# SYLLABUS

## 1. Information on the study programme

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| 1.1. Higher education institution | Universitatea de Vest din Timisoara |
| 1.2. Faculty | Mathematics and Computer Science |
| 1.3. Department | Computer Science |
| 1.4. Study program field | Computer Science - in English |
| 1.5. Study cycle | Licence |
| 1.6. Study programme / Qualification | Computer Science : *Database administration / Administrator baze de date - 252101; Computer network administration / Administrator de retea de calculatoare - 252301; Analyst / Analist - 251201; Research assistant in computer science / Asistent de cercetare în informatica - 214918; Teacher in secondary schools / Profesor în învatamântul gimnazial - 233002; Programmer / Programator - 251202; Software systems designers / Proiectant sisteme informatice - 251101* |

## 2. Information on the course

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|---|---|---|---|---|---|---|---|
| 2.1. Course title | | | Algorithms and Data Structures II | | | | |
| 2.2. Lecture instructor | | | Gabriel Istrate | | | | |
| 2.3. Seminar / laboratory instructor | | | TBD. | | | | |
| 2.4. Study year | 1 | 2.5. Semester | 1 | 2.6. Examination type | E | 2.7. Course type | DI |

## 3. Estimated study time (number of hours per semester)

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| 3.1. Attendance hours per week | 4 | out of which: 3.2 lecture | 2 | 3.3. seminar / laboratory | 2 |
| 3.4. Attendance hours per semester | 56 | out of which: 3.5 lecture | 28 | 3.6. seminar / laboratory | 28 |
| **Distribution of the allocated amount of time*** | | | | | **hours** |
| Study of literature, course handbook and personal notes | | | | | 35 |
| Supplementary documentation at library or using electronic repositories | | | | | 15 |
| Preparing for laboratories, homework, reports etc. | | | | | 40 |

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| Exams | 6 |
| Tutoring | 8 |
| Other activities… | |

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| 3.7. Total number of hours of individual study | 104 |
| 3.8. Total number of hours per semester | 160 |
| 3.9. Number of credits (ECTS) | 6 |

**4. Prerequisites (if it is the case)**

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| 4.1. curriculum | Algorithm and Data Structures I |
| 4.2. competences | Mathematical skills. |

**5. Requirements (if it is the case)**

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| 5.1. for the lecture | Online using Google Meet and other platforms. |
| 5.2. for the seminar / laboratory | Online using Google Meet and other platforms. |

**6. Specific acquired competences**

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| Professional competences | • capacity to design, analyze and implement simple algorithms and data structures. |
| Transversal competences | • capacity to communicate algorithms and data structures |

**7. Course objectives**

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| 7.1. General objective | To become familiar with the design, analysis and implementation of basic algorithms and data structures |
| 7.2. Specific objectives | Capacity to communicate knowledge pertaining to domain-specific algorithms. |

**8. Content**

**The actual content may change in response to concrete course conditions.**

| 8.1. Lecture | Teaching methods | Remarks, details |
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| **Course 1**. Introduction. Review of Data Structures in Algorithm Design. | Online.<br>Various other supporting material, given using the e-learning platform. | |
| **Course 2**. Linked lists. Applications of linked lists. Stacks. Queues. Self-adjusting linked lists. | | |
| **Course 3**. Binary search trees. Definition. Implementation | | |
| **Course 4**. Tree traversals. Preoder. Inorder. Postorder. | | |
| **Course 5**. Threaded trees. Implementation. Balancing BST. | | |
| **Course 6**. AVL Trees. | | |
| **Course 7.** Red-black trees. Definition and operations. | | |
| **Course 8.** Red-black trees. Implementation of operations. | | |
| **Course 9**. Splay trees. | | |
| **Course 10.** Applications of data structures I - Breadth-first search. Depth first search. | | |
| **Course 11.** Applications of data structures II – Shortest path algorithms in graphs | | |

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| **Course 12**. Applications of data structures II: computational geometry- closest points, convex hull. | | |
| **Course 13**: Hashing. Perfect hashing. Universal hashing. Applications. | | |
| **Course 14**: Revision for the spring semester exam. | | |
| **Recommended literature**<br><br>**T.H. Cormen, C.E.Leiserson, R.R. Rivest, C. Stein – Introduction to Algorithms, MIT Press. 2009.**<br><br>**J. Kleinberg, E. Tardos – Algorithm Design. Addison Wesley 2005.**<br><br>**Various course notes: Daniela Zaharie (UVT), Jeff Edmonds (York U, Canada), etc.**<br><br>Various online resources posted on the elearning course platform (moodle) | | |
| **8.2. Seminar / laboratory** | **Teaching methods** | **Remarks, details** |
| **Problem solving and implementation related to coursework** | Seminar. Students will solve problems from Cormen and other resources. | |
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| **Recommended literature** | | |

**Same as for the course.**

**9. Correlations between the content of the course and the requirements of the professional field and relevant employers.**

This is a basic course in computer science programs all around the world. Questions from this course appear both in the graduation exam, as well as in hiring interviews.

**10. Evaluation**

| Activity | 10.1. Assessment criteria | 10.2. Assessment methods | 10.3. Weight in the final mark |
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| 10.4. Lecture | Final | Online exam, given via the elearning platform (moodle). Likely to have multiple components:<br>- a first-level multiple choice exam for passing – grade 7.<br>- A second-level problem solving component, for higher grades. | 66 % |
| | | | |
| 10.5. Seminar / laboratory | Problem solving. May involve homework. | Established with the students in class. | 33 % |
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| 10.6. Minimum needed performance for passing | | | |
| - pass **both sections:** Course/Seminar-Lab<br>- knowledge of basic notions about data structures: the written exam will consist of simple questions that test this knowledge.<br>- abilities to solve simple problems. | | | |

Date of completion | Signature (lecture instructor) | Signature (seminar instructor)

15.09.2020

Date of approval | Signature (director of the department)