UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN
Faculty of Medicine

Course sylabus – part A
Biophysics

48SJO-BIOPHY
ECTS: 5.00
CYCLE: 2024

SUBJECT MATTER CONTENT

LECTURE

1. MECHANICS OF THE BODY 1.1 Skeleton, forces, and body stability 1.2 Muscles and the dynamics of body movement 1.3 Physics of body crashing 2. ENERGY HOUSEHOLD OF THE BODY 2.1 Energy balance in the body 2.2 Energy consumption of the body 2.3 Heat losses of the body 3. PRESSURE SYSTEM OF THE BODY 3.1 Physics of breathing 3.2 Physics of the cardiovascular system 4. ACOUSTICS OF THE BODY 4.1 Nature and characteristics of sound 4.2 Production of speech 4.3 Physics of the ear 4.4 Diagnostics with sound and ultrasound 5. OPTICAL SYSTEM OF THE BODY 5.1 Physics of the eye 6. ELECTRICAL SYSTEM OF THE BODY 6.1 Physics of the nervous system 6.2 Electrical signals and information transfer

SEMINAR

Seminar 1. Chosen problems of biophysics of sensory mechanisms (dr hab. K. Bryl, prof. UWM) P1. Biophysics of photoreception P2. Implants of vision apparatus – is it possible to repair vision apparatus P3. Biophysics of chemoreception: smell, taste. P4. Biophysics of mechanoreception P5. Biophysics of electroreception Seminar 2. Molecular biophysics of the cells and tissues. (dr hab. M. Szabelski) P6. Molecular spectroscopy in the study of structure and function of macromolecules. P7. “Classical” optical microscopy. P8. Confocal microscopy. P9. Biophysics of neural tissue. P10. Biophysics of muscular tissue. Seminar 3. Ionizing radiation in medicine. (dr hab. K. Bryl, prof. UWM) P11. Formation of corpuscular and electromagnetic ionising radiation. P12. Effect of electromagnetic and corpuscular ionising radiation on living organisms. P13. Dosimetry of ionising radiation. Basics of radiation protection. P14. Radioisotopes in diagnostics and therapy. P15. Ionising radiation in diagnostics and therapy. Seminar 4. Physical basis of selected imaging methods of tissues and organs. (dr hab. M. Szabelski) P16. Ultrasound in medicine and biology. P17. X-ray transmission computed tomography. P18. Nuclear magnetic resonance (NMR) – spectroscopy. P19. Nuclear magnetic resonance (NMR) – imaging. P20. Positron Emission Tomography – Computed Tomography (PET/CT).

CLASSES

M2. Ionizing radiation. Determination of linear and mass absorption coefficient of gamma rays for different materials. M3. Electrical activity of the heart. Electrocardiography. Determination of the heart's electrical vector. M12. Laminar and turbulent flow. Measurement of fluid viscosity. M5. The sense of hearing. Measures of auditory threshold. M6. Physical principles of ultrasound in medicine. Ultrasonography. Determination of blood pressure. M7. Modeling the electrical properties of biological objects. Examination of serial RLC circuit. M8. The phenomenon of absorption and emission of light in analysis. Measurement of absorption spectra and the concentration of riboflavin in aqueous solutions using a spectrophotometer. Determination of concentrations of substances in solution using fluorescence. M9. Optical rotation of solutions. Measurement of the concentration of optically active substances by using

Legal acts specifying learning outcomes: 467/2024
Disciplines: medical sciences
Status of the course: Obligatoryjny
Group of courses: A - przedmioty podstawowe
Code: ISCED 0912
Field of study: Medicine
Scope of education: Medicine
Profile of education: General academic
Form of studies: full-time
Level of studies: uniform master's studies
Year/semester: /1

Types of classes: Lecture, Seminar, Classes
Number of hours in semester: Lecture: 11.00, Seminar: 10.00, Classes: 24.00
Language of instruction: English
Introductory subject: mathematics
Prerequisites: no

Name of the organisational unit conducting the course: Katedra Fizyki i Biofizyki
Person responsible for the realization of the course: dr hab. Krzysztof Bryl, prof. UWM
e-mail: krzysztof.bryl@uwm.edu.pl

Additional remarks: No

a polarimeter. M10. Determination of changes of thermodynamic function of state. Determination of changes in the entropy of the system. Determination of enthalpy change in the process of dissolving salt.

TEACHING OBJECTIVE

Transfer of knowlege about physical laws and phenomenas with particular application in medicine. Development of personal abilities towards self-education in the cathegory of application of physical methods. Ability of performing simple physical experiments, assesment of precision of physical measurements and discussion. Development of commen work in group.

DESCRIPTION OF THE LEARNING OUTCOMES OF THE COURSE IN RELATION TO THE DESCRIPTION OF THE CHARACTERISTICS OF THE SECOND LEVEL LEARNING OUTCOMES FOR QUALIFICATIONS AT LEVELS 6-8 OF THE POLISH QUALIFICATION FRAMEWORK IN RELATION TO THE SCIENTIFIC DISCIPLINES AND THE EFFECTS FOR FIELDS OF STUDY:

Symbols for outcomes related to the discipline:	M/NMA_P7S_UW+, M/NMA_P7S_WG+, M/NMA_P7S_KO+
Symbols for outcomes related to the field of study:	B.U11.+, B.W7.+, K.7.+

LEARNING OUTCOMES:

Knowledge:

W1 – Understanding physical phenomena and processes and their connection with functioning of living organisms.

Skills:

U1 – Can perform simple observations in open area or in the laboratory.

Social competence:

K1 – Is able to perform any roule in the team.

TEACHING FORMS AND METHODS:

Lecture(W1;):ecture with multimediual support
Seminar(W1;):Oral presentation
Classes(W1;U1;K1;):performention of experiments and the analysis of data

FORM AND CONDITIONS OF VERIFYING LEARNING OUTCOMES:

Lecture (Written exam) - Test -
Seminar (Presentation) - Points -
Classes (Write-up) - points -
Classes (Written test) - points -

BASIC LITERATURE:

1. Halliday D., *Fundamentals of Physics Extended 8ed,*, Wyd. John Wiley Sons, R. 2008
2. R. K. Hobbie, B. J. Roth, *Intermediate Physics for Medicine and Biology 4ed*, Wyd. Springer, R. 2007

SUPPLEMENTARY LITERATURE:

Detailed description of ECTS credits awarded - part B

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The number of ECTS credits awarded consists of:

1. Contact hours with the academic teacher:

- participation in: Lecture	11.0 h
- participation in: Seminar	10.0 h
- participation in: Classes	24.0 h
- consultation	4.0
	Total: 49.0 h.

2. Independent work of a student:

Preparing for seminars, laboratories and tests.	64.00 h
Preparation preliminary presentation	12.00 h

Total: 76.0 h

contact hours + independent work of a student Total: 125.0 h

1 ECTS credit = 25-30 h of an average student’s work, number of ECTS credit = 125.0 h : 25.0 h/ECTS = 5.00 ECTS on average: 5.0 ECTS

- including the number of ECTS credits for contact hours with the direct participation of an academic teacher: 0,00 ECTS points,

- including the number of ECTS credits for hours of independent work of a student: