COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modelling of physiological processess [S2IBio1-IIiP>MPF]

Course

Field of study
Biomedical Engineering

Year/Semester
2/3

Area of study (specialization)
Engineering of Implants and Prosthesis

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

1. Basics knowledge in physiology. 2. Skills of using software and basic programming. 3. Understanding the need for learning and acquiring new knowledge.

Course objective

To familiarize students with the basic methods of simulation and analysis of physiological processess.

Course-related learning outcomes

Knowledge:
1. Student has extended knowledge of mathematics and computer science, necessary in biomedical engineering and useful for formulating and solving complex tasks related to biomedical engineering [K2_W01].
2. Student has knowledge related to IT systems in medicine [K2_W02].
3. Student has knowledge related to modelling biological structures and processes, including modelling and computer simulations in designing rehabilitation equipment [K2_W04].
4. Student knows basic methods, techniques, tools and materials used to solve complex engineering tasks related to biomedical engineering [K2_W10].

Skills:
1. Student can obtain information from literature, databases and other properly selected sources (also in English or another foreign language) [K2_U01].
2. Student can use ICT techniques specific for the performance of typical engineering tasks. He/she can develop and use IT systems in medicine [K2_U07].
3. Student can perform computer modelling and simulations in biomedical engineering [K2_U09].
4. Student can evaluate the usefulness of methods and tools applied to solve an engineering task typical of biomedical engineering and observe their limitations [K2_U22].

Social competences:
1. Student is aware of the validity and understanding of non-technical aspects and results of engineering activity [K2_K02].
2. Student can set priorities regarding the performance of a given task by him/herself or others [K2_K04].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture – final test.
Depending on the percentage of the student"s performance on the tests, the following scores are awarded:
2 (not enough) <0 points; 50 points>
3 (sufficient) (50 points; 60 points>
3+ (positive plus) (60 points; 70 points>
4 (good) (70 points; 80 points>
4+ (good plus) (80 points; 90 points >
5 (very good) (90 points; 100 points>
Laboratory – credit based on:
- oral or written answer regarding the content of each laboratory exercise. To get credit, all exercises must be passed,
- final test - an individual task carried out by the student on his / her last class.
Depending on the obtained sum of points and resulting percentage, the following scores are awarded:
2 (not enough) <0%; 50%>
3 (sufficient) (50%; 60%>
3+ (positive plus) (60%; 70%>
4 (good) (70%; 80%>
4+ (good plus) (80%; 90%>
5 (very good) (90%; 100%>

Programme content

Modelling the physiology of selected human systems - mathematical foundations and models implementation in a selected software environment.

Course topics

Lecture:
1. Introduction.
2. Modeling of circulatory-respiratory interactions.
3. Modeling of mineral metabolism.
4. Modeling of carbohydrate metabolism.
5. Modeling of cholesterol homeostasis.
6. Modeling of gallbladder motor activity.
Laboratory:
1. Introduction to MATLAB.
2. Modeling and simulation of selected models of physiological processes with the use of MATLAB/Simulink.

Teaching methods

1. Lecture: multimedia presentation supported by examples on the blackboard.
2. Laboratory: programming in MATLAB, performing tasks, discussion.

Bibliography

Basic
1. Praca zbiorowa pod red. K. Cieślickiego, T. Lipniackiego, J. Waniewskiego, Modelowanie procesów fizjologicznych i patologicznych, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2017, seria: Inżynieria biomedyczna. Podstawy i zastosowania (tom 1), zespół redakcyjny: W. Torbicz, R. Maniewski, A. Liebert, L. Granicka [in Polish].
Additional
1. Traczyk W.: Fizjologia człowieka w zarysie, PZWL, wyd. VI, Warszawa 1997 [in Polish].

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00