SYLLABUS

Discipline name	Decision and Estimation in Information Processing
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51324009
Course leader	Professor Monica BORDA, Ph.D – Monica.Borda@com.utcluj.ro
Collaborators	Assistant Professor Sorin POP, Ph.D, Sorin.Pop@com.utcluj.ro, Assistant Raul MALUTAN - Raul.Malutan@com.utcluj.ro
Department	Communications
Faculty	Electronics, Telecommunications and Information Technology

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

Acquired competences :

Acquired skills (what the student is able to do):

- Ability to model statistically memoryless and memory sources
- Ability to interpret values and characteristic functions for random processes
- Understanding of stationarity and ergodicity
- Ability to evaluate statistically detectors and estimators

Acquired abilities (what type of equipment/ instruments/ software the student is able to handle):

- Capacity to develop software experiments for telecommunications and radar systems design

Prerequisites (if necessary):

Basics of probability theory, algebra fundamentals, digital circuits, analogical circuits. Signal theory

A. Course/Lecture (course/lecture titles)	
1	Random variables, values and characteristic functions
2	Random processes. Stationarity and ergodicity.
3	Random sequences and pseudo-random sequences
4	Markov processes
5	Noise. Definition. Clasification. Models. Noise in receivers.
6	Noise in digital communication systems.
7	Statistical decision theory. Decision criteria (Bayes, Kotelnikov-Siegert, Fisher, Mini-max, Neyman-Pearson)
8	Binary decision with discrete observation
9	Binary decision with continuous observation
10	Parameter estimation.
11	Introduction model of an ITS with parameter estimation. Evaluation criteria for estimators
12	Minimum squared error estimation. MAP estimation
13	Random signal estimation with continuous observation
14	Non linear estimation

B. Applications – Laboratory (list of 4 hours laboratories)	
1	Introduction and random variables.
2	Probability distribution function
3	Pseudo-noise sequences
4	Markov processes
5	Noise in digital communication systems (PCM, delta)
6	Binary decision system
7	Parameter estimation system

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)

2 synthesis reports
12 sets of problems (the preparation part in every laboratory)
3 sets of problems (course homework)

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Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	31	18	3	14	94

References (Textbooks, courses, laboratory manual, exercise book)
1. Monica Borda – *Information Theory and coding.* UT Press, 2007
2. R. Gallagher - *Information theory and reliable communication*, John Willey and sons (1968).
3. R. Hamming, *Coding and Information Theory*, Prentice Hall, 1980.
4. G. Wade – *Signal coding and processing,* Palgrave-McMillan, 2000.
5. B. Sklar, *Digital Communications*, Prentice Hall, 2001 (second edition)
6. Monica Borda –*Teoria Transmiterii Informației,* Editura Dacia, 1999.

Final evaluation	
Evaluation method	Written exam (E): problem solving (70%) and theoretical subjects (30%).
Mark components	Exam (E: 0…10 points); Laboratory (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,

Professor Monica BORDA Ph.D.

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