SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Master
1.6 Program of study / Qualification	Artificial Intelligence and Vision / Master
1.7 Form of education	Full time

2. Data about the subject

2.1 Subject name	***Statistics and Probability***			Subject code	**7.10**
2.2 Course responsible / lecturer	Prof. dr. Ioan Rasa - Ioan.Rasa@math.utcluj.ro				
2.3 Teachers in charge of seminars / Laboratory / project	Prof. dr. Ioan Rasa - Ioan.Rasa@math.utcluj.ro				
2.4 Year of study	I	2.5 Semester	2	2.6 Type of assessment (E - exam, C - colloquium, V – verification)	E
2.7 Subject category	Formative category: DA – advanced, DS – speciality, DC – complementary				DS
	Optionality: DI – imposed, DO – optional (alternative), DF – optional (free choice)				DO

3. Estimated total time

3.1 Number of hours per week	3	of which:	Course	2	Seminars	1	Laboratory	-	Project	-
3.2 Number of hours per semester	42	of which:	Course	28	Seminars	14	Laboratory	-	Project	-
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										15
(b) Supplementary study in the library, online and in the field										15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										15
(d) Tutoring										5
(e) Exams and tests										3
(f) Other activities:										5

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	58
3.5 Total hours per semester (3.2+3.4)	100
3.6 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Mathematical Analysis, Linear Algebra, Special Mathematics
4.2 Competence	According to the above disciplines

5. Requirements (where appropriate)

5.1. For the course	black board, projector, computer
5.2. For the applications	black board, projector, computer

6. Specific competence

6.1 Professional competences	- operations with mathematical methods and models, techniques and advanced specific engineering and IT technologies - develop creative ideas - use data processing techniques - use data analysis techniques
6.2 Cross competences	The graduate: • develop an analytical approach • taking a proactive approach • developing strategies to solve problems • being open minded

7. Expected Learning Outcomes

Knowledge	The student has knowledge of: • algorithms • visual presentation techniques • operational research • systems theory • mathematical models in engineering
Skills	• analyse data • deliver visual presentations of data • build predictive models • create data models
Responsibilities and autonomy	The student has the ability to work independently in order to: • develop an analytical approach • take a proactive approach • develop strategies to solve problems • be open-minded

8. Discipline objective (as results from the *key competences gained*)

8.1 General objective	Studying, designing, implementing and evaluating probabilistic and statistical models
8.2 Specific objectives	Knowledge of data analysis and processing methods, determination and optimization of statistical parameters

9. Contents

9.1 Lectures	Hours	Teaching methods	Notes
Probability, entropy, information	2	Lecture, exercises, interactive methods	
Discrete random variables	2		
Continuous random variables	2		
Mean and variance	2		
The method of least squares	2		
Correlation and regression	2		
Markov chains	2		
Limit distribution. Examples	2		
Hidden Markov chains	2		

Statistical hypothesis testing	2		
Bayesian estimation techniques	2		
Gaussian families	2		
Maximum likelihood method	2		
The EM algorithm	2		

Bibliography:
1. Ioan Rasa, Lectures on Probability Theory and Stochastic Processes, U.T.Pres 2006
2. Ioan Rasa, Teoria Probabilitatilor si Aplicatii, ITCN 1994
3. C.Jalobeanu, I.Rasa, Incertitudine si decizie. Statistica si probabilitati aplicate in management, U.T.Pres 2001
4. T.K.Moon, Wynn C.Stirling, Mathematical Methods and Algorithms for Signal Processing, Prentice Hall 2000.

9.2 Applications - Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Probability, entropy, information	2	Exercises, interactive methods	
Discrete random variables, Continuous random variables	2		
Mean and variance, Method of least squares	2		
Markov chains	2		
Bayes estimation techniques	2		
Gaussian families	2		
EM algorithm	2		

Bibliography

1. Ioan Rasa, Lectures on Probability Theory and Stochastic Processes, U.T.Pres 2006
2. Ioan Rasa, Teoria Probabilitatilor si Aplicatii, ITCN 1994
3. C.Jalobeanu, I.Rasa, Incertitudine si decizie. Statistica si probabilitati aplicate in management, U.T.Pres 2001
4. T.K.Moon, Wynn C.Stirling, Mathematical Methods and Algorithms for Signal Processing, Prentice Hall 2000.
5. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, Wiley-Interscience, 2004

**Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.*

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

The content of the discipline was discussed with colleagues from other departments in order to corroborate with the expectations of representatives of the epistemic community, associations, professionals and employers in the field related to the program.

11. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Knowledge of theoretical principles and results. Problem solving skills	Written exam	30%
Seminar	Problem solving skills. Presence. Activity	written exam	70%
Laboratory	-	-	-
Project	-	-	-

Minimum standard of performance:
The ability to coherently present a theoretical result and to solve problems with an applicative nature.

Dateoffilling in: 01.09.2025	**Responsible**	**TitleFirstnameLastname**	**Signature**
	Course	Prof.dr. Ioan Rasa	
	Applications	Prof.dr. Ioan Rasa	

Date of approval in the department 17.09.2025	Head of department, Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council 19.09.2025	Dean, Prof.dr.eng. Vlad Mureșan