SYLLABUS

1. Information about the program

1.1 Higher education institution	Universitatea Politehnica Timișoara
1.2 Faculty[1] / Department[2]	Electronică, Telecomunicații și Tehnologii Informaționale/Communications
1.3 Field of study (name/code[3])	Electronică, Telecomunicații și Tehnologii Informaționale / 20.20.10
1.4 Study cycle	Master
1.5 Study program (name/code/qualification)	Communication Networks Engineering / 20.20.10

2. Information about discipline

2.1a Name of discipline/The educational classe[4]	Statistics and Stochastic Modeling/DF						
2.1b Name of discipline in Romanian							
2.2 Coordinator (holder) of course activities	Ass. Prof. Dr. Romeo NEGREA						
2.3 Coordinator (holder) of applied activities[5]	Ass. Prof. Dr. Romeo NEGREA						
2.4 Year of study[6]	1	**2.5** Semester	1	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DOP

3. Total estimated time (direct activities (fully assisted), partially assisted activities and unassisted activities[8])

3.1 Number of hours fully assisted/week	4 ,of which:	course	2	seminar/laboratory/project			0/2/0
3.1* Total number of hours fully assisted/sem.	56 ,of which:	course	28	seminar/laboratory/project			0/28/0
3.2 Number of on-line hours fully assisted/sem	,of which:	course		seminar/laboratory/project			
3.3 Number of hours partially assisted/week	,of which:	project, research		training		hours designing M.A. dissertation	
3.3* Number of hours partially assisted/ semester	,of which:	project of research		training		hours designing M.A. dissertation	
3.4 Number of hours of unassisted activities/ week	4.9 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					1
		Study using a manual, course materials, bibliography and lecture notes					1.9
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					2
3.4* Total number of hours of unasssited asctivities/ semester	69 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					14
		Study using a manual, course materials, bibliography and lecture notes					27
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					28
3.5 Total hrs./week[9]	8.9						
3.5* Total hrs./semester	125						
3.6 No. of credits	5						

4. Prerequisites (where applicable)

4.1 Curriculum	• Mathematics 4, Signals and systems
4.2 Learning outcomes	• Basic notions on probability theory and mathematical statistics

5. Conditions (where applicable)

5.1 of the course	• Room with video-projector
5.2 to conduct practical activities	• White board, video-projector, computers with Matlab software, internet access

6. **Learning outcomes** acquired through this discipline

Knowledge	• C1. The student/graduate knows research methods, techniques and paradigms • C5. The student/graduate knows concepts and methodologies from several fields • C6. The student/graduate understands algorithms and structures for data processing • C9. The student/graduate knows ways to integrate knowledge from various fields •
Skills	• A1. The student/graduate applies qualitative and quantitative methodologies • A5. The student/graduate integrates interdisciplinary methods and perspectives • A7. The student/graduate presents ideas and results in academic/professional contexts • A8. The student/graduate explains complex concepts for different audiences •
Responsibility and autonomy	• RA1 The student/graduate independently manages a research process and critically evaluates the results • RA2 The student/graduate assumes responsibility for the performance and reliability of the designed system • RA3 The student/graduate respects the principles of the open-source community and manages his/her own contributions • RA4 The student/graduate ensures the correctness and relevance of the conclusions drawn •

7. **Objectives of the discipline** (based on the grid of learning outcomes acquired)

- Acquisition of solid theoretical and practical knowledge regarding statistical and stochastic modeling
- Developing students' abilities to identify, adapt, interpret and apply a model based on stochastic processes appropriate to real data

8. **Content**

8.1 Course	Number of hours	Of which online	Teaching methods
Statistical estimators	2		Lecture, demonstration, motivation, conversation
Simple liiear and nonlinear regression models	2		
Multiple linear and nonlinear models	4		
Stochastic processes -Markov chains	2		
Stochastic processes with jumps. Poisson processes	2		
Time series. Component analysis	2		
Second-order stochastic processes. Spectral analysis	2		
AR, MA, ARMA and ARIMA stochastic processes	4		
Prediction, filtering and smoothing for second-order processes	2		
Difussion processes.Browninan motion process	2		
Martingales and Ito stochastic integral	2		

Bibliography[10]

1. R. Negrea, Stochastic and statistics modeling in engineering and economy (in Romanian) Politehnica Publ., Timisoara, 2006
2. *R. Negrea, B. Caruntu, C. Hedrea, Advanced calculus in engineering, Politehnica Publ, Timisoara, 2009*
3. C. Chatfield, *The Analysis of Time Series-an introduction, 5th ed.,* Chapman & Hall, 1996
4. I. Karatzas, S. E. Shreve, *Brownian motion and stochastic calculus, 2nd ed.,* Springer Verlag N.Y., 1991

8.2 Applied activities[11]	Number of hours	Of which online	Teaching methods
Simulation of random variables	2		Exposition, exemplification, conversation, software use
Optimization of regression models	2		
Simulation of Markov chains	2		
Simulations of Poisson processe and birth-death stochastic process	2		
Method for trend determination. Seasonal adjustment of a time series	2		
Autoregressive stochastic process AR(p)	2		
Mixte stochastic process ARMA(p,q)	4		
Integrated stochastic process ARIMA(p,d,q)	4		
Simulation of brownian motion	2		

	Bibliography[12] 1. R. Negrea, Stochastic and statistics modeling in engineering and economy (in Romanian) Politehnica Publ., Timisoara, 2006 2. *R. Negrea, B. Caruntu, C. Hedrea, Advanced calculus in engineering, Politehnica Publ, Timisoara, 2009* 3. C. Chatfield, *The Analysis of Time Series-an introduction, 5th ed.,* Chapman & Hall, 1996 4. W. J. Palm, *Introduction to Matlab 6 for engineers*, McGraw-Hill Higher Education, 2001

9. Evaluation

Type of activity	**9.1** Evaluation criteria[13]	**9.2** Evaluation methods	**9.3** Share of the final grade
9.4 Course	Summative assessment of understanding and application of acquired knowledge	Determining a model for real data, motivating the choice and applying it. Presentation of a comprehensive paper	50%
9.5 Applied activities	**S:**		
	L: Periodic evaluation.	Tests	50%
	P:		
	Pr:		
	Tc-R[14]:		
9.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified[15]			
• Report writing. Minimum grade 5 on the final test			

Date of completion 22.09.2025	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
Head of Department (signature)	**Date of approval in the Faculty Council** [16] 07.10.2025	**Dean (signature)**