



SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca			
1.2	Faculty	Automation and Computer Science			
1.3	1.3 Department Mathematics				
1.4	Field of study	Electronics and Telecommunications Engineering			
1.5	5 Cycle of study Bachelor of Science				
1.6	Program of study/Qualification	Telecommunications Technologies and Systems/			
	Frogram of study/Qualification	Engineer, Applied Electronics/ Engineer			
1.7	Form of education	Full time			
1.8	Subject code	TST-E02.00, EA-E02.00			

2. Data about the subject

2.1	Subject name				Linear Algebra						
2.2	2.2 Subject area				Mathematics						
2.3	Course responsible/lecturer				Assoc. Prof. Ioan Radu Peter						
2.4	2.4 Teachers in charge of applications				Assoc. Prof. Ioan Radu Peter						
2.5	Year of study	Ι	2.6	Semester	1	2.7	Assessment	Exam	2.8	Subject category DF/DC	ЭΒ

3. Estimated total time

Year	Subject name	No.	Course	Арр	licatio	ons	Course	Арр	olicati	ons	Indiv.		
/		of									study	JAL	dits
Sem.		weeks	[hours/week]		[hours/sem.]				0	Cree			
				S	L	Ρ		S	L	Р		F	0
ll / 1	Linear Algebra	14	2		2		28		28		74	130	5

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the curriculum	56	3.5	of which, course	28	3.6	applications	28
Individual study Hc								Hours
Manual, lecture material and notes, bibliography								
Supp	lementary study in the library, or	nline a	nd in th	e field				-
Prepa	aration for seminars/laboratory w	vorks,	homewo	ork, reports, portfo	lios	essays	;	28
Tutor	ing							3
Exam	is and tests							3
Other activities								0
3.7	Total hours of individual study		74					•

0.7	Total Hours of Individual Study	74	
3.8	Total hours per semester	130	
3.9	Number of credit points	5	

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basics of linear algebra and analytic geometry (romanian high
		school level, specialization mathematics and informatics)

4.2 Competence

Competence related to subjects above

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre, Cluj-Napoca
5.2	For the applications	Cluj-Napoca

6. Specific competences

Professional competences	Theoretical knowledge (what the student must know):	Descriptions and recognition of some specific concepts of analytic geometry, vectors operations, their meaning. Descriptions and recognition of some specific concepts of linear algebra, their meaning and problem solving skills. Descriptions and recognition of some specific concepts of some simple aplications in pattern recognition, machine learning folosind metode algebrice
	Acquired skills (what the student is able to do):	- Uses of theoretical aspects in problem solving.
	Acquired abilities: (what type of equipment the student is able to handle)	The student can operate and understand some topics in analytical geometry and linear algebra. He is prepared for understanding basics in pattern recognition, machine leraning and primary notions in computer vision.
	In accordance with Grila1 and Grila2 RNCIS	 C1. To use the fundamental elements regarding electronic devices, circuits, systems, instrumentation and technology C2. To apply basic methods for signal acquisition and processing C3. To apply knowledge, concepts and basic methods regarding computing systems' architecture, microprocessors, microcontrollers, programming languages and techniques
Cross	competences (Grila1 and Grila2 RNCIS)	N.A.

7. Discipline objectives (as results from the key competences gained)

7.1	General objectives	Preparing the ability to use analytical geometry and linear
		algebra in some engineering fields.
7.2	Specific objectives	 Using the matrix calculus (in the more general context of linear algebra and analytical geometry) to solve some specific problems in engineering.

8. Contents

1 Linear spaces. Definition. Linear subspaces. Examples.	8.1.	Lecture (syllabus)	Teaching methods	Notes
2Linear independence. Basis. Dimension. Change of basis.3Inner - product spaces. Definition, properties, Schwarz 'inequality. Examples4Linear transformations. Definition, elementary properties, Kernel and Image.5The matrix associated to a linear transformation. The standard construction.6Eigenvalues and eigenvectors. Definition, invariant subspaces, characteristic polynomials.7The diagonal form. Canonical form. Construction of a Jordan basis and a Jordan matrix.9Functions of a matrix. The n-th power of a matrix. Elementary functions of a matrix.10The adjoint operator. Definition, properties, examples.11Self-adjoint operators, unitary operators, properties of the eigenvalues and 	1	Linear spaces. Definition. Linear subspaces. Examples.		
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	14	Conics and quadrics, reduction to a canonical form		

Bibliography

 Ioan Radu Peter, Laszlo Szilard Csaba, Adrian Viorel, Elements of Linear Algebra, U.T. Press, Cluj-Napoca, 2014, ISBN 978-973-662-935-8, <u>http://algappl.utcluj.ro/</u>

2. S. Axler, Linear algebra done right, second edition, Springer, 1997

3. V. Pop, I. Rasa, Linear Algebra with Applications to Markov Chains, Ed. Mediamira, 2005

4. Gh. Sabac, Matematici speciale, E.D.P., Bucuresti, 1981

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline content and the acquired skills are in agreement with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job, and the expectations of the national organization for quality assurance (ARACIS).

10. Evaluations

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the			
						final grade			
Course		The level of acquired		exam		T=30% of the			
		theoretical knowledge and				pts			
		practical skills							
Applications		The level of acquired abilities		exam		P=			
						70% of pts			
10.4 Minimum standard of performance									
	0.3T+0.7Pr								

Date of filling in 19.01.2015

Course responsible Assoc. Prof. Ioan Radu PETER, PhD Teachers in charge of applications Assoc. Prof. Ioan Radu PETER, PhD

Date of approval in the department 19.01.2015

Head of department Prof. Mircea IVAN, PhD