaposi)

Practices

- 1 Introduction
- 2 Light emission
- 3 Resonance
- 4 Microscopy I.
- 5 Refractometry
- 6 Light absorption
- 7 Skin impedance

8 Optics of the eye

9 Nuclear medicine

10 Polarimetry

11 Amplifier

12 Dosimetry

13 Gamma absorption

14. Repetition

Teachers: Dr. Gergely Agócs, Dr. Erika Balog, Csilla Csányi, Dr. István Derka, Dr. Rita Galántai, Dr. Judit Gál-Somkuti, Dr. Dóra Haluszka, Dr. Levente Herényi, Dr. Dávid Juriga, Dr. Katalin Kis-Petik, Dr. Károly Liliom, Dr. Zsolt Mártonfalvi, Dr. Gusztáv Schay, Sr. Dániel Veres, Dr. István Voszka

Potential overlap(s) with other subjects: Medical physiology, Medical imaging methods, Ophthalmology, Medical statistics, informatics and telemedicine, Mathematical and physical basis of medical biophysics

Special training activities required³: -

Policy regarding the attendance and making up absences: Participation in the practical lessons is compulsory. No more than three absences from practices are allowed for any reason, otherwise the semester will not be credited. **The missed measurements should be done with another group during the 4 weeks cycle of laboratory practices if possible. (One should ask for the agreement of the teacher of own group and the other group.)**

Means of assessing the students' progress during the semester⁴:

It will be announced on the homepage of the department during the first week of the semester.

Requirement for acknowledging the semester (signature):

1. At least 50 % in the test in Mathematical and physical bases of medical biophysics.
2. Participation on at least 75 % of the practices, (in case of more than 3 absences the signature for the semester is denied.)

3. Acceptance of the lab. reports. If one has more than 3 „not accepted” lab. reports, the signature is denied. The lab reports must be uploaded to the website at the end of the practice.

Type of the examination: Semifinal exam.

Exam requirements⁵:

See on the homepage of the department

Type and method of grading⁶:

The final grade is the average of the 3 parts if all are better than 1. The grade is rounded up or down according to the decision of the second examiner. if for one part the student gets 1,5 we do not calculate the average, but the final grade can be max. 2. If any of the grades is 1, the final grade will be 1.

How to register for the exam: Through Neptun system

Opportunities to retake the exam: According to the educational rules of the university

Literature, i.e. printed, electronic and online notes, textbooks, tutorials (URL for online material):

Lecture notes, homework problems on the homepage of the department.

Damjanovich-Fidy-Szöllősi (eds): Medical Biophysics (2009)

Medical biophysics practices (Semmelweis Publisher, 2015)

Signature of the tutor:

Signature(s) of the head(s) of the Institute(s):

Date: 2019. 09. 16.

Credit Transfer Committee's opinion:

Comment of the Dean's Office:

Signature of the Dean:

¹ Dékáni Hivatal tölti ki, jóváhagyást követően.

² Az elméleti és gyakorlati oktatást órákra (hetekre) lebontva, sorszámozva külön-külön kell megadni, az előadók és a gyakorlati oktatók nevének feltüntetésével. Mellékletben nem csatolható!

³ Pl. terepgyakorlat, kórlapelemzés, felmérés készítése stb.

⁴ Pl. házi feladat, beszámoló, zárthelyi stb. témaköre és időpontja, pótlásuk és javításuk lehetősége.

⁵ Elméleti vizsga esetén kérjük a tételsor megadását, gyakorlati vizsga esetén a vizsgáztatás témakörét és módját.

⁶ Az elméleti és gyakorlati vizsga beszámításának módja. Az évközi számonkérések eredményeink beszámítási módja.