

## Subject card

|                                             |                                                                                                                                                                                     |                                                          |                                                                                                                                 |                                     |                                                                                                                                                |            |     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Advanced Programming in C++, PG_00179323                                                                                                                                            |                                                          |                                                                                                                                 |                                     |                                                                                                                                                |            |     |
| Field of study                              | Informatics                                                                                                                                                                         |                                                          |                                                                                                                                 |                                     |                                                                                                                                                |            |     |
| Date of commencement of studies             | October 2024                                                                                                                                                                        |                                                          | Academic year of realisation of subject                                                                                         |                                     | 2026/2027                                                                                                                                      |            |     |
| Education level                             | Bachelor's studies                                                                                                                                                                  |                                                          | Subject group                                                                                                                   |                                     | Obligatory subject group in the field of study<br>Optional subject group<br>Subject group related to scientific research in the field of study |            |     |
| Mode of study                               | full-time studies                                                                                                                                                                   |                                                          | Mode of delivery                                                                                                                |                                     | at the university                                                                                                                              |            |     |
| Year of study                               | 3                                                                                                                                                                                   |                                                          | Language of instruction                                                                                                         |                                     | Polish                                                                                                                                         |            |     |
| Semester of study                           | 6                                                                                                                                                                                   |                                                          | ECTS credits                                                                                                                    |                                     | 3.0                                                                                                                                            |            |     |
| Learning profile                            | academic                                                                                                                                                                            |                                                          | Assessment form                                                                                                                 |                                     | credit                                                                                                                                         |            |     |
| Conducting unit                             |                                                                                                                                                                                     |                                                          |                                                                                                                                 |                                     |                                                                                                                                                |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                  |                                                          | dr Tomasz Borzyszkowski                                                                                                         |                                     |                                                                                                                                                |            |     |
|                                             | Teachers                                                                                                                                                                            |                                                          | dr Tomasz Borzyszkowski<br><br>dr Maciej Dziemiańczuk                                                                           |                                     |                                                                                                                                                |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                         | Lecture                                                  | Tutorial                                                                                                                        | Laboratory                          | Project                                                                                                                                        | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                               | 15.0                                                     | 0.0                                                                                                                             | 15.0                                | 0.0                                                                                                                                            | 0.0        | 30  |
|                                             | E-learning hours included: 0.0                                                                                                                                                      |                                                          |                                                                                                                                 |                                     |                                                                                                                                                |            |     |
| Learning activity and number of study hours | Learning activity                                                                                                                                                                   | Participation in didactic classes included in study plan |                                                                                                                                 | Participation in consultation hours |                                                                                                                                                | Self-study | SUM |
|                                             | Number of study hours                                                                                                                                                               | 30                                                       |                                                                                                                                 | 0.0                                 |                                                                                                                                                | 0.0        | 30  |
| Subject objectives                          | The aim of the course is to teach students the basic programming constructs available in the C++ language.                                                                          |                                                          |                                                                                                                                 |                                     |                                                                                                                                                |            |     |
| Learning outcomes                           | Course outcome                                                                                                                                                                      |                                                          | Subject outcome                                                                                                                 |                                     | Method of verification                                                                                                                         |            |     |
|                                             | [INFL3_W05] has general knowledge of various programming paradigms and programming languages; has detailed knowledge of object-oriented design and programming methods and patterns |                                                          | The student understands the principles of the C++ language and knows how the basic programming constructs work in this language |                                     | [SW2] presentation/project/paper/report                                                                                                        |            |     |
|                                             | [INFL3_U03] can design and analyze algorithms for their correctness and computational complexity using appropriate algorithmic techniques and data structures                       |                                                          | The student is able to use selected C++ language libraries to solve programming problems                                        |                                     | [SU2] presentation/project/paper/report                                                                                                        |            |     |
|                                             | [INFL3_U06] is able to design, create, run and test programs using dedicated tools and adequate templates                                                                           |                                                          | The student is able to apply programming and code quality maintenance paradigms in his/her own projects                         |                                     | [SU2] presentation/project/paper/report                                                                                                        |            |     |

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|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Subject contents                                               | 1. The basics of object-oriented programming (constructors, destructors, memory management)<br>2. Inheritance and polymorphism<br>3. Overloading operators and exceptions<br>4 STL library<br>5. Move semantics and lambda expressions<br>6. Smart pointers<br>7. Templates and concepts |                                                                                                                                                                                                                                                    |                               |
| Prerequisites and co-requisites                                | The student should be familiar with basic programming constructs and the basics of object-oriented programming                                                                                                                                                                           |                                                                                                                                                                                                                                                    |                               |
| Assessment methods and criteria                                | Subject passing criteria                                                                                                                                                                                                                                                                 | Passing threshold                                                                                                                                                                                                                                  | Percentage of the final grade |
|                                                                | project presentation, observation of student work                                                                                                                                                                                                                                        | 51.0%                                                                                                                                                                                                                                              | 100.0%                        |
| Recommended reading                                            | Basic literature                                                                                                                                                                                                                                                                         | B. Stroustrup. Język C++. Kompendium wiedzy, Helion 2014<br>N. Josuttis "C++ Biblioteka Standardowa, podręcznik programisty", Wydawnictwo HELION 2003.<br>B. Eckel, Ch. Allinson, "Thinking in C++" Edycja Polska, tom 2, Wydawnictwo HELION 2004. |                               |
|                                                                | Supplementary literature                                                                                                                                                                                                                                                                 | Stephan Roth, Clean C++20 Sustainable Software Development Patterns and Best Practices, APress, czerwiec 2021                                                                                                                                      |                               |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                    |                               |
| Example issues/<br>example questions/<br>tasks being completed |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                    |                               |
| Work placement                                                 | Not applicable                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                    |                               |

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