SYLLABUS

1. Information on the study programme

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 Administrator- *252101; Network Administrator - 252301; Analist - 251201; Research assistant in Computer Science- 214918; Research assistant in mathematics-computer science - 212024; Highschool teacher- 233002; Programmer - 251202; System designer - 251101*

2. Information on the course

2.1. Course title			Algorithms and Data Structures I				
2.2. Lecture instructor			Gabriel Istrate				
2.3. Seminar / laboratory instructor			Teodora Voina				
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)

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
Exams	6
Tutoring	8

Other activities…		
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)

4.1. curriculum	N/A
4.2. competences	Elementary knowledge of mathemaitcs. Elementary problem-solving abilities.

5. Requirements (if it is the case)

5.1. for the lecture	Online, via Google Meet, and other platforms.
5.2. for the seminar / laboratory	Online, via Google Meet, and other platforms.

6. Specific acquired competences

Professional competences	□ Mathematical abilities needed for algorithm design and analysis. □ capacity to design, analyze and implement simple algorithms and data structures.
Transversal competences	□ capacity to communicate algorithms and data structures

7. Course objectives

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 concrete content may change in response to concrete course conditions.

8.1. Lecture	Teaching methods	Remarks, details
Course 1. Introduction to algorithmics.	Online	
Course 2. The RAM model for analyzing algorithms. Recursive algorithms.	Online	
Course 3. Analysis of Algorithms, Insertion Sort, Mergesort	Online	
Course 4. Asymptotic Notation; Recurrences; Substitution, Master Theorem.	Online	
Course 5. Divide-and-Conquer: analysis of mergesort, binary search, number powering, computing Fibonacci, Strassen's method for matrix multiplication.	Online	
Course 6. Quicksort, Worst-case and average case analysis.	Online	
Course 7. Linear-time Sorting: Lower Bounds, Counting Sort, Radix Sort	Online	
Course 8. Order Statistics, Median	Online	
Course 9. Heaps. Heapsort	Online	
Course 10. Dynamic programming. The Longest Common Subsequence Problem.	Online	

Course 11. Greedy Algorithms. Applications.	Online	
Course 12: Backtracking. Applications.	Online	
Course 13: NP-complete problems. Examples, reductions.	Online	
Course 14: Revision for the fall semester exam.	Online	

Recommended literature

T.H. Cormen, C.E.Leiserson, R.R. Rivest, C. Stein – Introduction to Algorithms, MIT Press. 2009.

Tim Roughgarden. Algorithms Illuminated, Volumes 1-4. Soundlikeyourself Publishing, 2017-2020.

J. Kleinberg, E. Tardos – Algorithm Design. Addison Wesley 2005.

Various course notes: Daniela Zaharie (UVT), Jeff Edmonds (York U, Canada), etc.

Various online references (videos, online books) will be posted on the course webpage on the elearning platform.

8.2. Seminar / laboratory	**Teaching methods**	**Remarks, details**
problem solving related to coursework	problem solving/seminar	Mostly problems from Cormen, as well as other online and offline sources.

Recommended literature		

The 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
10.4. Lecture	Final	Exam on the elearning platform (moodle). Details to be communicated to students before the exam. Likely to have multiple components: - a basic multiple-choice test for passing (up to grade 7) - a problem solving component for higher grades.	66 %
10.5. Seminar / laboratory	Seminar.	Attendance, activity.	33 %
	homework/quizzes	homework/quiz	they don't count towards the final grade, but they are **needed** to enter the exam.

10.6. Minimum needed performance for passing			
- complete **all homework/assignments/quizzes.** These will not count towards the final grade, but they are **needed**, in order to enter the final exam. They may be *light graded*: 2 points for a correct solution, 1 point for a somewhat correct solution, 0 points for an incorrect one. At least a 50% percentage is needed. - pass **both sections:** Course/Seminar-lab. - abilities to design simple algorithms and describe them in pseudocode - basic abilities to analyze the complexity of simple algorithms			

Date of completion	Signature (lecture instructor)	Signature (seminar instructor)
15.09.2020		
Date of approval	Signature (director of the department)	