



MINISTERUL EDUCAȚIEI
UNIVERSITATEA „AUREL VLAICU” DIN ARAD
310130 Arad, B-dul Revoluției nr. 77, P.O. BOX 2/158 AR
Tel : 0040-257- 283010; fax. 0040-257- 280070
http://www.uav.ro; e-mail: rectorat@uav.ro
Operator de date cu caracter personal nr.2929

SUBJECT SHEET

1. Program Data

1.1. Higher education institution	"AUREL VLAICU" UNIVERSITY OF ARAD
1.2. Faculty	of Exact Sciences
1.3. Department	Department of Mathematics and Computer Science
1.4. Field of study	Mathematics
1.5. Academic year	2024-2025
1.6. Cycle of studies	License
1.7. Specialization / Study Program	Computer Science Mathematics
1.8. Form of education	Full-time education (IF)

2. Discipline Data

2.1. Name of the discipline	GICS5A11 Optimization Techniques
2.2. Education Plan Holder	dr. Deac Dan-Stelian
2.3. Assistant	dr. Deac Dan-Stelian
2.4. Year of study	3
2.5. Semester	1
2.6. Type of assessment	ES
2.7. Discipline regime	Op

3. Total estimated time (hours per semester of teaching activities)

3.1. Number of hours per week	3
3.2. Hours of classes per week	2
3.3. Seminar/laboratory/project hours per week	1
3.4. Total hours of the curriculum	42
3.5. Course hours per semester	28
3.6. Seminar/laboratory/project hours per semester	14
Time Pool Distribution [Hours]	
3.4.1. Study by textbook, course material, bibliography and notes	28
3.4.2. Additional documentation in the library, on specialized electronic platforms and in the field	27
3.4.3. Preparation of seminars/laboratories, assignments, papers, portfolios and essays	28
3.4.4. Tutoring	0
3.4.5. Examinations	4
3.4.6. Other activities ...	0
3.7. Total hours of individual study	83
3.8. Total hours per semester	125
3.9. Number of credits	5

4. Preconditions (where applicable)

4.1. Curriculum prerequisites	Mathematical Analysis on R , Linear Algebra, Analytic Geometry, Differential Equations, Partial Differential Equations
4.2. Competence preconditions	Computer operation, text editing with Microsoft Word, Mathcad Prime 8 operation

5. Necessary conditions (where applicable)

5.1. Conditions for the course	Video projector, whiteboard, computers with Mathcad Prime 8 installed
5.2. Conditions for the seminar	
5.3. Conditions for conducting the laboratory	Video projector, whiteboard, computers with Mathcad Prime 8 installed
5.4. Conditions for carrying out the project	

6. Specific competences acquired (where applicable)

6.1. Professional competences	C1. Operating with mathematical notions and methods. C2. Mathematical data processing, analysis and interpretation of phenomena and processes. C3. Development and analysis of algorithms for problem solving
6.2. Cross-cutting competency	CT1. Applying the rules of rigorous and efficient work, manifesting responsible attitudes towards the scientific and didactic field, for the optimal and creative capitalization of one's own potential in specific situations, in compliance with the principles and norms of professional ethics. CT3. Efficient use of information sources and communication resources and assisted professional training, both in Romanian and in an international language.

7. Objectives of the discipline (where applicable)

7.1. General objective of the discipline	Formation of symbolic calculation skills, mathematical modeling, mathematical problem solving with the help of Mathcad Prime 8 software
7.2. Specific objectives	Mastering basic optimization techniques. These skills are necessary to be able to do scientific research. The knowledge can be used in the master's and doctoral study cycles.

8. Contents (where applicable)

8.1 Course Content	Teaching methods	Observations
1. Linear transformations on systems. The basic solutions of a linear system. Models of the linear programming problem. (4 hours) 2. Primal and dual simplex algorithm. (4 hours) 3. Linear programming in integers, Gomory's algorithm. (4 hours) 4. Convex linear programming. Lagrange's multiplier method. Kuhn-Tucker conditions. (4 hours) 5. Quadratic programming. The Theil van de Panne algorithm. (4 hours) 6. Transportation problems. (4 hours) 7. Elements of game theory. (4 hours)	interactive exposition -heuristic conversation -exemplification - problematization-modeling	28 hours
8.2 Course Bibliography [1] Brent Maxfield ,Essential Mathcad for Engineering, Science, and Math, Second Edition, Academic Press, 2009 [2] P.C. Pop, Cercetări Operaționale, Editura Risoprint, Cluj-Napoca, 2007. [3] R. Trandafir, Optimization Models and Algorithms, AGIR Publishing House, Bucharest, 2006 [4] Cira, O., The Convergence Simultaneous Inclusion Methods, MatrixRom Publishing House, Bucharest, 2012 [5] Deac D. Optimization Techniques Course and Laboratory Notes SUMS Platform [6] ***, Mathcad Prime 2.0 Curriculum Guide, Parametric Technology Corporation, 140 Kendrick Street, Needham, MA 02494 USA, August 2012		
8.3 Seminar Content	Teaching methods	Observations
8.4 Seminar Bibliographies		
8.5 Lab Content	Teaching methods	Observations
1 Implementation of linear transformations on systems and pivoting. The basic solutions of a linear system. (1 hour) 2 Implementation of the graphical representation of the linear programming problem. (1 hour) 3 Implementation of the primal and dual simplex algorithm. (2 hours) 4 Implementation of Gomory's algorithm. (2 hours) 5 Implementation of convex linear programming methods. (2 hours) 6 Implementation of the Theil van de Panne algorithm. (2 hours) 7 Implementation of the transport problem (2 hours) 8 2-person game problems. (2 hours)	- application - exercise - modeling	14 hours
8.6 Laboratory bibliography [1] Brent Maxfield ,Essential Mathcad for Engineering, Science, and Math, Second Edition, Academic Press, 2009. [2] P.C. Pop, Cercetări Operaționale, Editura Risoprint, Cluj-Napoca, 2007. [3] R. Trandafir, Optimization Models and Algorithms, AGIR Publishing House, Bucharest, 2006. [4] Cira, O., The Convergence Simultaneous Inclusion Methods, Ed. MatrixRom, București, 2012. [5] Deac D. Optimization techniques Course and laboratory notes on the SUMS platform. [6] ***, Mathcad Prime 2.0 Curriculum Guide, Parametric Technology Corporation, 140 Kendrick Street,Needham, MA 02494 USA, August 2012		
8.7 Project Content	Teaching methods	Observations
8.8 Project Bibliography		

9. Corroborating/validating the contents of the discipline (where applicable)

The content of the discipline is in accordance with the content of similar disciplines in other university centers in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with employers - representatives of the business environment and with mathematics and computer science teachers from the pre-university education in Arad.

10. Assessment (where applicable)

Activity Type	Evaluation criteria	Evaluation methods	Weight of the final grade
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10.1. Course	correctness and completeness of knowledge, logical coherence, degree of assimilation of specialized language, conscientiousness, interest in study	Free presentation of the student Evaluation conversation Oral quizzes. Active participation in courses.	50% 10%
10.2. Seminar			
10.3. Laboratory	ability to operate with assimilated knowledge, conscientiousness, interest in study	Evaluation of a project along the way Active participation in laboratory applications	30% 10%
10.4. Project			
10.5 Minimum Performance Standard			
Acquiring fundamental concepts, using specialized language, creating a simple optimization application.			

Titular dr. Deac
Dan-Stelian Asistent

dr. Deac Dan-Stelian

DEPARTMENT DIRECTOR
Reader Popa Lorena

DEAN
Prof.univ.dr. Sorin-Florin NĂDĂBAN