COURSE GUIDE

2019-2020

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iaşi
1.2 Faculty / Department	Electronics, Telecommunications and Information Technology
1.3 Department	Telecommunications and Information Technologies
1.4 Field	Electronic Engineering, Telecommunications and Information Technologies
1.5 Study level	Bachelor
1.6 Study program / Qualification	Telecommunication Technologies and Systems

2. Course info

2.1 Course name Statistical Data Processing							
2.2 Course organizer (lecturer)		Prof. Daniela Tarniceriu			*E.DOS 415T(412.1)*		
2.3 Teaching assistants		Assoc. Prof. Nicolae Cleju					
2.4 Year of study	4	2.5 Semester	8	2.6 Assessement	Continuous Exam	2.7 Category	DOS

3. Estimated total time (hours per semester for teaching activities)

9 ST (612.1)

3.1 Number of hours per week	5	3.2 lecture	3	3.3 seminar/laboratory	2
3.4 Total number of hours in curricula	70	3.5 lecture	42	3.6 seminar/laboratory	28
Time distribution					hours
Textbook, course support, references and course notes study					30
Library, electronic platforms and on site documentation					12
Seminar/laboratory preparation, homework, reports, portfolios and essays					20
Tutoring					4
Assessment					4
Other activities					4

3.7 Total individual study hours	74
3.9 Total hours per semester	144
3. 10 Number of credit points	6

4. Prerequisites (where applicable)

4.1 curricula type	Digital signal Processing, Decision and estimation in data processing
4.2 competence type	

5. Infrastructure (where applicable)

5.1. for lectures	Video-projector, whiteboard
5.2. for laboratories	Computer network, software environments

6. Specific competences

Professional competences	• CP1 To know the terminology specific to statistical signal processing • CP2 To use properly the terminology specific to the discipline • CP3 To acquire skills to design time invariant linear discrete systems, using statistical optimization methods • CP4 To understand the specific methods of evaluating the effects of the finite wordlength in designing of discrete filters • CP5 To acquire skills to implement discrete, linear, time invariant systems according to design requirements • CP6 To develop skills for the correct use of statistical processing specific tools, in order to solve a concrete problem of prediction, optimal filtering or parameter estimation • CPS1 To acquire skills in understanding, analyzing and evaluating system performance, related to design requirements. • CPS2 To identify and choose the optimal methods of solving problems related to the statistical processing of signals

Transversal competences	• To use effectively the information sources and communication and professional training resources both in Romanian and in an international language • To show concern for professional development by training critical thinking skills and improving education by lifelong learning • To work in an international context.

7. Course targets (as resulting from 6. Specific competences table)

7.1 Course main target	- In-depth knowledge of the theoretical, methodological and practical developments specific to the techniques of statistical signal processing (finite wordlength, prediction, optimal filtering, estimation of parameters).
7.2 Course specific targets	- To demonstrate that he has acquired sufficient knowledge to understand the studied notions - To understand critically, explain and interpret theoretical, methodological and practical developments specific to the statistical signal processing • - To apply correctly the basic methods and principles in obtaining the optimal solution for prediction, optimal filtering or estimation.

8. Contents

8. 1 Lectures	Teaching methods	Notes
Direct design techniques for digital filters	Combination: -the lecture method	2 lectures
Implementation and analysis of discrete, linear, time invariant systems based on state variables	-using the video projector, explication,	2 lectures
Signal quantization and analyzing the quantization effects	-debate, -case study, - connections with the content of	3 lectures
Modeling of discrete random processes	other disciplines, with previously transmitted information within the	2 lecture
Linear prediction	discipline, or practical applications of the investigated problem	2 lectures
Optimal (Wiener) filtering		3 lectures

References
1. Haykin, S., *Adaptive Filter Theory*, Prentice Hall, Englewood Cliffs, NJ, 1989.
2. Jackson, L. B., *Digital Filters and Signal Processing*, Kluwer Academic Publisher, Hingham, 1989.
3. Mateescu, A., Ciochină, S., Dumitriu, N., Şerbănescu, A., Stanciu, N., *Prelucrarea numerică a semnalelor*, Ed. Didactică şi Pedagogică, 1997.
4. Munteanu, V., Tarniceriu, D., Filtrare optimala, Ed. Tehnopress, 2005.
5. Nafornită, I., Câmpeanu, A., Isar, A., *Semnale, circuite şi sisteme*, Universitatea Politehnica Timişoara, 1995.
6. V. Oppenheim, R. W. Shafer, *Discrete - Time Signal Processing*, Englewood Cliffs, NJ. Prentice Hall, 1989.
7. Papoulis, A., *Probability, Random Variables and Stochastic Processes*, McGraw-Hill, New York, 1984.
8. Proakis, J. G., Manolakis, D. G., *Introduction to Digital Signal Processing*, New York Macmillian, 1992.
9. D. Tărniceriu, *Filtrare digitală*, Ed. Tehnopres, Iasi 2004, ISBN 973 − 702 − 044 − 8, 2004.
10. D. Tarniceriu, *Bazele prelucrarii numerice a semnalelor*, Ed. Vasiliana, Iaşi, 2001.
11. Vaidyanathan, P. P., *Filter Banks and Multirate Signal Processing*, Englewood Cliffs, N. J. Prentice Hall, 1993.
Mitra, S. K., Digital signal Processing, McGraw Hill, 2002.

8. 2 Laboratory	Teaching methods	Notes
1. Introductory Laboratory 2. Synthesis of infinite impulse response filters 3. Direct design techniques for IIR digital filters 4. Implementation of FIR filters in lattice form 5. Implementation of IIR filters in lattice form 6. Implement a digital filter in C language 7. Implement a plugin in the Winamp application to filter audio signals 8. Quantization of filter coefficients. Sensitivity analysis for quantization of filter coefficients 9-10. Analysis of quantization errors. The effect of quantization on the restoration of signals	Solving laboratory applications in Matlab environment or C language The exercise Discussions	

11. Limit cycles in recursive systems and scaling to prevent overloading		
12. Wiener FIR filters for filtering and prediction		
13. Wiener IIR filters for filtering and prediction		
14. Recovery of laboratory work		
References		

9. Course contents corroboration with the expectations of the epistemic community representatives, professional associations and relevant employers in the field of the program

In determining the content of the discipline and the methods of teaching / examination, the discipline holders consulted both Romanian and foreign academic counterparts, with whom they have links through the Erasmus / Socrates exchanges. It also takes into account the opinions and expectations of the main industrial actors in Romania, with whom we have constant collaborations. The objectives of the discipline are in perfect harmony with the curriculum, transmitting information and forming skills necessary for future specialists in the field of electronics, telecommunication and information technology. The program was designed to integrate the discipline into the curriculum for the specialization of Telecommunications Technologies and Systems, the curriculum content of the prestigious universities in the country and abroad.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of final grade
10.4 Lectures	• Knowledge acquired theoretically (quantity, accuracy)	Continuous tests: Homework: Final evaluation	0 60% (minimum mark 5)
10.5 Seminar/laboratory	• Knowing the equipment, how to use specific instruments; Evaluating tools or achievements, processing and interpreting results	• Written questionnaire • Oral response • Laboratory books (experimental papers, papers) • Practical demonstration	40% (minimum mark 5)

10.6 Minimum performance standard
• Knowing the fundamental elements of theory, solving a simple problem

Completion date   Course organizer signature,   Teaching assistant signature,
10.09.2019

                         Prof. Dr. Ing. Daniela Tărniceriu   Assoc. Prof. Nicolae Cleju

Department approval date

                                          Department director signature

....   Conf. dr. ing. Luminița Scripcariu

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