SYLLABUS

1. Information regarding the programme

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

2. Information regarding the discipline

2.1 Name of the discipline		**Algebra**					
2.2 Course coordinator		**Assoc.Prof.PhD. Septimiu Crivei**					
2.3 Seminar coordinator		**Assoc.Prof.PhD. Septimiu Crivei**					
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)	14
Preparation for seminars/labs, homework, papers, portfolios and essays	28
Tutorship	10
Evaluations	14
Other activities:	0

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	• Understanding of basic concepts of mathematics and use them to problem-solving activities • Ability to understand and approach problems of modeling nature from other sciences
Transversal competencies	• Ability to work independently and/or in a team in order to solve problems in defined professional contexts

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

7.1 General objective of the discipline	• To introduce the basic notions of linear algebra as well as some of its applications to computer science
7.2 Specific objective of the discipline	• To present some applications of linear algebra to computer science

8. Content

8.1 Course	Teaching methods	Remarks
1. Functions. Equivalence relations and partitions	exposition, didactic proof, algorithmization	
2. Binary operations. Groups, subgroups, group homomorphisms	exposition, didactic proof, algorithmization	
3. Rings and fields, subrings and subfields, ring homomorphisms	exposition, didactic proof, algorithmization	
4. Vector spaces, examples. Subspaces. Linear maps	exposition, didactic proof, algorithmization	
5. Linear dependence and independence. Bases, dimension. Steinitz theorem	exposition, didactic proof, algorithmization	
6. Bases and coordinates. Dimension related formulas	exposition, didactic proof, algorithmization	
7. Elementary operations. Matrices and determinants	exposition, didactic proof, algorithmization	
8. Rank and inverse of a matrix. Matrix of a list of vectors	exposition, didactic proof, algorithmization	
9. Matrix of a linear map. Change of basis	exposition, didactic proof, algorithmization	
10. Systems of linear equations, solving methods	exposition, didactic proof, algorithmization	
11. Eigenvectors and eigenvalues	exposition, didactic proof, algorithmization	
12. Bilinear and quadratic forms. Reduction of quadratic forms to the canonical form	exposition, didactic proof, algorithmization	
13. Linear codes, examples. Generator matrix and parity-check matrix	exposition, didactic proof, algorithmization	
14. Decoding linear codes	exposition, didactic proof, algorithmization	

Bibliography
1. G. Calugareanu, Lectii de algebra liniara, Lito UBB, Cluj-Napoca, 1995.
2. S. Crivei, Basic abstract algebra, Casa Cartii de Stiinta, Cluj-Napoca, 2002, 2003.
3. C. Gherghe, D. Popescu, Criptografie. Coduri. Algoritmi, Editura Univ. Bucuresti, 2005.
4. J. Gilbert, L. Gilbert, Elements of modern algebra, PWS-Kent, Boston, 1992.
5. W.J. Gilbert, W.K. Nicholson, Modern algebra with applications, John Wiley, 2004.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Functions. Equivalence relations and partitions	problematization, exercise	
2. Binary operations. Groups, subgroups, group homomorphisms	problematization, exercise	
3. Rings and fields, subrings and subfields, ring homomorphisms	problematization, exercise	
4. Vector spaces, examples. Subspaces. Linear maps	problematization, exercise	
5. Linear dependence and independence. Bases, dimension. Steinitz theorem	problematization, exercise	
6. Bases and coordinates. Dimension related formulas	problematization, exercise	
7. Elementary operations. Matrices and determinants	problematization, exercise	
8. Rank and inverse of a matrix. Matrix of a list of vectors	problematization, exercise	
9. Matrix of a linear map. Change of basis	problematization, exercise	
10. Systems of linear equations, solving methods	problematization, exercise	
11. Eigenvectors and eigenvalues	problematization, exercise	
12. Bilinear and quadratic forms. Reduction of quadratic forms to the canonical form	problematization, exercise	
13. Linear codes, examples. Generator matrix and parity-check matrix	problematization, exercise	
14. Decoding linear codes	problematization, exercise	

Bibliography
1. N. Both, S. Crivei, Culegere de probleme de algebra, Lito UBB Cluj-Napoca, 1996.
2. S. Crivei, Basic abstract algebra, Casa Cartii de Stiinta, Cluj-Napoca, 2002, 2003.
3. I. Purdea, C. Pelea, Probleme de algebra, Editura 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 contents is directed towards applications of linear algebra to computer science.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Knowledge of basic concepts, examples	Exam	25
10.5 Seminar/lab	Problem solving	Test, exam, assessments	75
10.6 Minimum performance standards			
➢ Grade 5			

Date	Signature of course coordinator	Signature of seminar coordinator
30.04.2013	Assoc.Prof.PhD. Septimiu CRIVEI	Assoc.Prof.PhD. Septimiu CRIVEI

Date of approval	Signature of the head of department
30.04.2013	Assoc.Prof.PhD. Octavian AGRATINI