COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computer analysis of medical data [S1IBio1E>KADM]

Course

Field of study
Biomedical Engineering

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Martyna Białecka
martyna.bialecka@put.poznan.pl

Lecturers

Prerequisites

1. Basics knowledge in mathematics, computer science and general programming. 2. Skills of logical thinking, general programming, use of information obtained from literature, the Internet and other sources. 3. Understanding the need for learning and acquiring new knowledge.

Course objective

To familiarize students with basic methods of statistics in application to medical data. To show the ability to use R language and free software, popular in the medical environment, allowing for statistical analysis.

Course-related learning outcomes

Knowledge:
1. Student has knowledge in mathematics that enables him/her to understand mathematical statistics [K_W01].
2. Student has basic knowledge in computer science that allows him/her to describe the architecture of computer systems; to use basics of algorithmics, databases and relational databases, compilers and programming languages, procedural and object-oriented programming, multimedia techniques, internet software and tools, systems of computer aided engineering in biomedical engineering and technology

[K_W04].
3. Student is familiar with and understands basic concepts and principles in the area of personal data protection act [K_W30].

Skills:
1. Student knows how to retrieve information from literature, databases and other properly selected sources (also in English) in the area of biomedical engineering; in particular he/she knows how to combine this information with technical aspects and engineering design, how to interpret it and how to draw conclusions and formulate and justify opinions [K_U01].
2. Student has the skill of self-learning.się [K_U05].
3. Student knows how to use information and communication technologies typically used in implementation of engineering activities [K_U07].
3. Student knows how to use computer aided design to solve technical problems [K_U08].
4. Student knows how to formulate problems and how to use mathematical methods to analyze technical issues [K_U10].
5. While formulating and solving engineering tasks student knows how to take into account their systematic and non- technical aspects, at the same time obeying legal regulations and ethical principles in medicine and biomedical engineering [K_U11].

Social competences:
1. Student is well aware of the necessity for continuous learning [K_K01].
2. Student knows how to prioritize in order to carry out a task either defined by him/herself or by others [K_K04].
3. Student is well aware of the social role of a graduate of a technical university, understands the need to formulate and inform the public through mass media about technical achievements and of other aspects of engineering activity and makes sure that such information and opinions are conveyed in a way that is generally understood [K_K07].

Methods for verifying learning outcomes and assessment criteria

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 to the R language.
2. Elements of descriptive statistics - theory and examples of statistical analysis using the R language.
3. Issues of estimation - theory and examples of statistical analysis using the R language.
4. Hypothesis verification - theory and examples of static analysis using the R language.
5. Classification and regression trees - theory and examples of statistical analysis using the R language.

6. Cluster analysis - theory and examples of statistical analysis using the R language.
Laboratory - exercises related to the application of knowledge obtained during the lecture for analysis of medical data using R language and Statistica software.

Course topics

none

Teaching methods

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

Bibliography

Basic:
1. Praca zbiorowa pod red. M. Walesiaka, E. Gatnara, Statystyczna analiza danych z wykorzystaniem programu R, Wydawnictwo Naukowe PWN, Warszawa 2009 [in Polish].
2. M. Quick, Analiza statystyczna w środowisku R dla początkujących, Helion, Gliwice 2012 [in Polish].

Additional:
1. M. Gągolewski, Programowanie w języku R. Analiza danych, obliczenia, symulacje, Wydawnictwo Naukowe PWN, Warszawa 2014 [in Polish].
2. H. Wickham, G. Grolemund, Język R. Kompletny zestaw narzędzi dla analityków danych, Helion, Gliwice 2018 [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