

Course name: Introduction to algorithms & programming		
Field of study: Computer science	Type of study: Full-time	Source code: CIDM1_01
Course characteristics: Mandatory within the additional content	Level: Second (M.Sc.)	Year: I Semester: I
Type of classes: lectures, laboratories, exercises	Hours per week: 2 lect, 2 lab, 1 ex	ECTS points amount: 5 ECTS

COURSE GUIDE

I. GENERAL INFORMATION OF THE COURSE

AIMS

- A1. Obtaining knowledge in the basic methods of programming using object-oriented programming languages.
- A2. Familiar with programming tools, environment, optimization techniques, methods of adaptation of codes to computing platforms
- A3. Obtaining knowledge in the area of developing and implementing selected algorithms
- A4. Acquisition by students practical skills to work independently and in a team, develop reports, analyze the results, etc.

PREREQUISITES

- 1. Knowledge of mathematics.
- 2. Basics of computer skills.
- 3. Rational and logical thinking.
- 4. Ability to perform mathematical operations to solve given tasks.
- 5. Ability to use various sources of information including manuals and technical documentation.
- 6. Ability to work independently and in a group.
- 7. Ability to correctly interpret and present their own actions.

LEARNING OUTCOMES

- EK 1 – able to use an object-oriented programming language
- EK 2 – able to develop and implement a given algorithm
- EK 3 – able to improve a performance of given algorithm using memory and computational techniques of optimizations
- EK 4 – able to use programming tools including compilers, debuggers, profilers, etc.
- EK 5 – able to solve a mathematical problem by developing an appropriate algorithm
- EK 6 – able to work independently and in a team, develop reports, analyze the results, etc.

CONTENT

Lectures		Hours
Lect. 1	Introduction to C++ Programming	2
Lect. 2	Built-in Data Types	2
Lect. 3	Common Strings Operations	2
Lect. 4	Loops, Nested Loops, and Functions	2
Lect. 5	Reference, Parameters, and Pointers	2
Lect. 6	Arrays, and Dynamic Memory Management	2
Lect. 7	File Streams	2
Lect. 8	Structs and Classes	2
Lect. 9	Class Implementation	2
Lect. 10	Functions and Classes Templates	2
Lect. 11	Introduction to Algorithms	2
Lect. 12	Complexity of the Algorithms	2
Lect. 13	Presentation of Selected Algorithms	2
Lect. 14	Performance analysis for Selected Algorithms	2
Lect. 15	Techniques of Optimizations	2
Exercises		Hours
Ex. 1	Introduction to Programming and Algorithms	1
Ex. 2	Bits, Data Types, and Operations	1
Ex. 3	Internal Representation of Fixed Point Data Types	1
Ex. 4	Internal Representation of Floating Point Data Types	1
Ex. 5	Logical Operations	1
Ex. 6	Bits Operations	1
Ex. 7	Reference, Parameters, and Pointers	1
Ex. 8	Multi Dimensional Computation	1
Ex. 9	Multi Dimensional Computation	1
Ex. 10	Memory Management	1
Ex. 11	Computation Management	1
Ex. 12	Complexity of the Algorithms	1
Ex. 13	Theoretical Performance Models	1
Ex. 14	Performance analysis for Selected Algorithms	1
Ex. 15	Performance analysis for Selected Algorithms	1
Laboratories		Hours
Lab. 1	Introduction to Compilers, Coding, and Programs Execution	2
Lab. 2	Using Built-in Data Types	2
Lab. 3	Application of Common Strings Operations	2
Lab. 4	Loops, Nested Loops, and Functions	2
Lab. 5	Reference, Parameters, and Pointers	2
Lab. 6	Arrays, and Dynamic Memory Management	2
Lab. 7	File Streams	2
Lab. 8	Structs and Classes	2
Lab. 9	Class Implementation	2
Lab. 10	Functions and Classes Templates	2
Lab. 11	Implementation of Selected Algorithms	2
Lab. 12	Implementation of Selected Algorithms	2
Lab. 13	Implementation of Selected Algorithms	2
Lab. 14	Techniques of Computation Optimizations	2
Lab. 15	Techniques of Memory Optimizations	2

TEACHING TOOLS

1. – multimedial presentations for lectures
2. – instructions for laboratories
3. – instructions for exercises
4. – wide range of algorithm and programming tools
5. – workplaces for students equipped with workstations

LITERATURE

1. Bruce Eckel, "Thinking in C++: Introduction to Standard C++", Prentice Hall, 2008
2. Bruce Eckel, Thinking In C++: Practical Programming, Prentice Hall, 2009
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, The Mit Press, 2009

TEACHERS

1. dr inż. Łukasz Szustak lszustak@icis.pcz.pl
2. dr inż. Krzysztof Rojek krojek@icis.pcz.pl