FISA DISCIPLINEI
Syllabus

1. Information about the study programme

1.1. Institution of higher education	West University of Timisoara
1.2. Faculty	PHYSICS
1.3. Department of	PHYSICS
1.4. Field of study	PHYSICS
1.5. Study cycle	MASTER
1.6. Study programme / qualification	Astrophysics, Elementary Particles and Computational Physics / according to COR: Analyst - 251201; Research assistant in physics - 211103; Physicist - 211101; Teacher - 233002;

2. Information about the subject/discipline

2.1. Name			Statistical methods for data analyzing in astrophysics				
2.2. Course coordinator			Paulescu Eugenia				
2.3. Seminar coordinator			Paulescu Eugenia				
2.4. Study year	2	2.5. Semester	3	2.6. type of assessment	**E**	2.7. type of discipline	

3. Total estimated time (hours of teaching per semester)

3.1. Number of hours per week	4	In which: 3.2 course	2	3.3. seminar/laboratory	2
3.4. Total hours in the curriculum	56	In which: 3.5 course	28	3.6. seminar/laboratory	28

Time distribution:	**hours**
Study based on lecture notes, bibliography or notes	56
Additional documentation in the library, specialized electronic platforms/ field	14
Training seminars / laboratories, homework, portfolios and essays	14
Tutoring	
Examinations	6
Other activities...	14

3.7. **Total hours of individual study**	104
3.8. **Total hours per semester**	160
3.9. **Number of credits**	5

4. Preconditions (where appropriate)

4.1. of curriculum	Mathematics
4.2. of skills	Elementary knowledge of R

5. Conditions (where appropiate)

5.3 for course	Individual access to computer
5.4 for seminar/lab	Individual access to computer

6. Specific skills gained

Professional competences	• The correct identification and usage of the main fundamental principles and results of broad fields of statistics applicable to astrophysics. • Solving problems from astrophysics research datasets using the R statistical software package • Students should be able to understand the statistics they encounter in research literature • Interdisciplinary approach of various physics topics
Transversal competences	• Programming in R statistical software

7. Course Objectives

7.1 Main Objective	To develop the basic skills needed to do statistical analysis of data.
7.2 Specific objectives	To acquire techniques and receipts for estimation, hypothesis testing and confidence set construction. To acquire knowledge of linear regression models

8. Table of content

8.1 Course	**Teaching methods**	**Observations**
1. Elements of Probability	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
2. Permutations and Combinations	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
3. Random Variables and Distributions	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
4. Properties of Distributions	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/

5. Probabitity Generating Functions.	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
6. Important Discrete Distributions	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
7. Important Continuous Distributions	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
8. Joint Distributions	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
9. Descriptive Statistics	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
10. Parameter Estimations	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
11. Hypothesis Testing	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
12. Regression	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
13. Analysis of Variance	Interactive lecture	Statistical Methods. Lecture notes http://www.physics.uvt.ro/ ~eugeniat/ metode_statistice/
14. Recapitulation of knowledge		
Seminar:		
1. Conditional Probability		
2. Bayes' Formula		
3. Variance and Standard Deviation		
4. Moments and Central Moments		
5. Moment Generating Functions		
6. The Poisson random Variables		
7. Distributions Arising from the Normal		
8. Covariance and Correlation		

9. The Central Limit Theorem
10. Confidence Intervals
11. Paired t-Test
12. Multiple Linear Regression
13. ANOVA
14. Checking knowledge
1. E. D. Feigelson, G.Jogesh Babu, Modern Statistical Methods for Astronomy With R Application, Cambridge University Press, 2012 . 2. D. C. Montgomery, G.C. Runger, Applied Statistics and Probability for Engineers, Ediţia a cincea, John Wiley and Sons, 2011. 3. K.F. Riley, M.P. Hobson, S.J. Bence, Mathematical Methods for Physics and Engineering, Third Edition, Cambridge 2006. 4. M.J. Crawley, Statistics: An Introduction Using R. 2nd Edition. John Wiley, New York, 2015. 5. Sheldon M. Ross, INTRODUCTION TO PROBABILITY AND STATISTICS FOR ENGINEERS AND SCIENTISTS, Fifth Edition, Elsevier. 2014 6. E. Paulescu, *Metode statistice*, Notite de curs si seminar. http://www.physics.uvt.ro/~eugeniat

9. Relation between subject content and the expectations of employers

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10. Evaluation

Activity type	10.1 Assesment criteria	10.2 Assesment method	10.3 Percent in final mark
Lecture	The evaluation has a continuous component that involves solving 10 homework problem sheets and a final component that consists of a written evaluation.	Written test with 10 questions/problems	**60%**
10.5. Seminar/labs	The mark 10 will be awarded to students who demonstrate the ability to apply and clearly explain all of the required material.	**Continuous assessment** 10 homework problem sheets	**40%**

10.6 Minimum performance standards
• The mark 5 will be obtained for showing a basic undersanding of the coure concepts.

Date of submission: 6.09.2023

Titular of the course and seminary
Signature: Eugenia Paulescu

Head of Department
Signature: Conf. dr. Catalin Marin