Data structures and algorithms - course description

General information

Course name	Data structures and algorithms
Course ID	13.2-WF-FizP-DSA-S17
Faculty	Faculty of Physics and Astronomy
Field of study	Physics
Education profile	academic
Level of studies	First-cycle studies leading to Bachelor's degree
Beginning semester	winter term 2022/2023

Course information

Semester	3
ECTS credits to win	5
Available in specialities	Computer Physics
Course type	obligatory
Teaching language	english
Author of syllabus	• dr Marcin Kośmider • dr Andrzej Szary

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	15	1	-	-	Credit with grade
Laboratory	45	3	-	-	Credit with grade

Aim of the course

Teaching the student the ability to adjust the mathematical model and algorithm adequately to considered problem. Students use the knowledge and skills acquired earlier in the courses of general physics, the course of numerical methods and mathematical methods of physics.

Prerequisites

Students know numerical methods, passed courses of mathematical analysis course and general physics.

Scope

The course deals with the general principles of algorithm writing, the ability to calculate the complexity of the algorithm.
Examples of algorithms and their implementation are considered. The special attention is devoted to optimization problems.

Teaching methods

Lecture:

Conventional lecture, workshop, working with documentation

Laboratory:

Laboratory exercises, project method, independent work

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
The student has knowledge and skills in the use of typical for Linux family operating system tools supporting programming work, in particular tools supporting the assessment of algorithmic complexity and resource requirements (memory, disk, CPU) of software used to solve problems in physics. Skills for planning an algorithmic solution consistent with the methodology of analysis and interpretation of data (measured and simulated in a computer experiment), allow for the later publication of the results of the algorithm's work in reports of a scientific nature	• K1A_W04 • K1A_U03 • K1A_U04	• a discussion • a project • an exam - oral, descriptive, test and other • an observation and evaluation of activities during the classes	• Lecture • Laboratory

Outcome description	Outcome symbols	Methods of verification	The class form
The student has the skills to obtain information from specialized sources and the awareness of the need to update current knowledge about modern technological achievements and programming tools (programming libraries, algorithm source codes, etc.) supporting solving physics problems implemented in within the framework of computer data analysis tools, analysis and registration of measurement signals.	• K1A_U07 • K1A_K01 • K1A_K04	• a discussion • a project • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Laboratory

Assignment conditions

Lecture:

Test - minumum 50%

Laboratory:

Students have to implement algorithms presented during the lecture. In addition, they have to apply one of the proposed algorithms (e.g. traveling salesman problem, image recognition using the Hausdorff dimension, evolutionary algorithm) in a real life problem and write a report describing the algorithm, programming techniques, and results of the work.

Before taking the exam a student must gain positive grade during the laboratory

Final grade: mean average of the exam (50%) and grade from the laboratory (50%).

Recommended reading

[1] L. Banachowski, K. Diks, W. Rytter, *Algorytmy i struktury danych*, Wydawnictwa Naukowo-Techniczne, 2006.

[2] N. Wirth, *Algorithms and Data Structures*, Prentice Hall, 1985.

Further reading

[1] W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery, *Numerical Recipes. The Art of Scientific Computing.* Third Edition, Cambridge University Press, 2007.

Notes

Modified by dr Marcin Kośmider (last modification: 04-04-2022 20:46)