SYLLABUS

Name: ***Algorithms and Data Structures (IBioAIB>SI3AaDS23S)***
Name in Polish:
Name in English:

Information on course:

Course offered by department: Faculty of Biomedical Engineering
Course for department: Silesian University of Technology
Term: Winter semester 2024/2025
Cordinator of course edition: Prof. dr hab. inż. Paweł Badura

Default type of course examination report:

ZAL

Course homepage:

https://platforma.polsl.pl/rib/course/view.php?id=248

Short description:

The aim of the course is an introduction to basic ideas and definitions of algorithmics and programming strategies. Simultaneously, students acquire knowledge in the field of time and memory computational complexity and selected complex data types and structures. Theoretical presentation during the lecture is supported by implementation and analysis of selected algorithms during laboratory classes.

Description:

Lectures:
1. Algorithms. Computational complexity.
2. Linear and tree data structures.
3. Sorting algorithms.
4. Recursion.
5. Dynamic programming.
6. Search. Exhaustive search. Backtracking. Sieving.
7. Graphs and graph algorithms.
8. Greedy algorithms.

Laboratory classes:
1. Linear and tree data structures.
2. Sorting algorithms.
3. Recursion and dynamic programming.
4. Search algorithms.
5. Graph algorithms.
6. Greedy algorithms.

Bibliography:

Primary sources:
1. R. Sedgewick, Algorithms in C, 1998.
2. A. Aho, J. Hopcroft, J. Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley, 1974.
3. A. Aho, J. Hopcroft, J. Ullman, Data Structures and Algorithms, Addison-Wesley, 1987.

Secondary sources (in Polish):
1. Z. Czech, S. Deorowicz, P. Fabian, Algorytmy i struktury danych: wybrane zagadnienia, Wydawnictwo Politechniki Śląskiej, Gliwice, 2007.
2. Z. Czech et al., Programowanie współbieżne: wybrane zagadnienia, Wydawnictwo Politechniki Śląskiej, Gliwice, 1999.
3. Z. Czech et al., Laboratorium podstaw programowania komputerów, Wydawnictwo Politechniki Śląskiej, Gliwice, 1991.
4. J. Łęski, Systemy neuronowo-rozmyte, Wydawnictwa Naukowo-Techniczne, Warszawa, 2008.
5. J. Arabas, Wykłady z algorytmów ewolucyjnych, Wydawnictwa Naukowo-Techniczne, Warszawa, 2001.
6. L. Banachowski, A. Kreczmer, W. Rytter, Analiza algorytmów i struktur danych, Wydawnictwa Naukowo-Techniczne, Warszawa, 1989.
7. J. Grębosz, Symfonia C++ standard: programowanie w języku C++ orientowane obiektowo, Wydawnictwo "Edition 2000", Kraków, 2006.
8. Supplementary web materials.

Learning outcomes:

1. Has a basic knowledge on algorithm design, is able to estimate computational complexity and compare algorithms on its basis.
Teaching methods: lecture/lab classes/consultations.
Method of assessment: test/lab exercise.
Learning outcomes reference code: K1A_W07.

2. Knows complex data types, is able to form them using basic types, and implement dedicated procedures.
Teaching methods: lecture/lab classes.
Method of assessment: test/lab exercise.
Learning outcomes reference code: K1A_W05.

3. Is able to design and formulate advanced algorithms.
Teaching methods: lecture/lab classes.
Method of assessment: test/lab exercise.
Learning outcomes reference code: K1A_U01.

4. Is able to solve programming problem using selected techniques and environment.
Teaching methods: lecture/lab classes.
Method of assessment: test/lab exercise.
Learning outcomes reference code: K1A_U07.

5. Is able to creatively use available sources to solve programming problem and to draw conclusions.

Teaching methods: lecture/lab classes.
Method of assessment: test/lab exercise.
Learning outcomes reference code: K1A_U06.

Assessment methods and assessment criteria:

Laboratory:
1. Laboratory exercises are obligatory.
2. One unjustified absence is allowed. An exercise not completed should be carried out at the additional slot or with another group, if there is such a possibility and the teacher agrees. Second unjustified absence during the semester may result in a failure to pass the laboratory. The fact of such absence is reported to the dean.
3. The student complies with health and safety regulations and computer lab regulations.
4. The student comes to the lab prepared on the basis of the material presented in the lecture, as well as the instructions and materials available on the Distance Education Platform for Silesian University of Technology. Preparation for the exercise may be subjected to verification before the start of classes.
5. The conditions for passing the exercise are defined by the teacher. Appropriate information is provided in the instruction or during classes.
6. The report on the exercise (if required) should be submitted not later than 2 weeks after the exercise.
7. The exercise (work during class and running program/protocol/report) is rated on a scale of 2.0 to 5.0 points with a step of 0.5.
8. Completing the laboratory in a given semester requires a grade of not less than 3.0 from each of the exercises.
9. The final grade for laboratory classes is the average grade for laboratory exercises rounded to the nearest multiple of 0.5.

Final test:
1. The course ends with a colloquium conducted in a written form at the end of semester 4.
2. The colloquium covers the full range of material presented in semester 4.

Course:
1. The subject is awarded on the basis of the final test and grades obtained in the laboratory.
2. The final grade is a weighted average rounded to the nearest multiple of 0.5:
O_k = 0.51 O_{kol} + 0.49 O_l,
where: O_{kol} - grade from final test, O_l -- grade from laboratory classes; each of these grades cannot be less than 3.0; otherwise O_k = 2.0.

Information on course edition:

Default type of course examination report:

ZAL

Bibliography:

missing bibliography in English

Details of classes and study groups

lecture (15 hours)

Study groups details

Group number 1

Class instructors:

Prof. dr hab. inż. Paweł Badura

laboratory classes (15 hours)

Study groups details

Group number 1

Class instructors:

Prof. dr hab. inż. Paweł Badura
Dr inż. Daniel Ledwoń

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (IBioAIB>SI-3-23-S)	2024/2025-Z	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2024/2025-Z	