

## SYLLABUS

### OPTIMIZATION TECHNIQUES 2023-2024

#### 1. Information on academic programme

1.1. University	„1 Decembrie 1918” from Alba Iulia
1.2. Faculty	Faculty of Informatics and Engineering
1.3. Department	Informatics, Mathematics and Applied Electronics
1.4. Field of Study	Computer Science
1.5. Cycle of Study	Undergraduate
1.6. Academic programme / Qualification	Computer Science

#### 2. Information of Course Matter

2.1. Course		<i>Optimization techniques</i>		2.2. Code		CSE214	
2.3. Course Leader				Aldea Mihaela			
2.4. Seminar Tutor				Aldea Mihaela			
2.5. Academic Year	<b>II</b>	2.6. Semester	<b>II</b>	2.7. Type of Evaluation (E – final exam/ CE - colloquy examination / CA -continuous assessment)	<b>CE</b>	2.8. Type of course (C– Compulsory, Op – optional, F - Facultative)	<b>C</b>

#### 3. Course Structure (Weekly number of hours)

3.1. Weekly number of hours	<b>3</b>	3.2. course	<b>2</b>	3.3. seminar, laboratory	<b>1</b>
3.4. Total number of hours in the curriculum	<b>42</b>	3.5. course	<b>28</b>	3.6. seminar, laboratory	<b>14</b>
Allocation of time:					Hours
Individual study of readers					<b>10</b>
Documentation (library)					<b>9</b>
Home assignments, Essays, Portfolios					<b>10</b>
Tutorials					
Assessment (examinations)					<b>4</b>
Other activities.....					

3.7 Total number of hours for individual study	33
3.9 Total number of hours per semester	75
3.10 Number of ECTS	3

#### 4. Prerequisites (*where applicable*)

4.1. curriculum-based	
4.2. competence-based	

### 5. Requisites (where applicable)

5.1. course-related	Room equipped with video projector / board
5.2. seminar/laboratory-based	Room equipped with video projector / board.

### 6. Specific competences to be acquired (chosen by the course leader from the programme general competences grid)

Professional competences	<p><b>C2 Development and maintenance of computer applications ( 3 cr. )</b></p> <p>C2.1 The identification of appropriate methodologies for software systems development.</p> <p>C2.2 The identification and explanation of appropriate mechanisms for software systems specification.</p> <p>C2.3 The use of methodologies, specification mechanisms and development environments for the development of computer applications.</p> <p>C2.4. The use of appropriate criteria and methods for the evaluation of computer applications.</p> <p>C2.5. The development of dedicated computer projects.</p> <p><b>C3 The use of computer tools in an interdisciplinary context (1 cr.)</b></p> <p>C3.1. The description of concepts, theories and models used in the application field.</p> <p>C3.2 The identification and explanation of base computer models that are suitable for the application domain.</p> <p>C3.3. The use of computer and mathematical models and tools to solve specific problems in the application field.</p> <p>C3.4. Data and model analysis.</p> <p>C3.5. The development of software components of interdisciplinary projects.</p>
Transversal competences	

### 7. Course objectives (as per the programme specific competences grid)

7.1 General objectives of the course	First, discipline aims, learning to analyze and decide logically and rigorously. On the other hand, it contributes to a multidisciplinary preparation of future IT specialists, aiming in this way to familiarize students with the concepts and techniques of mathematical modeling of social and economic phenomena.
7.2 Specific objectives of the course	Knowing the mathematical basic elements of optimization algorithms, familiarity with the use of optimization techniques and algorithms to solve problems.

### 8. Course contents

8.1 Course (learning units)	Teaching methods	Remarks
1. Solving a linear programming problem by graphical and algebraic methods	<i>Lecture, conversation, exemplification</i>	
2. Simplex method for solving linear programming problems	<i>Lecture, conversation, exemplification</i>	
3. Duality. The dual simplex algorithm	<i>Lecture, conversation, exemplification</i>	
4. Reoptimization of linear programming problems	<i>Lecture, conversation, exemplification</i>	
5. Parametric linear programming	<i>Lecture, conversation, exemplification</i>	
6. Transport problems.	<i>Lecture, conversation, exemplification</i>	

7. Reoptimization of transport problems.	<i>Lecture, conversation, exemplification</i>	
8. Parametric transport problems.	<i>Lecture, conversation, exemplification</i>	
9. Special transport problem.	<i>Lecture, conversation, exemplification</i>	
10. Integer linear programming – Gomory methods	<i>Lecture, conversation, exemplification</i>	
11. Dantzig-Manne algorithm for solving integer linear programming problems.	<i>Lecture, conversation, exemplification</i>	
12. Bellman method	<i>Lecture, conversation, exemplification</i>	
13. Enumeration and evaluation methods.	<i>Lecture, conversation, exemplification</i>	
<b>Seminars-laboratories</b>		
1. Solving linear programming problems using simplex and dual simplex algorithms.	<i>Laboratory activities, exemplification, conversation</i>	
2. Reoptimization of linear programming problems	<i>Laboratory activities, exemplification, conversation</i>	
3. Parametric linear programming	<i>Laboratory activities, exemplification, conversation</i>	
4. Transport problems. Reoptimization of transport problems.	<i>Laboratory activities, exemplification, conversation</i>	
5. Parametric and special transport problems.	<i>Laboratory activities, exemplification, conversation</i>	
6. Integer linear programming - Gomory methods, Dantzig-Manne algorithm	<i>Laboratory activities, exemplification, conversation</i>	
7. Bellman method. Enumeration and evaluation methods.	<i>Laboratory activities, exemplification, conversation</i>	
<b>References</b>		
<ol style="list-style-type: none"> <li>1. P. Blaga, A. Mureșan – <i>Matematici aplicate în economie vol II</i>, Cluj-Napoca, 1993, 1996.</li> <li>2. A. Muresan, R. I. Lung, - <i>Matematici aplicate în economie(cercetari oprationale)</i>, ED. Mediamira, 2005;</li> <li>3. D. Baz, V. Butescu, N. Stremțan – <i>Matematici superioare</i>, București, 1994.</li> <li>4. L. Căbulea – <i>Cercetări operaționale</i>, Ed. Dacia, Cluj-Napoca, 2002.</li> <li>5. L. Căbulea, M. Aldea – <i>Cercetări operaționale</i>, Ed. Didactica, Alba Iulia, 2004.</li> <li>6. G. David – <i>Linear and Non Linear Programming</i>, Addison Wesley, Massachusetts, 1989.</li> <li>7. G. L. Nemhauser, L. A. Wolsey – <i>Integer and combinatorial optimization</i>, John Wiley &amp; Sons Inc, New York, 1999.</li> <li>8. C. Zidăroiu – <i>Programare liniară</i>, Ed. Tehnică, București, 1983.</li> <li>9. V. Masgras, <i>Cercetari operationale</i>, ED. Fair Parteners, 2004</li> </ol>		

**9. Corroboration of course contents with the expectations of the epistemic community’s significant representatives, professional associations and employers in the field of the academic programme**

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## 10. Assessment

Activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	<i>Final evaluation</i>	<i>Written paper</i>	50%
	-	-	-
10.5 Seminar/laboratory	<i>Continuous assessment</i>	<i>Laboratory activities portfolio</i>	30%
	<i>Periodic testing by control paper</i>	<i>Written paper</i>	20%
10.6 Minimum performance standard: min. 5			
<i>Establishment and application optimization algorithm.</i>			

Submission date  
25.09.2023

Course leader signature  
Aldea Mihaela

Seminar tutor signature  
Aldea Mihaela

Date of approval by Department members  
02.10.2023

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Department director signature  
Aldea Mihaela

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