

SYLLABUS

Approved,
DEAN,
Prof. univ. dr. ing. Gilbert-Rainer GILLICH

1. Program Data

1.1. Institution of Higher Education	Babeş-Bolyai University
1.2. Faculty	Faculty of Engineering
1.3. Department	Department of Engineering Science
1.4. Field of Study	Electrical Engineering
1.5. Course of Study	License
1.6. Study Programme	Electromechanical

2. Date despre disciplină

2.1. Discipline Name	Probability theory and mathematical statistics						
2.2. Course Coordinator	Lect.dr.eng. Olga Ioana AMARIEI						
2.3.1. Seminary Coordinator	Lect.dr.eng. Olga Ioana AMARIEI						
2.3.2. Laboratory Coordinator	-						
2.3.3. Project Coordinator	-						
2.4. Year of Study	II	2.5. Semester	3	2.6. Evaluation Time	C	2.7. Discipline Regime	Opt.

3. Timpul total estimat (ore pe semestru al activităților didactice)

3.1. Number of Hours per Week	3	from which: 3.2. Course	2	3.3. seminar	1
3.4. Total Hours from the Curriculum Plan	42	from which: 3.5. Course	28	3.6. seminar	14
Time Fund Distribution - hours					58
Study of Handbook, Course Materials, Bibliography & Notes					24
Additional Documentation in Library, on Special E-learning Platforms & in the Field					16
Preparation of seminars/laboratories/ projects, topics, reports, portfolios & essays					14
Mentoring					0
Examination					2
Other Activities					
3.7. Total Time of Individual Study	58				
3.8. Total Hours per Semester	100				
3.9. Number of Credits	3				

4. Pre-condition (where is the case)

4.1. of Curriculum	• Mathematics
4.2. of Competences	• Minimum working knowledge of Excel

5. Conditions (where is the case)

5.1. of Course Progress	• PC, projector / Online platform
5.2.1. of Seminary Progress	• PC, projector, blackboard, chalk. Knowledge of the concepts taught in the course
5.2.2. of Laboratory Progress	• -
5.2.3. of Project Progress	• -

6. Specific competences acquired

Professional Competences	<ul style="list-style-type: none"> Application and appropriateness of specialist knowledge of mathematics, physics, computer science specific to electrical engineering. (CP1) Operation of specialist concepts in computing and information technology (CP2)
Transversal Competences	<ul style="list-style-type: none"> Identify the objectives to be achieved, the resources available, the conditions for their completion, the stages of work, the associated deadlines and the associated risks. (CT1) Efficient use of information resources and assisted communication and training resources (Internet portals, specialised software applications, databases, on-line courses, etc.) both in Romanian and in an international language. (CT3)

7. Discipline Objectives (coming out from the Checklist of Acquired Specific Competences)

7.1. General Objective of Discipline	• providing electrical engineering specialists
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	<ul style="list-style-type: none"> • providing highly qualified specialists to contribute to the development of the region, capable of applying the results of scientific research
7.2. Specific Objectives	<ul style="list-style-type: none"> • basic training in engineering sciences in general and electrical engineering disciplines in particular; • involvement of students in research activity; • carrying out research activities in electrical engineering and other related fields.

8. Contents

8.1. Course	Teaching methods	Observations
Elements of probability theory. 1. Introduction. 1.1. Field of events 1.2. Concept of probability 2. Probability field. 2.1. Definition and properties. 2.2. Classical probability models 2.2.1. Poisson model 2.2.2. Bernoulli's model (the ball return model) 2.2.3. The non-return ball model (hypergeometric)	Lecture, graphics, dialogue, problem-solving	4 hours
3. Random variables. 3.1. Discrete random variables. 3.2. Operations with discrete random variables. 3.3. Continuous random variables. 3.4. The distribution function 3.4.1. The distribution function for discrete random variables 3.4.2. The distribution function for the continuous random variables	- // -	6 hours
4. Numerical characteristics of random variables 4.1. Grouping characteristics 4.1.1. Mean value 4.1.2. Median value 4.1.3. Quantile 4.1.4. Modal value 4.1.5. Moments and higher order means 4.2. Scattering characteristics 4.2.1. Linear mean deviation 4.2.2. Root mean square deviation 4.2.3. Dispersion 4.2.4. Centered moments (centered means). Covariance 4.2.5. Norm of a random variable 4.3. Shape characteristics.	- // -	4 hours
5. Probabilistic distributions 5.1. Classical discrete probabilistic distributions 5.1.1. Bernoulli (binomial) distribution 5.1.2. Poisson distribution 5.1.3. Binomial distribution with negative exponent 5.1.4. Hypergeometric distribution 5.1.5. Geometric distribution 5.2. Continuous classical probabilistic distributions 5.2.1. Uniform distribution 5.2.2. Normal distribution 5.2.3. Normalized normal distribution 5.2.4. Lognormal distribution 5.2.5. Gamma distribution 5.2.6. Beta distribution. Particular cases 5.2.7. Weibull distribution 5.2.8. Hi-square distribution. Particular cases 5.2.9. Student t distribution 5.2.10. Fischer distribution	- // -	6 hours

Mathematical statistics		
6. Introduction to statistics 6.1. Focus of statistics 6.2. Forms of convergence in probability 6.3. Chebeshev's inequality	- // -	2 hours
7. Estimation of statistical characteristics 7.1. Estimates 7.2 Confidence interval estimation. 7.3. Determination of confidence intervals	- // -	2 hours
8. Frequency as an estimate of probability. 8.1. Theoretical concepts 8.2. Confidence intervals. 8.3. Approximate determination of confidence intervals	- // -	2 hours
9. Estimation of the mean and dispersion of a random variable 9.1. Estimation of the mean 9.2. Estimation of dispersion 9.3. Confidence intervals for the mean 10. Hypothesis testing for distribution law parameters 10.1 Hypothesis testing problems	- // -	2 hours
Bibliography <ol style="list-style-type: none"> 1. Amariei Olga-Ioana, (2021), <i>Probability theory and mathematical statistics. Course notes</i> 2. Amariei Olga-Ioana, (2020), <i>Statistical data processing. Course notes</i> 3. Anghelache C., Anghel M.G., (2016), <i>Basics of economic statistics. Theoretical concepts and case studies, Editura Economică, Bucharest.</i> 4. Badea G.S., Topliceanu V. (2017), <i>Statistics for Economists, Ed. Pro Universitaria, Bucharest.</i> 5. Bucea-Manea-Țoniș R., Bucea-Manea-Țoniș R., Epure M.(2010), <i>SPSS and Excel in the analysis of statistical data in the economic, social and technical fields, Ed. AGIR, Bucharest</i> 6. Caragea N., Alexandru C. (2018), <i>Statistics. Concepts, techniques and softwaRe tools, Ed. Pro Universitaria, Bucharest</i> 7. Gillich G-R. (2003), <i>Machine dynamics. Modeling technical systems, AGIR Publishing House, Bucharest, Romania</i> 8. Lung R.I. (2007), <i>Elements of probability theory</i> 9. Mihoc, C. Fătu (2003), <i>Probability Calculus and Mathematical Statistics, Transilvania Press, Cluj-Napoca</i> 10. Popp C-tin., Gillich N., Praisach V.I. (1998), <i>Elements of probability theory and mathematical statistics, "Eftimie Murgu" Publishing House, Resita</i> 		
8.2.1. Seminar	Teaching methods	Observations
1. Events. Probabilities. Poisson model. Bernoulli's model with two and more states. Applications.	Explanation, conversation, questioning	2 hours
2. Operations with independent random variables.	- // -	4 hours
3. Applications with random variables. Calculation of mean, median and modal values. Calculation of moments and means of order 1, 2 and 3. Calculation of linear mean deviation, standard deviation and variance.	- // -	2 hours
4. Classical discrete probabilistic distributions. Poisson distribution calculus. Binomial distribution calculation using MS-Excel.	- // -	2 hours
5. Classical continuous probabilistic distributions. Normal distribution. Use of Excel functions - STANDARDIZE, NORMSDIST.	- // -	2 hours
6. Estimation of the mean and dispersion of a random variable. Applications	- // -	2 hours
Bibliography: <ol style="list-style-type: none"> 1. Amariei Olga-Ioana, (2021), <i>Probability theory and mathematical statistics. Seminar notes.</i> 2. Anghelache C., Niculescu E., (2000), <i>Statistical brief. Indicators and calculation formulas, Ed. Economică, Bucharest.</i> 3. Anghelache C., Anghel M.G., (2016), <i>Basics of economic statistics. Theoretical concepts and case studies, Editura Economică, Bucharest.</i> 4. Bucea-Manea-Țoniș R., Bucea-Manea-Țoniș R., Epure M.(2010), <i>SPSS and Excel in the analysis of statistical data in the economic, social and technical fields, Ed. AGIR, Bucharest</i> 5. Caragea N., Alexandru C. (2018),), <i>Statistics. Concepts, techniques and softwaRe tools, Ed. Pro Universitaria, Bucharest</i> 6. Gillich, N., (2000), <i>Statistics, Laboratory Guide, Ed. Eftimie Murgu Reșița.</i> 7. Gillich, N., Praisach V.I., (2000), <i>Probabilities and reliability. Problem collection. Ed. Eftimie Murgu Reșița.</i> 8. Popescu A., Bucea-Manea-Țoniș R., Barbu M.I., Bucea-Manea-Țoniș R. (2009), <i>Statistics for economists. Data Analysis in Excel and SPSS, Ed. AGIR, Bucharest</i> 9. Sora V., Mihăescu C., Colibabă D., Grădinaru G., Danciu A. (2003), <i>Statistical-demographic analysis. Theory and applications, Economica Publishing House, Bucharest</i> 		
8.2.2. Laboratory	Teaching methods	Observations

This is not the case		
8.2.3. Project	Teaching methods	Observations
This is not the case		

9. Corroborating Discipline's Contents with the Expectation of the Epistemic Community Representatives, the Professional Associations and the Employers' Representatives from the Programme Corresponding Field

- The contents of the subject were agreed with the main employers in discussions prior to the study programme.

10. Evaluation

Type of activity	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Weight from the final grade
10.4. Course	Debates participation (recognition of previous year's activity)	Number of interventions	10 %
	Level of knowledge acquired	Colloquium (written)	60 %
10.5.1. Seminar	Involvement in activities (recognition of previous year's activity)	Number of interventions	10 %
	Level of skills acquired (recognition of previous year's work)	Homework	20 %
10.5.2. Laboratory			
10.5.3. Project			
10.6. Minimum performance standard			
• Completion of at least 50% of homework.			

Date of completion

Course Coordinator's Signature

Seminar Coordinator's Signature

Lect.dr.eng. Olga-Ioana Amariei

Lect.dr.eng. Olga-Ioana Amariei

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Department Endorsement Date

Chief of Department Signature

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