



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modelling of physiological processes [S2IBio1E-IIIIP>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

English

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

2,00

### Coordinators

### 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 processes.

### 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

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.

### Course topics

none

### 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. Cieślkiego, 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