SYLLABUS

Discipline name	Linear Algebra
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51320209
Course leader	Associate Professor Ioan Radu Peter, Ph.D, Ioan.Radu.Peter@math.utcluj.ro
Collaborators	
Department	Mathematics
Faculty	Automation and Computer Science

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/sem.]							
			S	L	P		S	L	P				
1	**Fundamental**	**2**	**2**	**-**	**-**	**28**	**28**	**-**	**-**	**94**	**150**	**5**	**Exam**

Acquired competences :
Acquired skills (what the student is able to do):
Knowledge of algebra, geometry and their applications. Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions
Acquired abilities: (what type of equipment/instruments/software the student is able to handle)
The ability to apply general rules to specific problems to produce answers that make sense.

Prerequisites (if necessary)
Linear Algebra and Analytic Geometry – elementary knowledge (high school level)

A. Course/Lecture (course/lecture titles)	
1	Linear spaces. Definition. Linear subspaces. Examples.
2	Linear independence. Basis. Dimension. Change of basis.
3	Inner - product spaces. Definition, properties, Schwarz' inequality. Examples
4	Linear transformations. Definition, elementary properties, Kernel and Image.
5	The matrix associated to a linear transformation. The standard construction. Expresions in terms of coordinates.
6	Eigenvalues and eigenvectors. Definitions, invariant subspaces, characteristic polynomials.
7	The diagonal form. Canonical forms, diagonalizability.
8	The Jordan canonical form. Construction of a Jordan basis and a Jordan matrix.
9	Functions of a matrix. The n-th power of a matrix. Elementary functions of a matrix.
10	The adjoint operator. Definition, properties, examples.
11	Self-adjoint operators, unitary operators, properties of the eigenvalues and eigenvectors.
12	Bilinear forms, quadratic forms. The associated matrix.
13	The canonical form. Reduction to a canonical form. The method of eigenvalues and Jacobi's method.
14	Conics and quadrics. Reduction to a canonical form. Geometric properties.

B1. Applications – **Laboratory** (list of laboratories), **Seminar** (contents), **Project** (project contents)	
1	Determinants, matrices, geometric vectors
2	Linear spaces, bases, dimension
3	Inner-product spaces
4	Linear transformations. Examples
5	Linear transformations characterized in terms of matrices
6	Invariant subspaces, eigenvalues, eigenvectors
7	Diagonalizable linear transformations
8	Jordan bases, Jordan canonical forms
9	Elementary functions of a matrix, examples
10	The adjoint operator
11	Special classes of operators
12	Bilinear forms, quadratic forms
13	Reduction to a canonical form
14	Conics and quadrics, reduction to a canonical form

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C. Individual study (reference study contents, synthesis materials, projects, applications etc.)						
14 sets of problems (the preparation part in seminar)						
Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	14	45	3	4	94

References (Textbooks, courses, laboratory manual, exercise book)

1. S. Axler, Linear algebra done right, second edition, Springer, 1997
2. V. Pop, I. Rasa, Linear Algebra with Applications to Markov Chains, Ed. Mediamira, 2005
3. Gh. Sabac, Matematici speciale, E.D.P. , Bucuresti, 1981

On – line references

http://users.utcluj.ro/~p.radu/Linkuri/semI_2008.html

Final evaluation	
Evaluation method	Oral exam (E): problem solving (70%) and theoretical subjects (30%).
Mark components	Exam (E: 0…10 points); Seminar (L: 0…10 points); Homework (H: 0…10 points);
Mark computation	M = 0.6E + 0.2L + 0.2H. Pass if: E≥4 and L≥4 and M≥4.5

Course leader,

Associate Professor Ioan Radu PETER, Ph.D.