



## SYLLABUS

### 1. Study programme

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	Informatics
1.5. Academic year	2024-2025
1.6. Study level	Bachelor
1.7. Study programme / Qualification	Computer Science
1.8. Form of education	Full – Time study

### 2. Course details

2.1. Name of the course	Algebraic Foundations of Computer Science
2.2. Course coordinator	PhD. Moț Ghiocel
2.3. Seminar/laboratory/project coordinator	PhD. Mihiț Claudia Luminița
2.4. Study year	1
2.5. Semester	2
2.6. Evaluation type	summative
2.7. Course type	compulsory

### 3. Estimated total time (hours per semester)

3.1. Hours per week	4
3.2. Lecture hours per week	2
3.3. Seminar/laboratory/project hours per week	2
3.4. Total hours per curriculum	56
3.5. Lecture hours per semester	28
3.6. Seminar/laboratory/project hours per semester	28
Time division [hrs]	
3.4.1. Independent study from textbooks, course support, bibliography and notes	20
3.4.2. Additional reading (libraries, specialized electronic platforms and field research)	20
3.4.3. Preparing of seminars/laboratories/projects, homework, papers, portfolios and essays	20
3.4.4. Tutorial coaching	5
3.4.5. Examinations	4
3.4.6. Other activities	0
3.7. Total individual study hours	69
3.8. Total hours per semester	125
3.9. Number of ECTS credits	5

### 4. Prerequisites (if applicable)

4.1. Curriculum related	
4.2. Competence related	Elements of algebra

**5. Conditions (if applicable)**

5.1. for the lecture	Internet access The classroom is equipped with a blackboard Computer/Laptop and Video projector
5.2. for the seminar	Internet access Specific equipment and apparatus Blackboard
5.3. for the laboratory	
5.4. for the project	

**6. Specific educational objectives (competences to be acquired)**

6.1. Professional skills	<b>C3.Using computer tools in interdisciplinary context;</b> <b>C4.Using the theoretical bases of computers and formal models.</b>
6.2. Transversal skills	<b>CT1.Applying the rules of organized and efficient work, of responsible attitudes towards teaching-scientific field, to value the own creative potential, while respecting the principles and norms of professional ethics.</b> <b>CT3.Using of efficient methods and techniques for learning, informing, research and development of the capacity to value knowledge, adapting to the requirements of a dynamic society and communicating in English and in an Internationally widespread language.</b>

**7. Course outcomes (resulting from the specific educational objectives to be acquired)**

7.1. General outcomes	- The student should know the basic notions and understand the important theorems in algebra. - The student should develop the skills to correctly apply the accumulated knowledge to solve different types of problems. - The student must train and develop his ability to think and analyze algebra problems.
7.2. Specific outcomes	- The student is able to demonstrate that he has acquired sufficient knowledge to understand the basic notions. - The student is able to correctly apply basic methods and principles in solving algebra problems. - The student is able to recognize the main classes/types of algebra problems and select the appropriate methods and techniques for solving them. - The student can create projects for the mathematical modeling of concrete problems.

**8. Outline (if applicable)**

8.1 Lecture Outline	Teaching methods	Remarks
1. Algebraic structures	Participatory lecture, problematization, demonstration, exemplification	4 hours
2. Linear spaces	Participatory lecture, problematization, demonstration, exemplification	4 hours
3. Linear subspaces	Participatory lecture, problematization, demonstration, exemplification	2 hours
4. Bases in linear spaces	Participatory lecture, problematization, demonstration, exemplification	2 hours
5. Pivot method	Participatory lecture, problematization, demonstration, exemplification	2 hours
6. Linear applications. Linear forms. Applications	Participatory lecture, problematization, demonstration, exemplification	4 hours
7. Bilinear forms. Quadratic forms. Applications	Participatory lecture, problematization, demonstration, exemplification	4 hours
8. Pre-Hilbert spaces	Participatory lecture, problematization, demonstration, exemplification	2 hours
9. Normed spaces	Participatory lecture, problematization, demonstration, exemplification	2 hours

10. Metric spaces	Participatory lecture, problematization, demonstration, exemplification	2 hours
<b>8.2 Lecture References</b> <b>1. P. Matei, Algebră liniară și geometrie analitică. Culegere de probleme, Ed. MatrixRom, 2007.</b> <b>2. G. Moș, C. L. Mihiț, Note de curs și seminar-Fundamentele algebrice ale informaticii, SUMS, 2024.</b> <b>3. G. Moș, A. Petrușel, Matematici superioare pentru ingineri și economiști, Ed. Mirton, Timișoara, 1999.</b> <b>4. G. Moș, L. Popa, Algebră liniară, geometrie analitică și geometrie diferențială, Ed. Univ. "Aurel Vlaicu" Arad, 2015.</b> <b>5. G. Moș, L. Popa, Algebră superioară pentru profilurile tehnic și economic. Teorie și aplicații-edțiia a 2-a, Ed. Univ. "Aurel Vlaicu" Arad, 2013.</b> <b>6. A. Toma, Algebră liniară: culegere de probleme, Ed. Economică, 2002.</b> <b>7. F. L. Țiplea, Fundamentele algebrice ale informaticii, Ed. Univ. "Al. I. Cuza", Iasi, 2021.</b>		

8.3 Seminar Outline	Teaching methods	Remarks
1. Algebraic structures	Exercises, applications, debates	4 hours
2. Linear spaces	Exercises, applications, debates	4 hours
3. Linear subspaces	Exercises, applications, debates	2 hours
4. Bases in linear spaces	Exercises, applications, debates	2 hours
5. Pivot method	Exercises, applications, debates	2 hours
6. Linear applications. Linear forms. Applications	Exercises, applications, debates	4 hours
7. Bilinear forms. Quadratic forms. Applications	Exercises, applications, debates	4 hours
8. Pre-Hilbert spaces	Exercises, applications, debates	2 hours
9. Normed spaces	Exercises, applications, debates	2 hours
10. Metric spaces	Exercises, applications, debates	2 hours

<b>8.4 Seminar References</b> <b>1. P. Matei, Algebră liniară și geometrie analitică. Culegere de probleme, Ed. MatrixRom, 2007.</b> <b>2. G. Moș, C. L. Mihiț, Note de curs și seminar-Fundamentele algebrice ale informaticii, SUMS, 2024.</b> <b>3. G. Moș, A. Petrușel, Matematici superioare pentru ingineri și economiști, Ed. Mirton, Timișoara, 1999.</b> <b>4. G. Moș, L. Popa, Algebră liniară, geometrie analitică și geometrie diferențială, Ed. Univ. "Aurel Vlaicu" Arad, 2015.</b> <b>5. G. Moș, L. Popa, Algebră superioară pentru profilurile tehnic și economic. Teorie și aplicații-edțiia a 2-a, Ed. Univ. "Aurel Vlaicu" Arad, 2013.</b> <b>6. A. Toma, Algebră liniară: culegere de probleme, Ed. Economică, 2002.</b> <b>7. F. L. Țiplea, Fundamentele algebrice ale informaticii, Ed. Univ. "Al. I. Cuza", Iasi, 2021.</b>		
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8.5 Laboratory Outline	Teaching methods	Remarks
8.6 Laboratory Outline		
8.7 Project Outline	Teaching methods	Remarks
8.8 Project Outline		

9. Correlation of course outline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

The content of the discipline is consistent with what is done 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 representatives of the business environment and with mathematics and computer science teachers from the Arad pre-university education.

**10. Evaluation / Grading (if applicable)**

Activity type	Evaluation criteria	Evaluation methods	Percentage of the final grade
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10.1. Lecture	<ul style="list-style-type: none"> <li>• <b>completeness of knowledge;</b></li> <li>• <b>logical coherence;</b></li> <li>• <b>degree of assimilation of the specialized language;</b></li>   <li>• <b>the criteria for attitudinal aspects: seriousness, interest in the topic addressed</b></li> </ul>	<p>final written exam at the end of the semester</p> <p>active participation in courses</p>	<p>40%</p> <p>10%</p>
10.2. Seminar	<ul style="list-style-type: none"> <li>• <b>the ability to operate with assimilated knowledge;</b></li> <li>• <b>the ability to apply in practice;</b></li>   <li>• <b>conscientiousness and interest in studying.</b></li> </ul>	<p>partial written exam during the semester</p> <p>active participation in seminars</p>	<p>40%</p> <p>10%</p>
10.3. Laboratory			
10.4. Project			
10.5 Minimal performance standard			
<b>Knowledge of basic theoretical notions and their application in solving problems.</b>			

Course coordinator  
Prof.univ.dr. Ghiocel MOȚ

Seminar/laboratory/project  
coordinator  
Lect.univ.dr. Claudia  
MIHIȚ

Head of the Department  
Lect.univ.dr. Lorena Camelia POPA

Dean  
Prof.univ.dr. Sorin-Florin NĂDĂBAN