SYLLABUS

OPTIMIZATION TECHNIQUES
2024-2025

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/2511/ Systems Analyst, 2512/ Software developers** **Analyst 251201** **Computer System Programmer 251204** **Computer System Engineer 251203**

2. **Information of Course Matter**

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

3. Course Structure (Weekly number of hours)

3.1. Weekly number of hours	***3***	3.2. course	***2***	3.3. seminar, laboratory	***1***
3.4. Total number of hours in the curriculum	***42***	3.5. course	***28***	3.6. seminar, laboratory	***14***

Allocation of time:	Hours
Individual study of readers	**10**
Documentation (library)	**9**
Home assignments, Essays, Portfolios	**10**
Tutorials	
Assessment (examinations)	**4**
Other activities…….	

3.7 Total number of hours for individual study	33
3.8 Total number of hours for university activities	42
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 aquired (chosen by the course leader from the programme general competences grid)

Professional competences	**C2 Development and maintenance of computer applications (3 cr.)** C2.1 The identification of appropriate methodologies for software systems development. C2.2 The identification and explanation of appropriate mechanisms for software systems specification. C2.3 The use of methodologies, specification mechanisms and development environments for the development of computer applications. C2.4. The use of appropriate criteria and methods for the evaluation of computer applications. C2.5. The development of dedicated computer projects. **C3 The use of computer tools in an interdisciplinary context (1 cr.)** C3.1. The description of concepts, theories and models used in the application field. C3.2 The identification and explanation of base computer models that are suitable for the application domain. C3.3. The use of computer and mathematical models and tools to solve specific problems in the application field. C3.4. Data and model analysis. C3.5. The development of software components of interdisciplinary projects.
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	***Lecture, conversation, exemplification***	
2. Simplex method for solving linear programming problems	***Lecture, conversation, exemplification***	
3. Duality. The dual simplex algorithm	***Lecture, conversation,***	

	exemplification	
4. Reoptimization of linear programming problems	***Lecture, conversation, exemplification***	
5. Parametric linear programming	***Lecture, conversation, exemplification***	
6. Transport problems.	***Lecture, conversation, exemplification***	
7. Reoptimization of transport problems.	***Lecture, conversation, exemplification***	
8. Parametric transport problems.	***Lecture, conversation, exemplification***	
9. Special transport problem.	***Lecture, conversation, exemplification***	
10. Integer linear programming – Gomory methods	***Lecture, conversation, exemplification***	
11. Dantzig-Manne algorithm for solving integer linear programming problems.	***Lecture, conversation, exemplification***	
12. Bellman method	***Lecture, conversation, exemplification***	
13. Enumeration and evaluation methods.	***Lecture, conversation, exemplification***	
Seminars-laboratories	**Teaching methods**	
1. Solving linear programming problems using simplex and dual simplex algorithms.	***Laboratory activities, exemplification, conversation***	
2. Reoptimization of linear programming problems	***Laboratory activities, exemplification, conversation***	
3. Parametric linear programming	***Laboratory activities, exemplification, conversation***	
4. Transport problems. Reoptimization of transport problems.	***Laboratory activities, exemplification, conversation***	
5. Parametric and special transport problems.	***Laboratory activities, exemplification, conversation***	
6. Integer linear programming - Gomory methods, Dantzig-Manne algorithm	***Laboratory activities, exemplification, conversation***	
7. Bellman method. Enumeration and evaluation methods.	***Laboratory activities, exemplification, conversation***	

References

1. P. Blaga, A. Mureşan – *Matematici aplicate în economie vol II,*Cluj-Napoca, 1993, 1996.
2. A. Muresan, R. I. Lung, - *Matematici aplicate în economie(cercetari oprationale),* ED. Mediamira, 2005;
3. D. Baz, V. Butescu, N. Stremţan – *Matematici superioare*, Bucureşti, 1994.
4. L. Căbulea – *Cercetări operaţionale,* Ed. Dacia, Cluj-Napoca, 2002.
5. L. Căbulea, M. Aldea – *Cercetări operaţionale,* Ed. Didactica, Alba Iulia, 2004.
6. G. David – *Linear and Non Linear Programming,* Addison Wesley, Massachusetts, 1989.
7. G. L. Nemhauser, L. A. Wolsey – *Integer and combinatorial optimization*, John Wiley & Sons Inc, New York, 1999.
8. C. Zidăroiu – *Programare liniară,* Ed. Tehnică, Bucureşti, 1983.
9. V. Masgras, *Cercetari operationale*, ED. Fair Parteners, 2004

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

10. Assessment

Activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	*Final evaluation*	*Written paper*	50%
	-	-	-
10.5 Seminar/laboratory	*Continuous assessment*	*Laboratory activities portfolio*	30%
	Periodic testing by control paper	*Written paper*	20%
10.6 Minimum performance standard: min. 5			
Establishment and application optimization algorithm. Attending the exam is only allowed if the student has at least 80% attendance at the seminar. The recovery before the colloquium of the seminar hours not carried out due to reasoned absences can be done by the student presenting a portfolio containing all the solved seminar topics. This portfolio can be presented no later than 5 days before the colloquium, according to a schedule agreed upon with the teacher.			

Submission date
1.10.2024

Course leader signature
Aldea Mihaela

Seminar tutor signature
Aldea Mihaela

Date of approval by Department members

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Department director signature
Aldea Mihaela

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