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| <b>Level:</b> bachelor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |                            |                     |          |
| <b>Course title:</b> Programming 1 (M4-04)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |              |                            |                     |          |
| <b>Status:</b> obligatory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |                            |                     |          |
| <b>ECTS:</b> 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |                            |                     |          |
| <b>Requirements:</b> none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |                            |                     |          |
| <b>Learning objectives</b><br>Students should be capable of solving mathematical and programming problems. They should master algorithmic thinking and be able to define problems precisely, using object-oriented programming, integrated development environment (IDE) and debugger.                                                                                                                                                                                                                                                                                                                                                                                        |              |                            |                     |          |
| <b>Learning outcomes</b><br><i>Minimal</i><br>Developing habits of algorithmic thinking in solving and interpretation of problems. Learning and using basic data types and data structures, as well as basic algorithms suitable for solving mathematical problems.<br><i>Desirable</i><br>Understanding concepts of procedural and object-oriented programming. Using arrays, collections, data structures and classes. Applying object-oriented programming techniques to solve mathematical problems. Knowing how to tackle combinatorial problems using advanced programming techniques.                                                                                  |              |                            |                     |          |
| <b>Syllabus</b><br><i>Theoretical instruction</i><br>Identifiers, commands. Variables, primitive data types, expressions. Basic control and repetitive structures. Using classes and objects. Stack and heap. Arrays and collections. Sorting. Extreme elements. Iterative and recursive approach. Dealing with basic combinatorial structures.<br><i>Practical instruction</i><br>Understanding and mastering the basic principles of programming. Using control and repetitive structures, as well as basic programming techniques. Implementation of algorithms for solving concrete mathematical problems, and modification of standard algorithms to solve new problems. |              |                            |                     |          |
| <b>Weekly teaching load</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |                            |                     | Other: 0 |
| Lectures: 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Exercises: 3 | Other forms of teaching: 0 | Student research: 0 |          |