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	Department	Mathematics
1.4	Field of study	Electronics and Telecommunications Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Telecommunications Technologies and Systems/ Engineer, Applied Electronics/ Engineer
1.7	Form of education	Full time
1.8	Subject code	TST-E23.00, EA-E23.00

2. Data about the subject

2.1	Subject name					Discrete Mathematics					
2.2	Subject area					Mathematics					
2.3	Course responsible/lecturer					Conf. Bogdan GAVREA, PhD math.					
2.4	Teachers in charge of applications										
2.5	Year of study	II	2.6	Semester	1	2.7	Assessment	Exam	2.8	Subject category	DF/ DOB

3. Estimated total time

Year/ Sem.	Subject name	No. of weeks	Course [hours/week]	Applications [hours/week]			Course [hours/sem.]	Applications [hours/sem.]			Indiv. study	TOTAL	Credits
				S	L	P		S	L	P			
II / 1	Discrete Mathematics	14	2	1			28	14			62	104	4

3.1	Number of hours per week	3	3.2	of which, course	2	3.3	applications	1
3.4	Total hours in the curriculum	42	3.5	of which, course	28	3.6	applications	14

Individual study	Hours
Manual, lecture material and notes, bibliography	40
Supplementary study in the library, online and in the field	-
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	16
Tutoring	3
Exams and tests	3
Other activities	0

3.7	Total hours of individual study	62
3.8	Total hours per semester	104
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	N / A
4.2	Competence	Mathematical analysis I and II, linear algebra

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre, Cluj-Napoca
5.2	For the applications	Discussion(Seminar) Room, Cluj-Napoca

6. Specific competences

Professional competences	Theoretical knowledge (what the student must know):	Mathematical models of discrete and continuous signals; the Z-transform and its inverse; the discrete and continuous Fourier transform; the Fast Fourier Transform; the Laplace transform; basic probability theory: mathematical definition of the probability concept, conditional probability, Bayes formula, the total probability formula, random variables/vectors (continuous and discrete), functions of random variables, numerical characteristics of random variables; brief overview of stochastic processes and Markov chains; introductory notions on interpolation theory.
	Acquired skills (what the student is able to do):	After completing the discipline, the students will be able to: - be able to work with the studied discrete and continuous transforms; - be able to operate with probability rules; - be able to work with random variables; - be able to perform basic statistical analysis; - be able to use basic polynomial interpolation theory.
	Acquired abilities	N.A.
	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	Developing the competences regarding the use of continuous and discrete transforms; understanding basic probability and statistics principles.
7.2	Specific objectives	1. Use of the Z-Transform, discrete Fourier transform, Laplace transform and the (continuous) Fourier transform. 2. Developing skills and abilities necessary in basic statistical analysis. 3. Developing basic knowledge regarding data interpolation.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Mathematical representation of discrete and continuous signals. Approximating continuous signals by discrete signals. Convolution product of discrete signals. l_1 and l_2 signals. Discrete linear systems: causal and non-causal systems, time-invariant systems.	Presentation, exemplification, problem presentation, teaching exercises	Use of projector, blackboard
2	The Z-Transform. Basic properties of the unilateral Z-transform.		
3	The inverse Z-transform. Digital filters and the Z-transform. Definition of the Discrete Fourier Transform (DFT). Examples of applications of the DFT in signal processing.		
4	Properties of the DFT. Parceval's identities. The Fast Fourier Transform (FFT) and its computational advantages.		
5	The Laplace transform. Definition and properties of the transform.		
6	The Fourier transform on L1 and L2. The Cosine and Sine transforms.		
7	Basic probability theory. Field of events, probability space, probability measure. Basic probability properties. Geometric interpretation of the probability measure.		
8	Conditional probability. Application: reliability of technical devices. Sequences of independent trials: Bernoulli scheme, Poisson scheme.		
9	The total probability formula and Bayes formula.		
10	Random variables. Important discrete and continuous variables.		
11	Numerical characteristics of random variables. Functions of random variables. Random vectors.		
12	A brief introduction to stochastic processes and Markov chains.		
13	Elements of interpolation theory: Lagrange and spline interpolation.		
14	Recapitulation. Preparation for the final exam.		
8.2. Applications (seminar)		Teaching methods	Notes
1	Discrete and continuous signals. Discrete linear systems.	Didactic proof, didactic exercise, team work	
2	The Z-Transform. The inverse Z-transform. Digital filters and the Z-transform.		
3	The DFT and FFT. The Laplace-transform.		
4	The (continuous) Fourier transform		
5	Basic probability theory. Conditional probability. Bayes' formula and the total probability formula.		
6	Random variables, random vectors and Markov chains.		
7	Elements of interpolation theory: Lagrange interpolation and spline interpolation.		

Bibliography

1. Gavrea, I., - Matematici speciale, Editura Mediamira, Cluj-Napoca, 2006, ISBN (10) 973-713-056-2.
2. Papoulis, A., - Signal Analysis, McGraw-Hill Book Company, 1977, ISBN (10) 007-048-460-0.
3. Atkinson, K., - An Introduction to Numerical Analysis, 2nd edition, John Wiley and Sons Inc., 1989, ISBN (10) 047-162-489-6.
4. Postolache, M., - Lecture Notes in Probability & Statistics, Fair Partners, 2003, ISBN: (10) 973-847-007-2.

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 theoretical knowledge and problem solving skills		Final examination		- E, max 10 pts. 80%
Applications (seminar)		The level of acquired abilities		- Continuous formative evaluation		- S, max 10 pts, 20%
10.4 Minimum standard of performance						
$S \geq 5$ and $E \geq 5$ and $0,8E+0,2S \geq 4.5$						

Date of filling in
18.03.2015

Course responsible
Assoc. Prof. Bogdan GAVREA, PhD

Teachers in charge of applications
Assoc. Prof. Bogdan GAVREA, PhD

Date of approval in the department
18.03.2015

Head of department
Prof. Mircea IVAN, PhD