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	Bachelor of Science
1.6 Program of study / Qualification	Information Theory and Statistics / Masters
1.7 Form of education	Full time
1.8 Subject code	9.00

2.   Data about the subject

2.1 Subject name	*Information Theory and Statistics*				
2.2 Subject area	Mathematics				
2.2 Course responsible / lecturer	Prof. dr. Rașa Ioan - Ioan.Rasa@math.utcluj.ro				
2.3 Teachers in charge of seminars	Prof. dr. Rașa Ioan - Ioan.Rasa@math.utcluj.ro				
2.4 Year of study	I	2.5 Semester	2	2.6 Assessment	Exam
2.7 Subject category	Formative category: DA – advanced, DS – speciality, DC – complementary				DS
	Optionality: DI – imposed, DO – optional (alternative), DF – optional (free choice)				DI

3.   Estimated total time

3.1 Number of hours per week	2	of which:	Course	1	Seminar	1	Laborator	-	Proiect	-
3.4 Total hours in the curriculum	28	of which:	Course	14	Seminar	14	Laborator	-	Proiect	-
3.7 Individual study:										
(a) Manual, lecture material and notes, bibliography										20
(b) Supplementary study in the library, online and in the field										20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										15
(d) Tutoring										14
(e) Exams and tests										3
(f) Other activities										-

3.8 Total hours of individual study (summ (3.7(a)…3.7(f)))	72
3.9 Total hours per semester (3.4+3.8)	100
3.10 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	computers, specific software

6. Specific competences

6.1 Professional competences	**C1** - Operation with mathematical methods and models, techniques and advanced specific engineering and IT technologies
	• **C1.1** - Knowledge and demonstration of advanced theoretical and practical concepts and principles in the field of software systems
	• **C1.2** - The use of specific theories and tools (algorithms, schemes, models, tools, etc.) to explain the structure and mode of operation of the latest software technologies, environments and program systems reported in the specialized scientific literature
	• **C1.3** - The use of specific models and methods for the identification of viable software components and solutions under conditions of partial specification
	• **C1.4** - Formal and comparative evaluation of the characteristics of software development methods, techniques and models, as well as complex software systems.
	• **C1.5** - Theoretical foundation of the characteristics of complex software systems, based on modern theoretical and practical trends used in all stages of the software development cycle (specification, analysis, design, implementation, testing and integration, validation).
	C2 - Development of advanced techniques, methods and methodologies in the field of software design, environments and program systems and their applications.
	• **C2.1** - Identifying and describing the structure and functioning of complex software systems and the applications developed based on them
	• **C2.2** - Exploitation of specialized knowledge in order to identify and understand the methodologies and techniques for making hardware and software components
	• **C2.3** - Building original software components of advanced program systems, using algorithms, techniques, design methods, methodologies, protocols, programming languages, data structures, technologies and complex programming environments, reported in specialized literature.
	• **C2.4** - The use of methods, criteria and metrics for evaluation and selection of software systems implementation methodologies, of their functional and non-functional characteristics
	• **C2.5** - The development of original software projects, their implementation, testing and validation based on the innovative combination of those reported in the specialized literature
6.2 Cross competences	N/A

7. Discipline objectives (as results from the *key competences gained*)

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

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Probability, entropy, information	2		
Discrete and continuous random variables	2		
Mean and variance	2		
Correlation and regression	2		
The method of least squares	2		
Statistical hypothesis testing	2		
Maximum likelihood method	2		
Bayesian estimation techniques	2		
Markov chains	2		
Limit distribution. Examples	2		
Shannon entropy	2		
Transmission of information	2		
Coding	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. S.T. Cover, J. Thomas, Elements of information theory 2nd ed-(Wiley, 2006)

8.2 Applications - Seminars / Laboratory / Project	Hours	Teaching methods	Notes
Probability, entropy, information	2		
Discrete random variables, Continuous random variables	2		
Correlation	2		
Markov chains	2		
Shannon entropy	2		
Transmission of information	2		
Coding	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
6. S.T. Cover, J. Thomas, Elements of information theory 2nd ed-(Willy, 2006)

9. 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.

10. 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% theory
Seminars / Laboratory / Project	Problem solving skills. Presence. Activity	Written exam	70% problems

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

Date of filling in: 26.02.2025	**Responsible**	**Title First name Last name**	**Signature**
	Course	Prof.dr. Ioan RAȘA	
	Applications	Prof.dr. Ioan RAȘA	

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