

SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babes-Bolyai University
1.2 Faculty	Faculty of Mathematics and Computer Science
1.3 Department	Department of Mathematics
1.4 Field of study	Mathematics
1.5 Study cycle	Bachelor
1.6 Study programme / Qualification	Mathematics-Computer Science

2. Information regarding the discipline

2.1 Name of the discipline	Algebra 1 (Linear Algebra)						
2.2 Course coordinator	Assistant Professor PhD. Cosmin Pelea						
2.3 Seminar coordinator	Assistant Professor PhD. Cosmin Pelea						
2.4. Year of study	1	2.5 Semester	1	2.6. Type of evaluation	E	2.7 Type of discipline	Compulsory

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					28
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					28
Tutorship					14
Evaluations					4
Other activities:					-
3.7 Total individual study hours		94			
3.8 Total hours per semester	150				
3.9 Number of ECTS credits	6				

4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	

5. Conditions (if necessary)

5.1. for the course	
5.2. for the seminar /lab activities	

6. Specific competencies acquired

Professional competencies	<p>C1.1 Identifying the notions, describing the theories and using the specific language</p> <p>C2.3 Applying the adequate analytical theoretical methods to a given problem.</p>
Transversal competencies	<p>CT1. Applying some rules of precise and efficient work, showing a responsible attitude regarding the scientific domain and teaching training for an optimal and creative development of the personal potential in specific situations, respecting the deontological norms.</p>

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	<ul style="list-style-type: none"> <input type="checkbox"/> To introduce the basic notions of linear algebra.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <input type="checkbox"/> To introduce some basic results on vector spaces, matrices, systems of linear equations, eigenvalues, eigenvectors and quadratic forms.

8. Content

8.1 Course	Teaching methods	Remarks
1. Groups. Rings. Fields.	<ul style="list-style-type: none"> <input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration 	
2. Polynomial rings. Matrix rings	<ul style="list-style-type: none"> <input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration 	
3. Determinants. The inverse of a matrix	<ul style="list-style-type: none"> <input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration 	

4. The rank of a matrix. Systems of linear equations	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
5. Elementary operations on a matrix. Applications	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
6. Vector spaces. Subspaces. The generated subspace	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
7. Linear maps	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
8. Test	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
9. Bases	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
10. Dimension	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
11. Matrices and linear maps	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
12. Eigenvectors and eigenvalues	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
13. Diagonalisable matrices. Hamilton-Cayley Theorem	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
14. Bilinear and quadratic forms.	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
Bibliography		
1. R. COVACI, Algebra si programare liniara, Litografia UBB, Cluj-Napoca, 1986.		

2. S. CRIVEI, Basic Abstract Algebra, Ed. Casa Cartii de Stiinta, Cluj-Napoca, 2002, 2003.
3. I.D. ION, N. RADU, Algebra (ed.4), Editura Didactica si Pedagogica, 1990.
4. C. NASTASESCU, I. STANESCU, C. NITA, Matematica, Elemente de algebra superioara, Editura Didactica si Pedagogica, Bucuresti, 1995.
5. I. PURDEA, I. POP, Algebra, Editura GIL, Zalau, 2003.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Groups. Rings. Fields. Review.	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
2. Determinants.	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
3. The rank of a matrix	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
4. The inverse of a matrix	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
5. Systems of linear equations	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
6. Vector spaces.	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
7. Subspaces. Generated subspace	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
8. Linear maps	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
9. Bases	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
10. Dimension formulas.	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	

11. Dimension and generated subspaces.	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
12. Matrices and linear maps	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
13. Eigenvectors and eigenvalues. Diagonalisable matrices. Hamilton-Cayley Theorem	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
14. Bilinear and quadratic forms.	<input type="checkbox"/> Interactive exposure <input type="checkbox"/> Explanation <input type="checkbox"/> Conversation <input type="checkbox"/> Didactical demonstration	
Bibliography 1. I.D. ION, C. NITA, D. POPESCU, N. RADU: Probleme de algebra, Editura Didactica si Pedagogica, Bucuresti, 1981. 2. C. NASTASESCU, I. STANESCU, C. NITA, Matematica, Elemente de algebra superioara, Editura Didactica si Pedagogica, Bucuresti, 1995. 3. I. PURDEA, C. PELEA, Probleme de algebra, EIKON, Cluj-Napoca, 2008.		

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The course presents notions which often appear in other undergraduate courses.
- The course offers a sufficiently general background for some highschool algebra topics and the opportunity to develop some problem solving skills useful for further teaching activities.

10. Evaluation

10.4 Course	Knowledge of basic concepts	Tests	25%
	Knowledge of basic results	Final exam.	25%
10.5 Seminar/laborator	Examples and problem solving	Final exam.	50%
10.6 Minimum performance standards			
The final grade must be at least 5.			

Date	Signature of course coordinator	Signature of seminar coordinator
11.04.2021	Assist. Prof. PhD. Cosmin Pelea	Assist. Prof. PhD. Cosmin Pelea

Date of approval	Signature of the head of department
	Prof.PhD. Octavian AGRATINI