Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and Statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	Applied Mathematics – Probabilities Theory								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	6

2.8. Leaders	C(C)	**prof.univ.dr. IFTIMIE Bogdan**	iftimieb@csie.ase.ro
	S(S)	**prof.univ.dr. IFTIMIE Bogdan**	iftimieb@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		S(S)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		S(S)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, labs, assignments, portfolios and essays	15.00
Tutorials	7.00
Examinations	2.00
Other activities	40.00

4. Prerequisites

4.1. of curriculum	● Probability theory and Mathematical Statistics
4.2. of competences	● Statistical software: Excel, R

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of investment projects in various fields
7.2. Specific objectives	• Identificarea, descrierea și utilizarea diferitelor modele probabiliste • Exemplificarea aplicării modelelor teoretice cu ajutorul pachetelor software specializate

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introductory oh Probability Theory: Events, field of probability, elementary probability: total probability formula, Bayes' formula	Lectures are held at the whiteboard/based on multimedia presentations in permanent interaction with students.	
2	Classical scheemes of probability: schema bilei revenite	Idem	
3	Random variables. Discrete random variables. Binomial and Poisson distributions.	Idem	
4	Continuous distributions. The Gaussian distribution.	Idem	
5	Momentele variabilelor aleatoare	Idem	
6	Central Limit type Theorems	Idem	
7	Bidimensional random vectors of discrete type	Idem	
8	Bidimensional random vectors of continuous type	Idem	
9	Markov Chains. Introduction. Examples in different domains of science	Idem	
10	Discrete states Markov chains in discrete time	Idem	
11	The stationary distribution. Applications.	Idem	
12	Discrete states Markov chains in continuous time	Idem	
13	The Poisson counting process	Idem	
14	Summary	Idem	

Bibliography:

1. Sheldon Ross, A first course in Probability, Fifth Edition, 1997, Editura Prentice Hall
2. S.Dedu, F.Serban, *Matematici aplicate in economie. Culegere de probleme*, Ed. Tipogrup Press, 2005.
3. **M. M. Rao, J. R. Swift,** *Probability Theory with Applications*, Oxford Science Publications, 1993.
4. **Ross,** *Introduction to Probability Models*, 8th Edition, Academic Press, 2003.
5. **M. Tudor, M. Sibiceanu, I. Mircea,** *Probabilitati, Statistica si Aplicatii*, Editura ASE, 2009.

8.2. S(S)		Teaching/Work methods	Recommendations for students
1	Applications of theoretical notions studied at lecture 1	At the whiteboard and using R software	
2	Applications of theoretical notions studied at lecture 2	At the whiteboard and using R software	
3	Applications of theoretical notions studied at lecture 3	At the whiteboard and using R software	
4	Applications of theoretical notions studied at lecture 4	At the whiteboard and using R software	
5	Applications of theoretical notions studied at lecture 5	At the whiteboard and using R software	
6	Applications of theoretical notions studied at lecture 6	At the whiteboard and using R software	
7	Applications of theoretical notions studied at lecture 7	At the whiteboard and using R software	
8	Applications of theoretical notions studied at lecture 8	At the whiteboard and using R software	
9	Applications of theoretical notions studied at lecture 9	At the whiteboard and using R software	
10	Applications of theoretical notions studied at lecture 10	At the whiteboard and using R software	
11	Applications of theoretical notions studied at lecture 11	At the whiteboard and using R software	
12	Applications of theoretical notions studied at lecture 12	At the whiteboard and using R software	

13	Applications of theoretical notions studied at lecture 13	At the whiteboard and using R software	
14	Summary	At the whiteboard and using R software	

Bibliography

1. S.Dedu, F.Serban, *Matematici aplicate in economie. Culegere de probleme*, Ed. Tipogrup Press, 2005.
2. **M. M. Rao, J. R. Swift,** *Probability Theory with Applications*, Oxford Science Publications, 1993.
3. **Ross,** *Introduction to Probability Models*, 8th Edition, Academic Press, 2003.

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge applied in practical applications

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Teste	10.00
10.2. S(S)	Activity during lectures and seminars	Oral/Written	20.00
10.3. Final assessment	Written exam		70.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	In order to pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
01.02.2023

Signature of the discipline leaders,
Prof.univ.dr. Bogdan IFTIMIE

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Economic Informatics and Cybernetics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	**Data Science with Python**								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)	**prof.univ.dr. DÂRDALĂ Adriana Elena**	adriana.dardala@ie.ase.ro
	L/P(L/P)	**prof.univ.dr. DÂRDALĂ Adriana Elena**	adriana.dardala@ie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	1.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	42.00	of which	
		C(C)	14.00
		L/P(L/P)	28.00

3.4. Total hours of study per semester (ECTS*25)	150.00
3.5. Total hours of individual study	108.00
Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, labs, assignments, portfolios and essays	15.00
Tutorials	7.00
Examinations	2.00
Other activities	29.00

4. Prerequisites

4.1. of curriculum	
4.2. of competences	

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software development tools

6. Acquired specific competences

PREFESSIONAL	C3	Data collection, data filtering, data analysis and processing
PREFESSIONAL	C4	Advanced computer programming skills for data analysis and visualizations with Python

7. Objectives of the discipline

7.1. General objective	Providing software tools for data analysis and processing applied in socio-economical field.
7.2. Specific objectives	- Creating procedures and programs for data analysing and visualising, extraction of new knowledge from data. - Use of specialized software packages for data analysis and processing. - Developing

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Overview of the Python language: general syntax, data types and structures, control structures, collections, functions	Lecture based on multimedia presentations, demo, and interaction with students.	
2	Handling data files and tabular data: aggregation, applying basic statistical functions, pivot tables	Idem	
3	Common Python modules and packages for data analysis and processing	Idem	
4	Using pre-existing machine learning models in Python	Idem	
5	Data visualisation with Python	Idem	
6	Libraries for geospatial analysis	Idem	
7	Web scrapping with Python	Idem	

Bibliography

- Jake VanderPlas, Python Data Science Handbook. Essential Tools for Working with Data, 2023, O'Reilly Media, U.S.A., ISBN 978-1491912058
- Kennedy R. Behrman, Foundational Python for Data Science, 2022, Pearson, ISBN 978-0136624356
- Kyran Dale, Data Visualization on the Web with Python and JavaScript. Scrape, Clean & Transform Your Data, 2023, O'Reilly Media, U.S.A., ISBN 978-1491920510
- Wade Briggs, Data science with Python. Beginner's Guide to Python for Data Science That's Easy to Follow, 2022, Notion Press, ISBN 979-8888159958.

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Selecting and working with integrated development environment for Python. Conceiving simple programs using the Python language.	Applications in Python and case studies	
2	Creating programs using the Python standard library	Idem	
3	Using the NumPy library for data analysis.	Idem	
4	SciPy library for statistics	Idem	
5	Using the Pandas library for files manipulation	Idem	
6	Using the Pandas library for data processing	Idem	
7	Using PyCaret library to manage pre-existing machine learning models	Idem	
8	Using SciKit-Learn library to manage machine learning models	Idem	
9	Data visualisation with Matplotlib	Idem	
10	Using Seaborn for statistical graphics	Idem	
11	Geopandas library for geospatial analysis	Idem	
12	Web scrapping with Python	Idem	
13	Using Beautiful Soup library for web scrapping with Python	Idem	
14	Project Presentation	Project Presentation	

Bibliography

- Bonny P. McClain, Python for Geospatial Data Analysis. Theory, Tools, and Practice for Location Intelligence, 2022, O'Reilly Media, U.S.A., ISBN 978-1098104795
- Susan E. McGregor, Practical Python Data Wrangling and Data Quality. Getting Started with Reading, Cleaning, and Analyzing Data, 2022, O'Reilly Media, U.S.A., ISBN 978-1-492-09150-9

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Active participation at course and seminars and involvement in discussing issues	Assessing theoretical and practical skills using quizzes, homework, project.	10.00
10.2. L/P(L/P)	Project evaluation	Project presentation	40.00
10.3. Final assessment	Assessing theoretical and practical skills	Written paper based or computer-based assessment	50.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. To pass the subject the student must achieve at least grade 5 at the written exam		

Date of listing,

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	**Data Mining Principles**								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**5**

2.8. Leaders	C(C)	**lect.univ.dr. OȚOIU Adrian**	**adrian.otoiu@csie.ase.ro**
	L/P(L/P)	**lect.univ.dr. OȚOIU Adrian**	**adrian.otoiu@csie.ase.ro**

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	2.00
		L/P(L/P)	1.00
3.3. Total hours from curriculum	42.00	of which	
		C(C)	28.00
		L/P(L/P)	14.00

3.4. Total hours of study per semester (ECTS*25)	125
3.5. Total hours of individual study	83.00
Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, labs, assignments, portfolios and essays	15.00
Tutorials	7.00
Examinations	2.00
Other activities	6.00

4. Prerequisites

4.1. of curriculum	Statistics
4.2. of competences	Statistical software statistic: Data Analysis (Excel), R

5. Conditions

for the C(C)	The classes take place in rooms with internet access and multimedia equipment.
for the L/P(L/P)	The classes take place in rooms with internet access and computers with the required software: Excel, R

6. Acquired specific competences

PROFESSIONAL	C1	Optimising resources for the development and exploitation of official statistics
PREFESSIONAL	C2	Application of statistical software in data collection, use and dissemination
PREFESSIONAL	C3	Knowledge of advanced econometric research and modelling methods and techniques

7. Objectives of the discipline

7.1. General objective	Understanding the teoretical concepts regarding Data Mining techniques and the way these techniques can be applied in addressing the real-world problems.
7.2. Specific objectives	Define Data Mining and show how data mining can be used to solve problems; Describe the KDD process; Describe data mining as a step of the KDD process; Associate to a real-world problem one or a combination of Data Mining tasks Examine several data mining techniques and show how each technique builds a generalized model to represent data; Show how a confusion matrix is used to help evaluate supervised learner models; Apply lift measure to compare the performance of several competing supervised learner models; Examine how feed-forward neural networks learn through backpropagation; Show how Bayes classifier can be used to build supervised learner models; Describe how clustering algorithms are used to partition data instances into disjoint clusters; Describe how and when bagging, boosting, and stacking can be used to improve performance of supervised models. Describe random forest and boosting models.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Theme 1: Introduction to Data Mining - Data Flood - Data Mining Application Examples - Data Mining & Knowledge Discovery - Data Mining Tasks: Clustering, Classification, Estimation, Market Basket Analysis - Data Mining Strategies: Description vs. Prediction - Data Mining Techniques - Evaluation of DM Models	Lecture based on PowerPoint presentations and interaction with students.	
2	Theme 2: Introduction to Data Mining - Data Mining Strategies: Description vs. Prediction - Data Mining Techniques - Evaluation of DM Models	Idem	
3	Theme 3: Data Mining Techniques - Decision Trees	Idem	
4	Theme 4: Data Mining Techniques - Association Rules - K-Means Algorithm - Choosing a Data Mining Technique	Idem	
5	Theme 5: Formal Evaluation Techniques I - What Should Be Evaluated? - Tools for Evaluation - Computing Test Set Confidence Intervals	Idem	
6	Theme 6: Formal Evaluation Techniques II - Comparing Supervised Learner Models - Attribute Evaluation - Unsupervised Learning Evaluation Techniques - Evaluating Supervised Models with Numeric Output	Idem	
7	Theme 7: Advanced Data Mining Techniques - Feed-Forward Neural Networks	Idem	

	- Neural Network Explanation - Backpropagation Algorithm: An Example		
8	Theme 8: Advanced Data Mining Techniques - Bayes Classifier - Regression trees	Idem	
9	Theme 9: Invited speaker or Predictive analytics topics	Idem	
10	Theme 10: Advanced Data Mining Techniques - Clustering Algorithms: Agglomerative Clustering, Conceptual Clustering - Expectation-Maximization Algorithm - Machine Learning vs. Statistical Techniques - Improving performance: bagging, boosting, instance typicality	Idem	
11	Theme 11: Ensemble modeling I - Principles of ensemble modeling - Bagging models - Random forests	Idem	
12	Theme 12: Ensemble modeling II • Key modelling concepts • Boosting models: ADAboost, Gradient boosting, description of XGBoost	Idem	
13	Theme 13: Review • Overview of data mining and predictive techniques • Discussions/consultations regarding projects	Idem	
14	Examination	Idem	

Bibliography

- Roiger R.J., Geatz W.M., Data Mining: a tutorial-based primer, Addison-Wesley, 2003, United States of America
- Costea A., Computational Intelligence Methods for Quantitative Data Mining (chapters 3 and 5), Painosalama Oy, 2005, Finland
- Han J., Kamber M., Data Mining: Concepts and Techniques (2nd edition), Morgan Kaufmann Publishers, 2006, United States of America
- Inmon W.H., Building the Data Warehouse (4th edition), Wiley Publishing, Inc., 2005, United States of America
- Durham M., Data Mining: Introductory and Advanced Topics, Prentice Hall, 2002, United States of America
- Witten I.H., Eibe F., Hall M.A., Data Mining: Practical Machine Learning Tools and Techniques (Third Edition), Morgan Kaufmann, 2011, United States of America
- Kuhn M and Johnson K (2013) Applied Predictive Modeling, Springer, NY
- James, R. G., Witten, D., Hastie, T., & Tibshirani. An Introduction to Statistical Learning: with Applications in Springer, (2013)
- https://cran.r-project.org/

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Introduction to R. Commands and useful features	Classic and/or R applications	
2	Decision trees	Classic and/or R applications	
3	Association rules generating algorithms. The K-Means algorithm	Classic and/or R applications	
4	Neural network training algorithms.	Classic and/or R applications	
5	Naïve Bayes & project requirements (presentation and consultations)	Classic and/or R applications	
6	Random forest models & Boosting models	Classic and/or R applications	
7	Project presentations	Project Presentation, R use optional	

Bibliography

- Roiger R.J., Geatz W.M., Data Mining: a tutorial-based primer, Addison-Wesley, 2003, United States of America
- Costea A., Computational Intelligence Methods for Quantitative Data Mining (chapters 3 and 5), Painosalama Oy, 2005, Finland
- Han J., Kamber M., Data Mining: Concepts and Techniques (2nd edition), Morgan Kaufmann Publishers, 2006, United States of America
- Inmon W.H., Building the Data Warehouse (4th edition), Wiley Publishing, Inc., 2005, United States of America
- Durham M., Data Mining: Introductory and Advanced Topics, Prentice Hall, 2002, United States of America
- Witten I.H., Eibe F., Hall M.A., Data Mining: Practical Machine Learning Tools and Techniques (Third Edition), Morgan Kaufmann, 2011, United States of America
- Kuhn M., Johnson K. Applied Predictive Modeling, 2013, Springer, NY
- James, R, Witten, D, Hastie, T, Tibshirani, R. An Introduction to Statistical Learning with Applications in R, 2013, Springer
- https://cran.r-project.org/

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

Discussion of the content of the discipline and the requirements of the Project with representatives of the local business community.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course attendance and interventions	10.00
10.2. L/P(L/P)	Data mining project done during the semester	Presentation	30.00
10.3. Final assessment	Written exam	Written exam	60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. The project can be done alone or in groups of up to 3 masters students.		

Date of listing,
01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	Data Science approach to Asset Pricing								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**7**

2.8. Leaders	C(C)	Dr Gurjeet Dhesi	Dhesig74@gmail.com
	C(C)		
	L/P(L/P)		
	L/P(L/P)		

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	40.00		
Additional documentation in the library, on specialized online platforms and in the field	15.00		
Preparation of seminars, labs, assignments, portfolios and essays	15.00		
Tutorials	7.00		
Examinations	2.00		
Other activities	40.00		

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Probability theory and Mathematical Statistics
4.2. of competences	● Statistical software: Excel

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: SPSS, SAS, R, Tableau etc

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in financial data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures of statistical time series researches with modelling in finance

7. Objectives of the discipline

7.1. General objective	This module focuses on the use of modern econometric methodology for dealing with problems in the area of finance and provides students with the econometric tools applied in the area. It applies the techniques of mathematics, statistics and econometrics to analyse financial data so as to understand and model the underlying financial and/or economic conditions. In achieving the above, use of specialist software packages is employed. Empirical applications are considered in the stock, bond and exchange rate markets.
7.2. Specific objectives	The module aims to develop knowledge and understanding of the theories and tools used in financial econometric, so as to choose and apply the appropriate tools and techniques to carry out empirical analysis of financial markets efficiency, models of equity return, financial time-series data, asset pricing, volatility and risk measurement. The module also aims to develop the ability to reach conclusions in the domain of finance and financial economics problems by following appropriate analytic procedures.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1		Lecture based on multimedia presentations and interaction with students.	
2	Descriptive Statistics and Statistical Inference.	Idem	
3	Simple regression: application for capital asset pricing model (CAPM) and single index model. Multiple Regression, including Diagnostics.	Idem	
4	Time series approach: Autocorrelation and partial autocorrelation function. Stationarity and nonstationarity in mean. Application in testing Efficient Market Hypothesis.	Idem	
5	Time series approach: introduction to ARIMA models	Idem	
6	Random walk models: Brownian Motion, application in testing Efficient Market Hypothesis. Cointegration.	Idem	
7	Modelling asset prices as a stochastic process. Variations on the Brownian Motion: modelling fat tails	Idem	
8	Modelling volatitliy: ARCH&GARCH models : modelling volatility clustering in financial time series data	Idem	
9			

Bibliography

- Koop,G.(2006) Analysis of Financial Data, Wiley, 2006
- Carol, A. (2008) *Market Risk Analysis: Practical Financial Econometrics v. 2*, The Wiley Finance 2008

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	1. Case studies: What is Asset Pricing, The many steps involved, and how to get there	Applications and Case Studies in specialized statistical software: EXCEL	
2	2. Case study: Descriptive Statistics and Statistical Inference.	Applications and Case Studies in specialized statistical software: EXCEL	
3	3. Case study: Simple regression: application for capital asset pricing model (CAPM) and single index model.	Applications and Case Studies in specialized statistical software: EXCEL	
4	4. Case study: Time series approach: Autocorrelation and partial autocorrelation function. Stationarity and nonstationarity in mean. Application in testing Efficient Market Hypothesis.	Applications and Case Studies in specialized statistical software: EXCEL	
5	5. Case study: Time series approach: introduction to ARIMA models	Applications and Case Studies in specialized statistical software: EXCEL	
6	6. Case study: Random walk models: Brownian Motion, application in testing Efficient Market Hypothesis	Applications and Case Studies in specialized statistical software: EXCEL	
7	7. Case study: Modelling asset prices as a stochastic process. Variations on the Brownian Motion: modelling fat tails	Applications and Case Studies in specialized statistical software: EXCEL	
8	8. Case studies: Modelling volatitliy: ARCH&GARCH models : modelling volatility clustering in financial time series data	Applications and Case Studies in specialized statistical software: EXCEL	
9			

Bibliography

- Koop,G.(2006) Analysis of Financial Data, Wiley, 2006
- Carol, A. (2008) *Market Risk Analysis: Practical Financial Econometrics v. 2*, The Wiley Finance 2008

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Teste	10.00
10.2. L/P(L/P)	PROJECT	Software application to time series data and written report	30.00
10.3. Final assessment	Written exam		60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
02/206/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	**Survey and Measurement Methodology**								
2.2. Code	**22.0291IF1.1-0003**								
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**A**	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)	**conf.univ.dr. SACALA Mihail-Dumitru**	mihai.sacala@csie.ase.ro
	L/P(L/P)	**conf.univ.dr. SACALA Mihail-Dumitru**	mihai.sacala@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	40.00		
Additional documentation in the library, on specialized online platforms and in the field	15.00		
Preparation of seminars, labs, assignments, portfolios and essays	15.00		
Tutorials	7.00		
Examinations	2.00		
Other activities	40.00		

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Nonparametric Statistics ● Probability theory and Mathematical Statistics
4.2. of competences	● Statistical software: Excel, R, SAS, SPSS

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: SPSS, SAS, R, Tableau etc

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of surveys in various fields
7.2. Specific objectives	• Identifying, describing and using different data analysis techniques • Exemplifying the application of theoretical models with the help of specialized software packages.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Theme 1:Introduction and Errors in Surveys - An Introduction to Survey Methodology" - Inference and Error in Surveys	Lecture based on multimedia presentations and interaction with students.	
2	Theme 2: Basic Sampling Concepts - Fundamentals of Applied Sampling	Idem	
3	Theme 3: Basic Sampling Concepts - Deciding How Many Will Be In the Sample	Idem	
4	Theme 4: Modes and Methods of Data Collection - Methods of Data Collection	Idem	
5	Theme 5: Modes and Methods of Data Collection - Methods of Data Collection	Idem	
6	Theme 6: Measurement, Instruments, and Response Issues - Questions and Answers in Surveys - Question and Questionnaire Design	Idem	
7	Theme 7: Measurement, Instruments, and Response Issues - Measurement Models for Survey Research - Designing Effective Web Surveys.	Idem	
8	Theme 8: Evaluating and Testing Survey Questions - Evaluating Survey Questions	Idem	
9	Theme 9: Nonresponse/Nonparticipation - Nonresponse in Sample Surveys	Idem	
10	Theme 10: Interviewers and Interviewing. - Survey Interviewing	Idem	
11	Theme 11: Post-Survey Processing, Estimation, and Documentation	Idem	

	- Postcollection Processing of Survey Data		
12	Theme 12: Post-Survey Processing, Estimation, and Documentation - Postcollection Processing of Survey Data	Idem	
13	Theme 13: Confidentiality, Privacy, and Standards of Practice/ - Principles and Practices Related to Scientific Integrity • Graphical representation patterns for text analysis	Idem	
14	Theme 14: Summary	Idem	

Bibliography

- Niculescu-Aron Ileana Gabriela, Sondaje si Anchete, Ed. ASE 2011
- Groves, Robert M., Floyd J. Fowler, Mick Couper, James M. Lepkowski, Eleanor Singer, and Roger Tourangeau. 2009. Survey Methodology, Second Edition. Hoboken, New Jersey: Wiley

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Theme 1:Introduction and Errors in Surveys - An Introduction to Survey Methodology" - Inference and Error in Surveys	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
2	Theme 2: Basic Sampling Concepts - Fundamentals of Applied Sampling	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
3	Theme 3: Basic Sampling Concepts - Deciding How Many Will Be In the Sample	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
4	Theme 4: Modes and Methods of Data Collection - Methods of Data Collection	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
5	Theme 5: Modes and Methods of Data Collection - Methods of Data Collection	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
6	Theme 6: Measurement, Instruments, and Response Issues - Questions and Answers in Surveys - Question and Questionnaire Design	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
7	Theme 7: Measurement, Instruments, and Response Issues - Measurement Models for Survey Research - Designing Effective Web Surveys.	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	

8	Theme 8: Evaluating and Testing Survey Questions - Evaluating Survey Questions	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
9	Theme 9: Nonresponse/Nonparticipation - Nonresponse in Sample Surveys	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
10	Theme 10: Interviewers and Interviewing. - Survey Interviewing	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
11	Theme 11: Post-Survey Processing, Estimation, and Documentation - Postcollection Processing of Survey Data	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
12	Theme 12: Post-Survey Processing, Estimation, and Documentation - Postcollection Processing of Survey Data	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
13	Theme 13: Confidentiality, Privacy, and Standards of Practice/ - Principles and Practices Related to Scientific Integrity • Graphical representation patterns for text analysis	Applications and Case Studies in specialized statistical software: SPSS, EXCEL	
14	Project Presentation	Project Presentation, SPSS, EXCEL	

Bibliography

- Niculescu-Aron Ileana Gabriela, Sondaje si Anchete, Ed. ASE 2011
- Groves, Robert M., Floyd J. Fowler, Mick Couper, James M. Lepkowski, Eleanor Singer, and Roger Tourangeau. 2009. Survey Methodology, Second Edition. Hoboken, New Jersey: Wiley

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Test	20.00
10.2. L/P(L/P)	PROJECT	Written	30.00
10.3. Final assessment	Written exam		50.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. The project can be done alone or in groups of up to 4 masters students. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,

01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	Data Management for Data Science								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**End of course assessment**	2.6. Status of the discipline	A	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)	**Conf. Univ. Dr. BELCIU Anda** **Conf. Univ. Dr. CORBEA Alexandra Maria Ioana**	anda.belciu@ie.ase.ro alexandra.corbea@ie.ase.ro
	L/P(L/P)	**Conf. Univ. Dr. BELCIU Anda** **Conf. Univ. Dr. CORBEA Alexandra Maria Ioana**	anda.belciu@ie.ase.ro alexandra.corbea@ie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	100.00		
3.5. Total hours of individual study	44.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	15.00		
Additional documentation in the library, on specialized online platforms and in the field	10.00		
Preparation of seminars, labs, assignments, portfolios and essays	10.00		
Tutorials	2.00		
Examinations	2.00		
Other activities	5.00		

4. Prerequisites

4.1. of curriculum	Databases, Web Technologies, Programming
4.2. of competences	Use methods and techniques regarding advanced databases analysis, design and implementation.

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	• The seminars take place in rooms with internet access and the computers can connect to the Oracle Database server • The following products are installed: Oracle SQL Developer. • Requirements for re-examination: written exam on the computer.

6. Acquired specific competences

PREFESSIONAL		
PREFESSIONAL		

7. Objectives of the discipline

7.1. General objective	Students gain knowledge of modern technologies on advanced database systems for data science
7.2. Specific objectives	• Understanding and explaining the specific concepts of advanced database systems; • In-depth knowledge of advanced database systems (object-oriented, distributed, spatial, etc.), with applicability in extended DBMS, for the development of complex information systems; • Relevant application of the notions specific to extended relational database systems with new facilities and optimizations; • Studying new IT solutions with databases for the efficient use of computing resources at the organization level (Grid Computing) and at the interorganizational level (Cloud Computing).

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction to databases	Lecture based on multimedia presentations and interaction with students.	
2	Relational databases	Idem	
3	Other types of databases	Idem	
4	NoSQL Databases	Idem	
5	DBMS, fundamental concepts	Idem	
6	Functions, architecture and classifying DBMS	Idem	
7	Relational DBMS, characteristics, mechanisms, characterizing PL/SQL	Idem	
8	Advanced database systems	Idem	
9	The data block, transactions, properties of transactions	Idem	
10	OLTP and OLAP systems	Idem	
11	The relational model and the SQL standard	Idem	
12	SQL procedural extensions, fundamental control structures, advantages and disadvantages of using stored procedures, packages and triggers	Idem	
13	Summary	Idem	
14	Evaluation	Idem	

Bibliography

- C.J. Date , An introduction to database systems, Addison Wesley, 2004
- Database PL/SQL Language Reference, https://docs.oracle.com/en/database/oracle/oracle-database/19/lnpls/index.html
- SQL Language Reference, https://docs.oracle.com/en/database/oracle/oracle-database/19/sqlrf/
- A.Belciu, Introduction to Databases, ASE, Bucuresti, 2016, Romania
- R.Elmasri, S.Navathe, Fundamentals of database systems, 7th edition, Pearson, 2016, USA

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Introduction	Practical demonstrations, case studies	
2	Advanced SQL	Practical demonstrations, case studies	
3	Advanced SQL	Practical demonstrations, case studies	
4	Advanced SQL	Practical demonstrations, case studies	
5	Advanced SQL – project presentation	Project Presentation	
6	Oracle spatial	Practical demonstrations, case studies	
7	Oracle spatial	Practical demonstrations, case studies	
8	Oracle spatial	Practical demonstrations, case studies	
9	Oracle spatial – project presentation	Project Presentation	
10	Oracle APEX	Practical demonstrations, case studies	
11	Oracle APEX	Practical demonstrations, case studies	
12	Oracle APEX	Practical demonstrations, case studies	
13	Oracle APEX – project presentation	Project Presentation	
14	Late project presentations	Project Presentation	

Bibliography

- SQL Language Reference, https://docs.oracle.com/en/database/oracle/oracle-database/19/sqlrf/
- APEX Documentation, https://apex.oracle.com/en/learn/documentation/

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The content of the course is consistent with what is taught in other universities in the country and abroad. For a better adaptation to the labor market needs and requirements, will be held meetings with experts in the field of databases, representatives of Oracle Romania and other prestigious IT companies, but also with teachers of computer sciences/ databases from Romanian universities dedicated data centers.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	- the obtained grade; -activity during classes (about 5 attendances), responding to questions, ideas, suggestions etc	- the written exam on PC; -points for classes activity (+ or -)	50.00
10.2. S(S)	Defending the three projects	The average of the three project grades	50.00
10.3. Final assessment			
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	At least, the student should know: - The current trends regarding the integrated technologies into database systems - To make at least two of the projects using the studied products		

Date of listing,
02/15/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	**Machine Learning and Predictive Analytics**								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**2**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)	**Prof. univ. dr. STANCU STELIAN**	stelian.stancu@csie.ase.ro
	L/P(L/P)	**Prof. univ. dr. STANCU STELIAN**	stelian.stancu@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	1.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	42.00	of which	
		C(C)	14.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	150.00		
3.5. Total hours of individual study	119.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	40.00		
Additional documentation in the library, on specialized online platforms and in the field	15.00		
Preparation of seminars, labs, assignments, portfolios and essays	15.00		
Tutorials	7.00		
Examinations	2.00		
Other activities	40.00		

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Nonparametric Statistics ● Probability theory and Mathematical Statistics
4.2. of competences	● Statistical software: Excel, RStudio, Python

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: Excel, RStudio, Python etc

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of investment projects in various fields
7.2. Specific objectives	• Identifying, describing and using different data analysis and visualization techniques • Exemplifying the application of theoretical models with the help of specialized software packages.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introductive course - Introduction to ML - Types of ML: Supervised, Semisupervised, Unsupervised and Reinforcement Learning - Base models vs. ensemble models	Lecture based on multimedia presentations and interaction with students.	
2	Data Collection and Preprocessing in Machine Learning - Sources of data - Collecting the data - Preprocessing the data	Idem	
3	Performance metrics in Machine Learning - The confusion matrix - True-positive rate & True-negative rate - Accuracy, Precision and Recall - F Score - ROC Curve etc	Idem	
4	Supervised Learning Algorithms (I) - K Nearest Neighbors - Distances: Euclidean, Hamming, Minkowski - Mathematical approach - Naïve Bayes - prior and posterior probabilities - Bayes' Theorem - Mathematical concepts - Linear Regression	Idem	
5	Supervised Learning Algorithms (II) - Random Forest - Theory and mathematical concepts related to RF - Entropy in the context of RF - Suport Vector Machines (SVM) - Mathematical Approach	Idem	

	- Discussion upon hyperplanes and kernels - Decision Trees		
6	Unsupervised Learning Algorithms (I) - Cluster analysis - Hierarchical clustering	Idem	
7	Unsupervised Learning Algorithms (II) - K-means clustering - Determining the optimal number of clusters - the elbow method - average silhouette method - the gap statistics method	Idem	
8	Reinforcement Learning - Markov Decision Process (MDP) - Bellman Equations - Dynamic Programming	Idem	
9	Text analytics in ML - Introduction to text analytics - Natural Language Understanding (NLU) - Natural Language Processing (NLP) - Natural Language Generation (NLG)	Idem	
10	Deep Neural Networks in ML - Development of feed-forward neural networks - Development of recurrent neural networks - Implementing Boltzman Machine Deep Neural Networks (DNNs).	Idem	
11	Convolutional Neural Networks in ML - Foundations of CNN - Multi-class image classification problems using CNN	Idem	
12	Ensemble methods in ML - Bagging and boosting (I) - Introduction to ensemble learning, in a bagging-boosting context - Bootstrapping - - Selection of the best technique: bagging or boosting	Idem	
13	Ensemble methods in ML - Bagging and boosting (II) - Similarities and differences between bagging and boosting - Bagging used in classification and regression AdaBoost used in classification and regression	Idem	
14	Ensemble methods in ML – Stacking (III) - Building a stacking algorithm/model, by combining more basic models	Idem	

Bibliography

Stancu, S. (2021). Algoritmi de optimizare în mediul R : teorie și aplicații economice, Editura ASE, București.
Stancu, S. (2020) Machine learning, deep learning, deep neural network în mediul R: teorie și aplicații, Editura ASE, București.
Stancu, S. (2020) Data science în mediul R: teorie și aplicații, Editura ASE, București.
Stancu, S. (2022). Data mining în mediul R: teorie și aplicații, Editura ASE, București.
Stancu, S. (2022). Analiza datelor în mediul R: teorie și aplicații, Editura ASE, București.

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Discussion on different packages used for building ML algorithms - Training, test and validation subsets - Python/R practical applications	Applications and Case Studies in specialized software: Python/R	
2	Data Preprocessing in Machine Learning - Application using a real dataset in Python/R - Collecting the data - Importing libraries for data preprocessing - Finding missing data, correct framing of data types, outlier treatment	Applications and Case Studies in specialized software: Python/R	
3	Performance metrics in Machine Learning - Application on the metric evaluation of a model's performances, using Python/R	Applications and Case Studies in specialized software: Python/R	
4	Supervised Learning Algorithms (I) - Case study-based Python/R application	Applications and Case Studies in specialized software: Python/R	
5	Supervised Learning Algorithms (II) - Case study-based Python/R application	Applications and Case Studies in specialized software: Python/R	
6	Unsupervised Learning Algorithms (I) - Case study-based Python/R application	Applications and Case Studies in specialized software: Python/R	
7	Unsupervised Learning Algorithms (II) - Case study-based Python/R application	Applications and Case Studies in specialized software: Python/R	
8	Reinforcement Learning - Case study-based Python/R application	Applications and Case Studies in specialized software: Python/R	
9	Text analytics in ML - Case study: building a chatbot in Python for highlighting the concepts of NLU, NLP and NLG	Applications and Case Studies in specialized software: Python/R	
10	Deep Neural Networks in ML - Development of feed-forward and recurrent deep neural networks in Python/R - Introduction to *Keras* and *Tensorflow* (Python) and *neuralnet* and *nnet* (R)	Applications and Case Studies in specialized software: Python/R	
11	Convolutional Neural Networks in ML - Building a visual recognition task using *Keras* in Python	Applications and Case Studies in specialized software: Python/R	
12	Ensemble learning - Case studies - AdaBoost and Bagging application in regression using Python/R - AdaBoost and Bagging application in classification using Python/R - Random Forest regression and classification application using Python/R	Applications and Case Studies in specialized software: Python/R	
13	Ensemble learning - Case studies - Building a stacking model by combining four basic models in Python/R - Model stacking using Random Forest in Python/R	Applications and Case Studies in specialized software: Python/R	
14	Project Presentation	Project presentation in Python/R	

Bibliography

- Stancu, S. (2021). Algoritmi de optimizare în mediul R : teorie și aplicații economice, Editura ASE, București.
- Stancu, S. (2020) Machine learning, deep learning, deep neural network în mediul R: teorie și aplicații, Editura ASE, București.
- Stancu, S. (2020) Data science în mediul R: teorie și aplicații, Editura ASE, București.
Stancu, S. (2022). Data mining în mediul R: teorie și aplicații, Editura ASE, București.
Stancu, S. (2022). Analiza datelor în mediul R: teorie și aplicații, Editura ASE, București.

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Teste	10.00
10.2. L/P(L/P)	PROJECT	Written	30.00
10.3. Final assessment	Written exam		60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. The project can be done alone or in groups of up to 4 masters students. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	**TEXT MINING**								
2.2. Code	**XXX**								
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	5

2.8. Leaders	C(C)	**Valerio Ficcadenti**	Ficcadv2@lsbu.ac.uk
		TBD	

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	1.00	of which	
		C(C)	1.00
		L/P(L/P)	1.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	20.00
Additional documentation in the library, on specialized online platforms and in the field	7.50
Preparation of seminars, labs, assignments, portfolios and essays	7.50
Tutorials	3.5
Examinations	2.00
Other activities	20.00

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Programming logic
4.2. of competences	● Python and R

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: Python, R, Tableau etc

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical text mining
PREFESSIONAL	C4	Development of routine for organization and monitoring text mining applications in social economic field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis of corpora through quantitative methods
7.2. Specific objectives	To compare and contrast methods for sentence segmentation, tokenisation and part-of-speech tagging. To apply named entity recognition, entity linking and relation to extracting information from text, while leveraging corpora via lexical, semantic, and terminological resources. To learn the text distributional features distinguishing between word's frequencies and co-occurrences frequencies. To learn the most common text's evaluation measures, such as lexical richness.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction to the module and to text mining	Lecture based on multimedia presentations and interaction with students.	
2	Working with Strings	Idem	
3	Morphology	Idem	
4	Statistical Language Modelling	Idem	
5	Parts-of-Speech Tagging – Identifying Words	Idem	
6	Building Feature-Based Grammars	Idem	
7	Semantic Analysis	Idem	
8	Analysing Sentence Structure	Idem	
9	Learning to Classify Text	Idem	
10	Sentiment Scoring	Idem	
11	Hidden Structures: Clustering, String Distance, Text Vectors and Topic Modelling	Idem	
12	Mesoanalysis	Idem	

12	Topic modelling	Idem	
13	Common Text Mining Visualizations	Idem	
14	Coursework presentation	Idem	

Bibliography

- Thanaki, Jalaj. Python natural language processing. Packt Publishing Ltd, 2017.
- Lei, Lei. "Text Analysis with R for Students of Literature." (2016): 228-233.
- Bird, Steven, Ewan Klein, and Edward Loper. Natural language processing with Python: analyzing text with the natural language toolkit. " O'Reilly Media, Inc.", 2009.
- *Chopra, Deepti, Nisheeth Joshi, and Iti Mathur. Mastering natural language processing with python. Packt Publishing, 2016.*

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Applications review presentation		
2	How to handle strings with Py or R	Workshop	
3	Exercise on morphological measures	Workshop	
4	Statistical exercise with words distributions	Workshop	
5	POS tag exercise	Workshop	
6	Grammar exercise for the machine	Workshop	
7	Capture the semantic	Workshop	
8	Evaluate sentence structure exercise	Workshop	
9	Classifications of text exercise	Workshop	
10	Semantic analysis exercise	Workshop	
11	Clustering exercise	Workshop	
12	Calculate some text complexity measures	Workshop	
13	Topic modelling exercise	Workshop	
14	Project Presentation	Project Presentation, SA	

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of Activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at the course and seminars and involvement in discussing issues	Number of courses and seminar attendance and interventions Teste	10.00
10.2. L/P(L/P)	PROJECT	Written	60.00
10.3. Final assessment	Written exam		30.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation at the end of the module. The project can be done alone or in groups of up to 4 master's students. To pass the exam, the student must achieve at least grade 5 on the written exam		

Date of listing,
02/15/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Applied Mathematics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	**Soft Computing**								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**2**	2.5. Type of assessment	**V**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)	**prof.univ.dr. Agapie Alexandru**	alexandru.agapie@csie.ase.ro
	C(C)	**prof.univ.dr. Giuclea Marius**	marius.giuclea@csie.ase.ro
	L/P(L/P)	**prof.univ.dr. Agapie Alexandru**	alexandru.agapie@csie.ase.ro
	L/P(L/P)	**prof.univ.dr. Giuclea Marius**	marius.giuclea@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	2.00
		L/P(L/P)	1.00
3.3. Total hours from curriculum	42.00	of which	
		C(C)	28.00
		L/P(L/P)	14.00
3.4. Total hours of study per semester (ECTS*25)	150.00		
3.5. Total hours of individual study	90.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	30.00		
Additional documentation in the library, on specialized online platforms and in the field	10.00		
Preparation of seminars, labs, assignments, portfolios and essays	11.00		
Tutorials	6.00		
Examinations	1.00		
Other activities	32.00		

4. Prerequisites

4.1. of curriculum	● Basic Algebra ● Probability Theory and Mathematical Statistics
4.2. of competences	● Statistical software: Excel

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software.

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of investment projects in various fields
7.2. Specific objectives	• Identificarea, descrierea și utilizarea diferitelor tehnici de analiza a datelor și vizualizarea acestora • Exemplificarea aplicării modelelor teoretice cu ajutorul pachetelor software specializate.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction: Presenting the objectives and competences to be achieved during the course. Specifying the methods and tools to be used, as well as the requirements and the evaluation standards during the course and at the final evaluation. Rehearsing the basic probabilistic notions used in evolutionary algorithms.	Lecture based on multimedia presentations and interaction with students.	
2	Discrete and continuous random variables involved in evolutionary algorithms. Random number generators. Stochastic processes. Markov chains. Martingales.	Idem	
3	Evolutionary algorithms on finite space – genetic algorithms. Probabilistic operators: mutation, crossover, selection.	Idem	
4	Convergence theory of genetic algorithms.	Idem	
5	Applications of genetic algorithms.	Idem	
6	Evolutionary algorithms on continuous n-dimensional space – evolution strategies. Specific probabilistic notions used in the continuous case.	Idem	
7	Convergence theory of evolution strategies.	Idem	
8	Applications of evolutionary algorithms in optimization problems	Idem	
9	Fuzzy sets. Operations with fuzzy sets.	Idem	
10	Fuzzy logic and Approximate reasoning.	Idem	
11	Fuzzy systems.	Idem	
12	Fuzzy numbers and applications.	Idem	
13	Optimization of fuzzy systems with evolutionary algorithms.	Idem	

14	Final revision.	Idem	

Bibliography

- EVOLUTIONARY ALGORITHMS – MODELING AND CONVERGENCE, A. Agapie, Editura Academiei, Bucuresti, 2007.
- SPHERICAL DISTRIBUTIONS USED IN EVOLUTIONARY ALGORITHMS, A. Agapie, Mathematics, 11(1), 201, doi.org/10.3390/math11010201, 2023.
- THEORY OF (1+1) ES ON SPHERE REVISITED, A. Agapie, O. Solomon, L. Badin, IEEE Transactions on Evolutionary Computation IF 16.497, doi: 10.1109/TEVC.2022.3217524, 2022.
- THEORY OF (1+1) ES ON THE RIDGE, A. Agapie, O. Solomon, M. Giuclea, IEEE Transactions on Evolutionary Computation, 26(3), pp. 501-511, 2022.
- SPHERICAL DISTRIBUTIONS USED IN EVOLUTIONARY ALGORITHMS, A. Agapie, Mathematics, 9(23), 3098, doi.org/10.3390/math9233098, 2021.
- FUZZY SETS, UNCERTAINTY, AND INFORMATION, G. Klir, T. Folger, Prentice-Hall International Edition, 1998.
- METODE DE INTELIGENŢĂ COMPUTAŢIONALĂ CU APLICAŢII LA SISTEME DINAMICE, M. Giuclea, T. Sireteanu, G. Ghita, Editura Bren, 2008, ISBN 978-973-648-786-6.
- A MODEL OF MULTIPLE LINEAR REGRESSION, C. Popescu, M. Giuclea, Proceedings of the Romanian Academy, Series A, vol. 8, nr. 2, pg.137-144, 2007, ISSN 1454-9069.
- ON STATISTICAL PATTERN WITH FUZZY DATA, M. Giuclea, C. C. Popescu, Journal of Economic Computation and Economic Cybernetics Studies and Research, vol. 43, nr. 4, 2009, pg. 187-198, ISSN 1842–3264.
- ON CRITICAL PATH WITH FUZZY WEIGHTS, C. C. Popescu, M. Giuclea, Journal of Economic Computation and Economic Cybernetics Studies and Research, vol. 52, nr. 4, 2018, pg. 49-60, ISSN 1842–3264.

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Examples and applications of stochastic processes.	Seminar based on multimedia presentations and interaction with students.	
2	Genetic algorithms on finite space: case studies.	Idem	
3	Genetic algorithms on continuous space: case studies.	Idem	
4	Applications of genetic algorithms in optimization problems.	Idem	
5	Examples and problems related to fuzzy systems.	Idem	
6	Applications of fuzzy numbers in dynamic systems.	Idem	
7	Fuzzy modelling using evolutionary algorithms: case studies.	Idem	

Bibliography

- EVOLUTIONARY ALGORITHMS – MODELING AND CONVERGENCE, A. Agapie, Editura Academiei, Bucuresti, 2007.
- SPHERICAL DISTRIBUTIONS USED IN EVOLUTIONARY ALGORITHMS, A. Agapie, Mathematics, 11(1), 201, doi.org/10.3390/math11010201, 2023.
- THEORY OF (1+1) ES ON SPHERE REVISITED, A. Agapie, O. Solomon, L. Badin, IEEE Transactions on Evolutionary Computation IF 16.497, doi: 10.1109/TEVC.2022.3217524, 2022.
- THEORY OF (1+1) ES ON THE RIDGE, A. Agapie, O. Solomon, M. Giuclea, IEEE Transactions on Evolutionary Computation, 26(3), pp. 501-511, 2022.
- SPHERICAL DISTRIBUTIONS USED IN EVOLUTIONARY ALGORITHMS, A. Agapie, Mathematics, 9(23), 3098, doi.org/10.3390/math9233098, 2021.
- FUZZY SETS, UNCERTAINTY, AND INFORMATION, G. Klir, T. Folger, Prentice-Hall International Edition, 1998.
- METODE DE INTELIGENŢĂ COMPUTAŢIONALĂ CU APLICAŢII LA SISTEME DINAMICE, M. Giuclea, T.

Sireteanu, G. Ghita, Editura Bren, 2008, ISBN 978-973-648-786-6.
- A MODEL OF MULTIPLE LINEAR REGRESSION, C. Popescu, M. Giuclea, Proceedings of the Romanian Academy, Series A, vol. 8, nr. 2, pg.137-144, 2007, ISSN 1454-9069.
- ON STATISTICAL PATTERN WITH FUZZY DATA, M. Giuclea, C. C. Popescu, Journal of Economic Computation and Economic Cybernetics Studies and Research, vol. 43, nr. 4, 2009, pg. 187-198, ISSN 1842–3264.
- ON CRITICAL PATH WITH FUZZY WEIGHTS, C. C. Popescu, M. Giuclea, Journal of Economic Computation and Economic Cybernetics Studies and Research, vol. 52, nr. 4, 2018, pg. 49-60, ISSN 1842–3264.

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and answers.	10.00
10.2. L/P(L/P)	PROJECT	Written	30.00
10.3. Final assessment	Written exam		60.00
10.4. Modality of grading	Whole marks 1-10		
10.5. Minimum standard of performance	To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
02/02/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	**Data Visualization Techniques**								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**2**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)	**prof.univ.dr. MARIN ERIKA**	erika.marin@csie.ase.ro
	C(C)	**conf.univ.dr. CIMPOERU M SMARANDA**	smaranda.cimpoeru@csie.ase.ro
	S(S)	**prof.univ.dr. MARIN ERIKA**	erika.marin@csie.ase.ro
	S(S)	**conf.univ.dr. CIMPOERU M SMARANDA**	smaranda.cimpoeru@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		S(S)	2.00
3.3. Total hours from curriculum	56	of which	
		C(C)	28
		S(S)	28
3.4. Total hours of study per semester (ECTS*25)	150		
3.5. Total hours of individual study	94		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	14		
Additional documentation in the library, on specialized online platforms and in the field	28		
Preparation of seminars, labs, assignments, portfolios and essays	34		
Tutorials	16		
Examinations	2		
Other activities			

4. Prerequisites

4.1. of curriculum	● Basic Statistics
4.2. of competences	● Statistical software: Excel

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: Excel, Tableau, Power BI, etc

6. Acquired specific competences

PREFESSIONAL	C3	Applying statistical software in data collection, analysis and dissemination
PREFESSIONAL	C4	Development of organization and monitoring procedures in statistical research in the socio-economic field

7. Objectives of the discipline

7.1. General objective	Preparing students to use didicated softwares in data visualisation in order to identify trends, patterns, relationships between variables and exploratory analysis of data sets as aids in the decision making process.
7.2. Specific objectives	Develope abilities in creation and critical analysis of data visualisation Understande the importance of data visualisation. Understande the components of the visualisation techniques and of the propper choice of charts depending on the nature of the data set, the audience and the objective Constructing and presenting a dashboard in different data visualisation software

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction to data visualization - Importance and role of data visualization. -Evolution of data visualization - Elements of graphic representations. Introduction to the use of Tableau for viewing data.	Lecture based on multimedia presentations and interaction with students.	
2	Basics of data visualization - Main types of graphical representations. - Detecting errors in graphical views.	Idem	
3	Exploratory Data Analysis and Visual Analytics -Principles of visual perception -Attributes used in visual perception -Choosing the optimal graph according to the characteristics of the data set. - Data exploration facilities using visual representation.	Idem	
4	Design principles and best practices in visual representation -Design principles -Strategic use of colour -Esthetical elements in data visualization	Idem	
5	Dashboards -Principles for creating effective dashboards -Best practices and errors to avoid in creating dashboards.	Idem	
6	Dashboards -Creating dashboards in Tableau. Examples Cluster Analysis using Tableau	Idem	
7	Data visualisation using Microsoft Excel. -Undertanding the several types of charts in Excel. -Design principle in Excel	Idem	
8	LookUp functions and Pivot tables used in creating a Dashbord in Excel	Idem	
9	Creation of an interactive Dashbord in Excel	Idem	
10	Introduction in Power BI . Data flows Understanding the Interface Basic working principles in Power BI	Idem	
11	Power BI – part 2 Creation of interface Constructiin charts Patrticularities of charts preseting distributions, associations, trends	Idem	
12	Constructing a dashbord in Power BI. Use of Slicer Use of Filter pane and other instruments used in creating an interactive dashboard in Power BI	Idem	
13	Use of advanced instruments in reporting and visualising data in Powewr BI	Idem	
14	Integration of visualisation techniques	Idem	

Bibliography

- Few, S. (2006). Information dashboard design: The effective visual communication of data. O'Reilly Media, Inc..
- Tufte, E. R., McKay, S. R., Christian, W., & Matey, J. R. (1998). Visual explanations: Images and quantities, evidence and narrative.
- Tableau web site, http://www.tableau.com/academic/teaching/university-of-washington
- https://learn.microsoft.com/en-us/power-bi/fundamentals/desktop-get-the-desktop

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Introduction in data visualization. Introduction in Tableau	Applications and Case Studies in specialized visualisation software	

2	Main types of graphs in Tableau. Creating new variables using the “if” function. Case study: Business products/orders database.	Applications and Case Studies in specialized visualisation software	
3	Using new calculated fields and parameters. Creating a control chart. Creating a synthesis visualization using Tableau functionalities Special types of graphs: Word Cloud; Bubble Map Case Study: Business products/orders database.	Applications and Case Studies in specialized visualisation software	
4	Visual representations of macroeconomic data Special types of graphs: Butterfly chart	Applications and Case Studies in specialized visualisation software	
5	Creating a dashboard using Tableau Using the interactive features of dashboards in Tableau: actions and filters. Case Study: Creating a dashboard for the Business products/orders database.	Applications and Case Studies in specialized visualisation software	
6	Dashboards Case Study: Human Resources Database	Applications and Case Studies in specialized visualisation software	
7	Data visualisation using Microsoft Excel. Applications in -Undertanding the several types of charts in Excel. -Design principle in Excel	Applications and Case Studies in specialized visualisation software	
8	LookUp functions (VlookUp, HlookUp) and Pivot tables and charts used in creating a Dashbord in Excel	Applications and Case Studies in specialized visualisation software	
9	Creation of an interactive Dashbord in Excel based on a multidimentional databes	Applications and Case Studies in specialized visualisation software	
10	Introduction in Power BI . Data flows Understanding the Interface Basic working principles in Power BI	Applications and Case Studies in specialized visualisation software	
11	Power BI – part 2 Creation of interface Constructiin charts Patrticularities of charts preseting distributions, associations, trends	Applications and Case Studies in specialized visualisation software	
12	Constructing a dashbord in Power BI. Use of Slicer Use of Filter pane and other instruments used in creating an interactive dashboard in Power BI	Applications and Case Studies in specialized visualisation software	
13	Project Presentation	Applications and Case Studies in specialized visualisation software	
14	Project Presentation	Applications and Case Studies in specialized visualisation software	

Bibliography

- Marin, E, Cimpoeru, S, Data Visualization Techniques, class notes
- https://learn.microsoft.com/en-us/power-bi/fundamentals/desktop-get-the-desktop
- Tableau web site, http://www.tableau.com/academic/teaching/university-of-washington
-

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Active participation	Recording of answers and participation in discussions	5
10.2. S(S)	Active participation PROJECT	Recording of answers and participation in discussions Project presentation/ Oral evaluation	5 30
10.3. Final assessment	Written exam		60
10.4. Modality of grading	Grades from 1 to 10.		
10.5. Minimum standard of performance	Project presentation Min 5 points based on the algorithm: semester activity*40% + exam grade*60%		

Date of listing,

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	**Artificial Neural Networks**								
2.2. Code	**22.0291IF1.1-0003**								
2.3. Year of study	**1**	2.4. Semester	**2**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**7**

2.8. Leaders	C(C)	**conf.univ.dr. Vinte Claudiu**	claudiu.vinte@ie.ase.ro
	L/P(L/P)	**conf.univ.dr. Vinte Claudiu**	claudiu.vinte@ie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00

3.4. Total hours of study per semester (ECTS*25)	175.00
3.5. Total hours of individual study	119.00
Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, labs, assignments, portfolios and essays	15.00
Tutorials	7.00
Examinations	2.00
Other activities	40.00

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Nonparametric Statistics ● Probability theory and Mathematical Statistics
4.2. of competences	● Python programming (numpy, pandas, matplotlib, scipy, scikit-learn)

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: Python interpreter, PyCharm IDE, Python packages numpy, pandas, matplotlib, scipy, scikit-learn

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of investment projects in various fields
7.2. Specific objectives	• Identificarea, descrierea și utilizarea diferitelor tehnici de analiza a datelor și vizualizarea acestora • Exemplificarea aplicării modelelor teoretice cu ajutorul pachetelor software specializate.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Theme 1: Basic architecture of artificial neural networks. Neural networks with a single computational layer – The Perceptron.	Lecture based on multimedia presentations and interaction with students.	It is recommended that students go through the course material in advance to be able to interact during the lecture.
2	Theme 2: Multilayer Neural Networks. 2.1 The multilayer network as a computational graph; 2.2 Training a neural network with backpropagation.	Idem	Idem
3	Theme 3: Practical problems in training neural networks. 3.1 The problem of overfitting; 3.2 Difficulties in convergence; 3.3 Local optimum; 3.4 Choice of composing function.	Idem	Idem
4	Theme 4: Neural networks architectures. 4.1 Radial basis function networks; 4.2 Restricted Boltzmann machines; 4.3 Recurrent neural networks; 4.4 Convolutional neural networks; 4.5 Deep reinforcement learning 4.6 Hierarchical feature engineering and pretrained models.	Idem	Idem
5	Theme 5: Machine learning with shallow neural networks. 5.1 Neural architectures for binary classification models; 5.2 Backpropagation for feature selection; 5.3 Matrix factorization with autoencoders; 5.4 Simple neural architectures for embedded graphs.	Idem	Idem
6	Theme 6: Training deep neural networks. 6.1 Backpropagation (reverse); 6.2 Setup and initialization issues; 6.3 Cost function minimization strategies: gradient descent.	Idem	Idem
7	Theme 7: Training deep neural networks to generalize. 7.1 Bias-variance trade-off; 7.2 Regularization based on penalties; 7.3 Global methods; 7.4. Early shutdown; 7.5 Unsupervised pretraining.	Idem	Idem
8	Theme 8: Radial Basis Function Networks (RBF). 8.1 Training a radial basis function network; 8.2 Variations and special cases of RBF networks; 8.3 Relationship to kernel methods; 8.4 Support-vector machine (SVM) – special case of kernel method for RBF networks.	Idem	Idem

9	Theme 9: Restricted Boltzmann Machines (RBM). 9.1 Hopfield networks; 9.2 The Boltzmann automaton; 9.3 Boltzmann machines with constraints; 9.4 Using RBM beyond binary data types; 9.5 Stacking RBM.	Idem	Idem
10	Theme 10: Recurrent Neural Networks. 10.1 Expressiveness of recurrent networks; 10.2 The architecture of recurrent neural networks; 10.3 The challenges of forming recurrent networks; 10.4 Long-short term memory (LSTM); 10.5 Gated recurrent units (GRU).	Idem	Idem
11	Theme 11: Convolutional Neural Networks (1). 11.1 Basic structure of a convolutional network; 11.2 Training a convolutional network.	Idem	Idem
12	Theme 12: Convolutional Neural Networks (2). 12.1 Case studies of convolutional architectures; 12.2 Visualization and unsupervised learning; 12.3 Applications of convolutional networks.	Idem	Idem
13	Theme 13: Deep reinforcement learning (1). 13.1 Stateless Algorithms; 13.2 The basic framework of reinforcement learning; 13.3 Bootstrapping for value function learning.	Idem	Idem
14	Theme 14: Deep reinforcement learning (2). 14.1 Gradient methods. 14.2 Monte Carlo tree search.	Idem	Idem

Bibliography

- Michael Nielsen, *Neural Networks and Deep Learning*, http://neuralnetworksanddeeplearning.com
- Charu C. Aggarwal, *Neural Networks and Deep Learning*, Springer International Publishing AG, part of Springer Nature, ISBN 978-3-319-94462-3 ISBN 978-3-319-94463-0 (eBook), 2018.

8.2. L/P(L/P)		Applications and Case Studies in the Python	Recommendations for students
1	Introduction to the PyTorch library: tensors, data sets and data loaders, transforms.	Applications and Case Studies in specialized statistical software: SAS	It is recommended that students continue to deepen their knowledge of using Python packages, especially PyTorch.
2	PyTorch for building a neural network, automatic differentiation with *torch.autograd*.	Idem	Idem
3	PyTorch: optimizing model parameters, saving and loading the model.	Idem	Idem
4	Building models with PyTorch; PyTorch *TensorBoard*.	Idem	Idem
5	PyTorch examples: hidden layer training, orthogonal least-squares algorithm, fully supervised learning, classification with Perceptron Criterion.	Idem	Idem
6	PyTorch examples: example of linear separability promoted by radial basis function networks (RBF), application to interpolation.	Idem	Idem
7	PyTorch examples for restricted Boltzmann machines: RBM training, contrastive divergence algorithm.	Idem	Idem
8	PyTorch examples for restricted Boltzmann machines: dimensionality reduction and data reconstruction, RBM for collaborative filtering, using RBM for classification.	Idem	Idem
9	PyTorch examples for restricted Boltzmann machines: stacking restricted Boltzmann machines, unsupervised learning, supervised learning, deep Boltzmann machines.	Idem	Idem
10	PyTorch examples with applications of recurrent neural networks: time-series forecasting and prediction, temporal recommendation systems, handwriting recognition.	Idem	Idem

11	Applications of convolutional networks: content-based image retrieval, object location, object detection.	Idem	Idem
12	Applications of convolutional networks: natural language and sequence learning.	Idem	Idem
13	Deep reinforcement learning. Building conversational systems: deep learning for chatbots.	Idem	Idem
14	Project Presentation	Idem	Idem

Bibliography

- Josh Patterson and Adam Gibson, *Deep Learning A Practitioner's Approach*, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472, 2017.
- Ivan Vasilev, Daniel Slater, Gianmario Spacagna, Peter Roelants and Valentino Zocca, *Python Deep Learning Second Edition - Exploring deep learning techniques and neural network architectures with PyTorch, Keras, and TensorFlow*, Packt Publishing Ltd., Livery Place 35 Livery Street, Birmingham, B3 2PB, UK, 2019.
- Francois Chollet, *Deep Learning with Python*, Manning Publications Co, 20 Baldwin Road PO Box 761, Shelter Island, NY 11964, 2018.
- Nikhil Ketkar and Jojo Moolayil, *Deep Learning with Python - Learn Best Practices of Deep Learning Models with PyTorch Second Edition*, Apress, ISBN-13 (pbk): 978-1-4842-5363-2, ISBN-13 (electronic): 978-1-4842-5364-9 https://doi.org/10.1007/978-1-4842-5364-9, 2021.
- PyTorch - tutoriale, https://pytorch.org/tutorials/

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. L/P(L/P)	PROJECT	Oral presentation	40.00
10.2. Final assessment	Oral exam	Computer examination	60.00
10.3. Modality of grading	Whole notes 1-10		
10.. Minimum standard of performance	Project presentation during the seminar. The project can be done alone or in groups of up to 4 masters students. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Economic Informatics and Cybernetics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	**Social Network Analysis**								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**2**	2.5. Type of assessment	**Verification**	2.6. Status of the discipline	**A**	2.7. Number of ECTS credits	7

2.8. Leaders	C(C)	**prof.univ.dr. DÂRDALĂ Adriana Elena**	adriana.dardala@ie.ase.ro
	L/P(L/P)	**prof.univ.dr. DÂRDALĂ Adriana Elena**	adriana.dardala@ie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	4.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	42.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, labs, assignments, portfolios and essays	15.00
Tutorials	7.00
Examinations	2.00
Other activities	40.00

4. Prerequisites

4.1. of curriculum	Data Science with Python
4.2. of competences	computer programming fundamentals

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software development tools

6. Acquired specific competences

PREFESSIONAL	C3	Using advanced methods and techniques to gather new knowledge from social networks.
PREFESSIONAL	C4	Advanced techniques, methods and software tools for assessing and processing data from social networks.

7. Objectives of the discipline

7.1. General objective	Underlying theoretical concepts of social media analytics and hands-on experience with current technologies relevant for business. The course advances students' technical skills necessary to perform social media analysis and to leverage social media data.
7.2. Specific objectives	• Understand the role of social media data and analytics in supporting socio-economic analytics. • Analyse social media data using native analytics (e.g. Facebook, Twitter, Instagram, YouTube, TripAdvisor, Google Trends) and social media measurement tools. • Introducing social network analysis software packages & tools. • Use of social network analysis in behaviour analytics and recommendations systems. • Recognize opportunities to apply social media analytics in various business areas, their pros and cons.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction in social media analytics: foundation and core features; advantage and limitation of social media	Lecturing with visual aids, examples and class discussions	
2	Overview of social media analytics: type of analytics, tools, semantics, strategies	Idem	
3	Harnessing social data: connecting, capturing, and cleaning	Idem	
4	Social media metrics: methods and meaning underlying social media metrics	Idem	
5	Social media analytics process	Idem	
6	Software tools for social media analytics	Idem	
7	Techniques for social media analysis– first part	Idem	
8	Techniques for social media analysis– the second part	Idem	
9	Identifying opinions through sentiment analysis and topic modelling	Idem	
10	Search engine analytics	Idem	
11	Identifying influencers in social network. Measuring variations in user behaviour using social media data	Idem	
12	Graph mining for social network analysis: community detection, community structure and clustering – first part	Idem	
13	Graph mining for social network analysis: community detection, community structure and clustering – second part	Idem	
14	Final evaluation	Idem	

Bibliography

- John Scott, Social Network Analysis, SAGE, 2017, ISBN: 978-1473952126.
- Alex Gonçalves, *Social Media Analytics Strategy: Using Data to Optimize Business Performance*, Apress, 2017, ISBN: 978-1-4842-3101-2.
- Gabor Szabo, Gungor Polatkan, Oscar Boykin, Antonios Chalkiopoulos, *Social Media Data Mining and Analytics, 2019, John Wiley & Sons*, ISBN: 978-1-118-82485-6.
- Jeremy Harris Lipschultz, *Social Media Measurement and Management. Entrepreneurial Digital Analytics*, Routledge, Taylor & Francis, 2020, ISBN: 978-0-8153-6390-3.
- Gohar F. Khan, *Seven layers of social media analytics. Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data*, 2015, CreateSpace Independent Publishing, ISBN 9781507823200
- Alex Gonçalves, *Social Media Analytics Strategy: Using Data to Optimize Business Performance*, Apress Business, 2017, ISBN 978-1-4842-3101-2

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Harnessing social data: connecting, capturing, and cleaning (e.g. Facebook, Twitter, Instagram, YouTube, TripAdvisor, Google Trends)	Collaborative practice exercises, case studies and in-class activities to develop relevant skills	
2	Reporting and visualizing social media data	Idem	
3	Elements of natural language processing for social data analysis: word tokenisation, sentence segmentation, text classification	Idem	
4	Natural language processing with Python applied for social media	Idem	
5	Discover hidden patterns, relationships, and meanings in social media data	Idem	
6	Feature extraction techniques applied on social data	Idem	
7	Content analysis in the social media context	Idem	
8	Uncovering brand activity and popularity on social media; using Google Trends to boost social media opportunities	Idem	
9	Recommendation in social networks: collaborative filtering and content-based recommendation systems	Idem	
10	Search engine analytics using Google Trends API	Idem	
11	Using Facebook API to uncover brand activity and popularity	Idem	
12	Sentiment analysis and entity recognition on Twitter	Idem	
13	Campaigns and consumer reaction analytics using YouTube API	Idem	
14	Project Presentation	Project Presentation	

Bibliography

- Sharan Kumar Ravindran, Vikram Garg, *Mastering Social Media Mining with R*, Packt Publishing, 2015, ISBN 978-1-78439-631-2.
- Bater Makhabel, Pradeepta Mishra, Nathan Danneman, Richard HeimannR: *Mining Spatial, Text, Web, and Social Media Data*, 2017 Packt Publishing, ISBN 978-1-78829-374-7.
- Krishna Raj P. M., Ankith Mohan, K. G. Srinivasa, *Practical Social Network Analysis with Python*, Springer Nature, 2018, ISBN 978-3-319-96745-5 .
- Anna Atefeh Farzindar, Diana Inkpen, *Natural Language Processing for Social Media*, Morgan & Claypool, 2020, ISBN: 9781681738116.
- Siddhartha Chatterjee Michal Krystyanczuk, *Python Social Media Analytics. Analyze and visualize data from Twitter*, YouTube, GitHub and more, 2017 Packt Publishing, ISBN 978-1-78712-148-5

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Assessing theoretical and practical skills using quizzes, homework, project.	10.00
10.2. L/P(L/P)	Project evaluation	Project presentation	40.00

10.3. Final assessment	Assessing theoretical and practical skills	Written paper based or computer-based assessment	50.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. To pass the subject students must achieve at least grade 5 at the final assessment.		

Date of listing,

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	Scientometrics and Bibliometrics								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**End of course assessment**	2.6. Status of the discipline	A	2.7. Number of ECTS credits	**7**

2.8. Leaders	C(C)	**Prof. Univ. Dr. Adriana Davidescu**	
	L/P(L/P)	**Prof. Univ. Dr. Adriana Davidescu**	

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	100.00		
3.5. Total hours of individual study	44.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	15.00		
Additional documentation in the library, on specialized online platforms and in the field	10.00		
Preparation of seminars, labs, assignments, portfolios and essays	10.00		
Tutorials	2.00		
Examinations	2.00		
Other activities	5.00		

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Nonparametric Statistics ● Probability theory and Mathematical Statistics
4.2. of competences	● Statistical software: Excel, SPSS, R

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: SPSS, SAS, R, Tableau etc and videoprojector

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of investment projects in various fields
7.2. Specific objectives	• Understanding the role and the importance of main bibliometric indicators in research area; • Using bibliometric indicators in research projects

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction	Lecture based on multimedia presentations and interaction with students.	
2	Main bibliometric indicators for assessing the impact of academic journals available in the Web of Science database	Idem	
3	Main bibliometric indicators for assessing the impact of academic journals available in Google Scholar	Idem	
4	Main bibliometric indicators for assessing the impact of academic journals available in Scopus	Idem	
5	Assessing researchers' performance using bibliometric indicators in Web of Science	Idem	
6	Assessing researchers' performance using bibliometric indicators in Google Scholar	Idem	
7	Assessing researchers' performance using bibliometric indicators in Scopus	Idem	
8	Assessing institutions using bibliometric indicators	Idem	
9	Other available databases: Microsoft Academic, REPEC	Idem	
10	Altmetrics in academic performance evaluation 1	Idem	
11	Altmetrics in academic performance evaluation 2	Idem	
12	Will altmetrics replace bibliometrics?	Idem	
13	Comparison between Google Scholar, Web of Science and Scopus	Idem	
14	Summary	Idem	

Bibliography

- https://harzing.com/resources/publish-or-perish/
- https://www.nature.com/nature-index/mission
- https://clarivate.com/
- https://www.scopus.com/standard/marketing.uri

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Introduction	Applications and Case Studies in specialized statistical software: SPSS	
2	Case study: Comparing various journals using Web Of Science metrics	Applications and Case Studies in specialized statistical software: SPSS	
3	Case study: Comparing various journals using Google scholar metrics	Applications and Case Studies in specialized statistical software: SPSS	
4	Case study: Comparing vaous journals using Scopus metrics	Applications and Case Studies in specialized statistical software: SPSS	
5	Written assessment	Written assessment	
6	Case study: comparing researchers using Google Scholar, Web of Science and Scopus metrics part 1	Applications and Case Studies in specialized statistical software: SPSS	
7	Case study: comparing researchers using Google Scholar, Web of Science and Scopus metrics part 2	Applications and Case Studies in specialized statistical software: SPSS	
8	Case study: choosing the right bibliometric indicators for research purposes part 1	Applications and Case Studies in specialized statistical software: R	
9	Case study: choosing the right bibliometric indicators for research purposes part 2	Applications and Case Studies in specialized statistical software: R	
10	Case study: choosing the right bibliometric indicators for research purposes part 3	Applications and Case Studies in specialized statistical software: R	
11	Written assessment	Written assessment	
12	Altmetrics vs. Bibliometrics	Debate	
13	Project Presentation part 1	Project Presentation	
14	Project Presentation part 2	Project Presentation	

Bibliography

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- https://harzing.com/resources/publish-or-perish/
- https://www.nature.com/nature-index/mission
- https://clarivate.com/

  https://www.scopus.com/standard/marketing.uri

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. L/P(L/P)	Written test	Written assessment	10.00
10.2. L/P(L/P)	Written test	Written assessment	10.00
10.2. L/P(L/P)	Individual project	Presentation of the project	20.00
10.3. Final assessment	Written exam		60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	**Complex systems**								
2.2. Code									
2.3. Year of study	**2**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**5**

2.8. Leaders	C(C)	**prof.univ.dr. Roy CERQUETI**	roy.cerqueti@uniroma1.it

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C) S(S)	1.00 1.00
		T(T)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C) S(S)	14.00 14.00
		T(T)	28.00
3.4. Total hours of study per semester (ECTS*25)	125.00		
3.5. Total hours of individual study	79.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	25.00
Additional documentation in the library, on specialized online platforms and in the field	10.00
Preparation of seminars, labs, assignments, portfolios and essays	10.00
Tutorials	5.00
Examinations	2.00

Other activities	27.00

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Basic Mathematics
4.2. of competences	● none

5. Conditions XXX I WOULD REMOVE THIS SECTION XXX

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: SPSS, SAS, R, Tableau etc

6. Acquired specific competences

PREFESSIONAL	C3	Knowledge of the theoretical foundations of data science and complex systems.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of complex systems with applications
7.2. Specific objectives	• Assessment of the methodological instruments to analyze complex systems • Applications of the complexity in economics, finance and social science

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Theme 1: Preliminaries - Summary of some basic mathematics and statistics	Lecture based on slides, multimedial presentation and interaction with students.	
2	Theme 2: complex networks - Introductory concepts - Classification of networks - Centrality measures - Resilience, communities	Idem	
3	Theme 3: Rank-size analysis - Introductory concepts - Best-fit procedures - Family of curves - Interpretation of the rank-size results	Idem	
4	Theme 4: Clustering and distance measures - Introductory concepts - Probabilistic and point-wise distance - Clustering procedures	Idem	
5	Theme 5: Data regularity - Introductory concepts - Interpretation of data regularities - Theoretical foundation of data regularity	Idem	
6	Theme 6: Fuzziness, interval-valued data and fuzzy numbers - Introductory concepts - Algebraic operators and interpretation	Idem	
7	Theme 7: Summary and applications to economics, finance and social science	Idem	

Bibliography

Ausloos, M., & Cerqueti, R. (2016). A universal rank-size law. PloS one, 11(11), e0166011.
Newman, M., (2018). Networks. Oxford University Press

Landau, S., Leese, M., Stahl, D., & Everitt, B. S. (2011). Cluster analysis. John Wiley & Sons.

Berger, A., & Hill, T. P. (2015). An introduction to Benford's law. Princeton University Press.

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Case studies - Preliminary data analysis - Statistical visualization	Multimedial presentation, slides, interaction	
2	Case studies - Resilience of complex networks - Communities in complex networks	Multimedial presentation, slides, interaction	
3	Case studies - Ranked data - Best-fit and best curve interpretation	Multimedial presentation, slides, interaction, MATLAB	
4	Case study - Cluster analysis, clusters overlap and interpretation of the results - Discrepancies among different distance measures	Multimedial presentation, slides, interaction, statistical software	
5	5. Case study - Benford’s law and interpretation of the results - Data regularities and deviations and related discussion	Multimedial presentation, slides, interaction, statistical software	
6	6. Case study - Interval-valued data and applications - Fuzzy assignments to clusters and interpretations	Multimedial presentation, slides, interaction, statistical software	
7	7. Case study - Overview of economic, financial and social science applications in the broad field of complexity	Multimedial presentation, slides, interaction, statistical software	

Bibliography

Ausloos, M., & Cerqueti, R. (2016). A universal rank-size law. PloS one, 11(11), e0166011.

Newman, M., (2018). Networks. Oxford University Press

Landau, S., Leese, M., Stahl, D., & Everitt, B. S. (2011). Cluster analysis. John Wiley & Sons.

Berger, A., & Hill, T. P. (2015). An introduction to Benford's law. Princeton University Press.

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Teste	10.00
10.2. T(T) and S(S)	PROJECT	Written	30.00

10.3. Final assessment	Written exam		60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. The project can be done alone or in groups of up to 4 masters students. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
01/31/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and Statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2024-2025

2. Information on the discipline

2.1. Name	**Digital Storytelling**								
2.2. Code									
2.3. Year of study	**2**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	6

	C(C)		
	L/P(L/P)		

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	40.00		
Additional documentation in the library, on specialized online platforms and in the field	15.00		
Preparation of seminars, labs, assignments, portfolios and essays	15.00		
Tutorials	7.00		
Examinations	2.00		
Other activities	40.00		

4. Prerequisites

4.1. of curriculum	● Data Mining Principles ● Data Visualization Techniques
4.2. of competences	● Software: Excel, PowerPoint, Tableau

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	The ability to effectively communicate with data is no longer a luxury in today's economy; it is a necessity. Transforming data into visual communication is only one part of the picture. It is equally important to engage your audience with a narrative--to tell a story with the numbers. Digital Storytelling will teach you the essential skills necessary to communicate your insights through persuasive and memorable data stories.
7.2. Specific objectives	• Transform your insights and data visualizations into appealing, impactful data stories • Learn the fundamental elements of a data story and key audience drivers • Understand the differences between how the brain processes facts and narrative • Structure your findings as a data narrative, using a four-step storyboarding process • Incorporate the essential principles of better visual storytelling into your work

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction – Telling the story of your data	Lecture based on multimedia presentations and interaction with students.	
2	Three essential elements of data stories. Driving Action with Data Stories	Idem	
3	The Psychology of Data Storytelling. How we react to facts and how we react to stories?	Idem	
4	The Anatomy of a Data Story. The six essential elements of a data story	Idem	
5	Data stories come in all shapes and sizes. Some famous storytellers. Know your audience before telling your story	Idem	
6	The foundation of your Data Story. Examine the building blocks of your Data Stories	Idem	
7	The analysis process: Exploration to Explanation. Analyzing and communicating data demands discipline	Idem	
8	Defining a narrative model for Data Stories	Idem	
9	Storyboarding your Data Story	Idem	
10	Setting the scenes of your Data Story	Idem	
11	Facilitating meaningful comparisons with visuals	Idem	
12	Polishing the scenes of your Data Story	Idem	
13	A Principled Approach to Visual Storytelling	Idem	
14	Crafting your own Data Story. Deconstructing a Data Story	Idem	

Bibliography

- Cole Nussbaumer Knaflic (2015) *Storytelling with Data: a data visualization guide for business professionals*, John Wiley & Sons, Inc., Hoboken, New Jersey
  Vora Sejal (2019) *The power of data storytelling*, SAGE Publications India

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Introduction – Understand the context. Storytelling in a Digital Era	Applications and Case Studies	
2	Stories, data and narratives	Idem	
3	The power of visual Data Stories	Idem	
4	Basic data prep with data interpreter	Idem	
5	Importance of context in Storytelling	Idem	
6	Choosing the right visual	Idem	
7	Identify and eliminate clutter	Idem	
8	Curating visuals for your audience	Idem	
9	Preparing data for Storytelling	Idem	
10	Storyboarding frame by frame	Idem	
11	Advanced Storytelling charts.	Idem	
12	Five steps to visual Data Storytelling	Idem	
13	Practice more on your own	Idem	
14	Project Presentation	Project Presentation	

Bibliography

- Cole Nussbaumer Knaflic (2020) *Storytelling with Data: let's practice!* John Wiley & Sons, Inc., Hoboken, New Jersey

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions	10.00
10.2. L/P(L/P)	Project	Written	30.00
10.3. Final assessment	Written exam		60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing, Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Economic Informatics and Cybernetics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	Big Data Platforms								
2.2. Code									
2.3. Year of study	2	2.4. Semester	**1**	2.5. Type of assessment	**End of course assessment**	2.6. Status of the discipline	A	2.7. Number of ECTS credits	**7**

2.8. Leaders	C(C)	**prof.univ.dr. DIACONITA V VLAD**	diaconita.vlad@ie.ase.ro
	C(C)	**conf. univ. dr. CORBEA ALEXANDRA**	alexandra.florea@ie.ase.ro
	L/P(L/P)	**prof.univ.dr. DIACONITA V VLAD**	diaconita.vlad@ie.ase.ro
	L/P(L/P)	**conf. univ. dr. CORBEA ALEXANDRA**	alexandra.florea@ie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00

3.4. Total hours of study per semester (ECTS*25)	100.00
3.5. Total hours of individual study	44.00
Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	15.00
Additional documentation in the library, on specialized online platforms and in the field	10.00
Preparation of seminars, labs, assignments, portfolios and essays	10.00
Tutorials	2.00
Examinations	2.00
Other activities	5.00

4. Prerequisites

4.1. of curriculum	● Data science with Python ● Machine learning and Predictive Analytics
4.2. of competences	● SQL

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	• Seminars are conducted in rooms equipped with computers and Internet access • Computers have Hadoop Virtual Machines installed • Requirements of the course and seminars are available through online.ase.ro.

6. Acquired specific competences

PREFESSIONAL	C5	Develop complex research projects regarding the integration of various informatics technologies within Big Data context

7. Objectives of the discipline

7.1. General objective	Provide students with the conceptual framework of big data systems
7.2. Specific objectives	Addressing the problem of information systems integration at the level of companies. Presentation of the complexity of the integration problem and the integration technologies currently used. Understanding the importance of defining an integration strategy and developing an big data infrastructure.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction	Lecture based on multimedia presentations and interaction with students.	
2	Data types: structured, semi-structured and unstructured.	Idem	
3	Distributed systems for data storage and processing	Idem	
4	CAP and Base theorems vs ACID.	Idem	
5	Big Data characteristics: from 3V to 6V	Idem	
6	Hadoop ecosystem: MapReduce, HDFS	Idem	
7	Hadoop ecosystem: Tez, Spark, Hive, Sqoop, Storm	Idem	
8	HiveQL	Idem	
9	Publish–subscribe pattern	Idem	
10	Processing data flows	Idem	
11	Apache Kafka and Apache Zookeeper	Idem	
12	Cloud based big data platforms	Idem	
13	Machine learning algorithms in a Big Data context, online algorithms	Idem	
14	Summary	Idem	

Bibliography

- Jan Kunigk, Ian Buss, Paul Wilkinson, Lars George, Architecting Modern Data Platforms: A Guide to Enterprise Hadoop at Scale
- Pradeep Menon, Data Lakehouse in Action: Architecting a modern and scalable data analytics platform
- Nataraj Dasgupta, Practical Big Data Analytics: Hands-on techniques to implement enterprise analytics and machine learning using Hadoop, Spark, NoSQL and R
- Materials posted on https://online.ase.ro/

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Collecting data using Apache Flume.	Case study	
2	Using Hive and HiveQL	Case study	
3	Hive table types	Case study	
4	HiveQL functions	Case study	
5	Developing project 1	Project development and presentation	
6	User defined functions in Hive, using jar files	Case study	
7	Transferring data from Hadoop to Oracle using Oracle Loader for Hadoop	Case study	
8	Oracle Data Miner	Case study	
9	Apriori model on the transferred data	Case study	
10	Developing project 2	Project development and presentation	
11	Using Apache Sqoop for data transfer	Case study	
12	HBase and Phoenix	Case study	
13	Apache Kafka	Case study	
14	Developing project 3	Project development and presentation	

Bibliography

- Jan Kunigk, Ian Buss, Paul Wilkinson, Lars George, Architecting Modern Data Platforms: A Guide to Enterprise Hadoop at Scale
- Pradeep Menon, Data Lakehouse in Action: Architecting a modern and scalable data analytics platform
- Nataraj Dasgupta, Practical Big Data Analytics: Hands-on techniques to implement enterprise analytics and machine learning using Hadoop, Spark, NoSQL and R
- Materials posted on https://online.ase.ro/

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The demand for specialists in big data is high, as companies seek to make use of this technology to improve their operations. This course provides a master set of knowledge aligned with international standards in this area, offering an opportunity to gain the skills and expertise necessary to work in the field of big data.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. L/P(L/P)	• Solving case studies according with the provided instructions • Ability to apply in practice and to present the acquired scientific knowledge	Presentation of the projects	40.00
10.2. Final assessment	• Accuracy and completeness of	Written exam on the computer	60.00

	acquired knowledge • Logical thinking • Involvement during classes, the degree of assimilation of specialized terms		
10.3. Modality of grading	Whole grades 1-10		
10.4. Minimum standard of performance	For passing, the student should be fluent in HiveQL for the exam: group by, explode, lateral view, join		

Date of listing,
01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Statistics and Data Science
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	**Time Series Analysis and Forecasting**								
2.2. Code	**22.0291IF1.1-0003**								
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**7**

2.8. Leaders	C(C)	**prof.univ.dr. Daniel Traian Pele**	danpele@ase.ro
	C(C)	**prof.univ.dr. Davidescu Adriana-Ana-Maria**	adrianaalexandru@yahoo.com
	L/P(L/P)	**prof.univ.dr. Daniel Traian Pele**	danpele@ase.ro
	L/P(L/P)	**prof.univ.dr. Davidescu Adriana-Ana-Maria**	adrianaalexandru@yahoo.com

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	1.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	14.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, labs, assignments, portfolios and essays	15.00
Tutorials	7.00
Examinations	2.00
Other activities	40.00

4. Prerequisites

4.1. of curriculum	• Statistics • Econometrics • Analysis of time series (license cycle) • Macroeconomics / Microeconomics
4.2. of competences	● Statistical software: Excel, R, SAS, Python, Eviews

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	Seminars are hosted in Internet classes with computers that have the right software: Eviews, R, Python OR online

6. Acquired specific competences

PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.
PREFESSIONAL	C5	Advanced statistical analysis of demo-social phenomena and processes.

7. Objectives of the discipline

7.1. General objective	Acquisition of the theoretical notions regarding the techniques specific to the analysis of time series in the investigation of some real time phenomena.
7.2. Specific objectives	

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Theme 1: A brief recap of the concepts of time series: - Stationarity versus non-stationarity - Unit root tests - ARMA / ARIMA models - Box-Jenkins Methodology (BJ) -Forecasting Case Study: Unemployment rate forecasting using BJ methodology	Lecture	
2	Theme 2: Stationary Autoregressive Models (VAR): - introductory notions - estimations; - Granger Causality; - Impulse response function; -Variance decomposition. - Toda-Yamamoto Causality - Impulse response function; - Variance decomposition; - Forecasting.	Lecture	
3	Theme 3: SVAR models - Blanchard and Quah methodology - Impulse response function; - Variance decomposition.	Lecture	
4	Theme 4: Non-stationary VAR models and VECM models - introductory notions - representations - univariate cointegration - Granger Causality - Toda-Yamamoto Causality Impulse response function - Variance decomposition	Lecture	

	- Predictions		
5	Theme 5: State Space Models and Markov Switching Models	Lecture	
6	Theme 6: Panel Data: - introductory remarks (short review) - representations - root unit tests - VAR/VECM models - Impulse response function; - Variance decomposition. - VAR/VECM models - Impulse response function; - Variance decomposition.	Lecture	
7	Theme 7: Modern Machine Learning Methods for Time Series Analysis	Lecture	

Bibliography

- Kevin Kotze, Time Series Analysis, 2019, https://www.economodel.com/time-series-analysis
- Robert H. Shumway, David S. Stoffer, Time Series Analysis and Its Applications: With R Examples, Springer, 2017, https://www.stat.pitt.edu/stoffer/tsa4/
- Hamilton, J.D., Time Series Analysis, Princeton University Press,, 1994
- Terence C. Mills, Applied Time Series Analysis A Practical Guide to Modeling and Forecasting, Elsevier Academic Press, 2019
- Baltagi, B, Econometric analysis of panel data, John Wiley & Sons, 2008
- Pele, D.T., Criza piețelor de capital – dezastru predictibil sau lebădă neagră?, ASE, 2013, https://www.researchgate.net/publication/338409433_Criza_pietelor_de_capital_-_dezastru_predictibil_sau_lebada_neagra
- Changquan Huang, Alla Petukhina, Applied Time Series Analysis and Forecasting with Python, Springer, 2022

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Theme 1: A brief recap of the concepts of time series: -Stationarity versus non-stationarity -Unit root tests -ARMA / ARIMA models -Box-Jenkins Methodology (BJ) Forecasting.	PC class	
2	Theme 2: Making forecasts based on time series specific models: forecasting statistics, introduction to forecast strategies.	PC class	
3	Theme 3: Uncertainty Forecast and Model Evaluations: - Sources of uncertainty; - Introduction to structural breaks - fan charts.	PC class	
4	Theme 4: Stationary Autoregressive Models (VAR): -introductory notions -estimations; -Granger Causality; -Impulse response function; -Variance decomposition.	PC class	
5	Theme 5:Stationary VARs -Toda-Yamamoto Causality - Impulse response function; - Variance decomposition; - Forecasting.	PC class	
6	Theme 6: Introduction in SVAR models : -Introductory notions -representations -Long run restrictions	PC class	
7	Theme 7: SVAR models -Blanchard and Quah methodology; -Impulse response function; -Variance decomposition;	PC class	
8	Theme 8: VAR Structural Models: - Applying SVAR models to identify shocks of monetary and fiscal policy	PC class	
9	Theme 9: Non-stationary VAR models and VECM models -introductory notions - representations -univariate cointegration analysis vs. multivariate cointegration analysis	PC class	
10	Theme 10: Non-stationary VAR models and VECM models -Granger Causality -Toda-Yamamoto Causality	PC class	
11	Theme 11: Non-stationary VAR models and VECM models -Impulse response function -Variance decomposition -Predictions	PC class	
12	Theme 12: Panel Data: -introductory remarks (short review) -representations -unit root tests	PC class	
13	Theme 13: Panel Data: -Cointegration analysis	PC class	
14	Theme 14: Modern Machine Learning Methods for Time Series Analysis	PC class	

Bibliography

- Kevin Kotze, Time Series Analysis, 2019, https://www.economodel.com/time-series-analysis
- Robert H. Shumway, David S. Stoffer, Time Series Analysis and Its Applications: With R Examples, Springer, 2017, https://www.stat.pitt.edu/stoffer/tsa4/
- Hamilton, J.D., Time Series Analysis, Princeton University Press,, 1994
- Terence C. Mills, Applied Time Series Analysis A Practical Guide to Modeling and Forecasting, Elsevier Academic Press, 2019
- Baltagi, B, Econometric analysis of panel data, John Wiley & Sons, 2008

- Changquan Huang, Alla Petukhina, Applied Time Series Analysis and Forecasting with Python, Springer, 2022
- www.quantlet.de
- www.quantinar.com

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C) L/P(L/P)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Tests	10.00
10.2. L/P(L/P)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Tests	20.00
10.3. Final assessment	PROJECT	Presentation	70.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. The project can be done alone or in groups of up to 4 masters students. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2022-2023

2. Information on the discipline

2.1. Name	**Linear and Nonlinear Models for Business Application**								
2.2. Code	**22.0291IF1.1-0003**								
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**7**

2.8. Leaders	C(C)	**prof.univ.dr. Daniel Traian Pele**	danpele@ase.ro
	C(C)	**prof.univ.dr. Davidescu Adriana-Ana-Maria**	adrianaalexandru@yahoo.com
	L/P(L/P)	**prof.univ.dr. Daniel Traian Pele**	danpele@ase.ro
	L/P(L/P)	**prof.univ.dr. Davidescu Adriana-Ana-Maria**	adrianaalexandru@yahoo.com

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	1.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	14.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	175.00		
3.5. Total hours of individual study	119.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, labs, assignments, portfolios and essays	15.00
Tutorials	7.00
Examinations	2.00
Other activities	40.00

4. Prerequisites

4.1. of curriculum	• Statistics • Econometrics • Analysis of time series (license cycle) • Macroeconomics / Microeconomics
4.2. of competences	● Statistical software: Excel, R, SAS, Python, Eviews

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	Seminars are hosted in Internet classes with computers that have the right software: Eviews, R, Python OR online

6. Acquired specific competences

PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.
PREFESSIONAL	C5	Advanced statistical analysis of demo-social phenomena and processes.

7. Objectives of the discipline

7.1. General objective	By the end of the course, students should be equipped with the knowledge and skills necessary to identify appropriate linear and nonlinear modeling techniques for different business problems, implement these models using statistical software, and interpret the results in a meaningful way for effective decision-making in the business domain.
7.2. Specific objectives	▪ Introduce students to the principles and concepts of linear and nonlinear models used in business analysis. ▪ Develop students' ability to apply linear and nonlinear models to solve real-world business problems. ▪ Familiarize students with statistical software tools commonly used for implementing linear and nonlinear models. ▪ Enable students to perform variable selection, model building, and model validation for effective business analysis. ▪ Enhance students' skills in interpreting and communicating the results of linear and nonlinear models. ▪ Expose students to a range of business applications where linear and nonlinear models can be utilized effectively. ▪ Foster critical thinking and problem-solving skills by analyzing and evaluating the strengths and limitations of linear and nonlinear models in different business scenarios. ▪ Promote an understanding of ethical considerations related to data analysis, modeling, and decision-making in the business context.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Lecture 1: Introduction to Linear and Nonlinear Models Overview of linear models: linear regression, multiple regression Introduction to nonlinear models: polynomial regression, exponential regression Understanding the assumptions and limitations of linear and nonlinear models Examples of business applications for linear and nonlinear models	Lecture	
2	Lecture 2: Model Building and Variable Selection Techniques for variable selection: stepwise regression, backward elimination, forward selection Model validation and diagnostics: residual analysis, multicollinearity, heteroscedasticity Strategies for dealing with missing data and outliers Hands-on exercises using statistical software for model building and variable selection	Lecture	
3	Lecture 3: Advanced Linear Models Generalized linear models: logistic regression, Poisson regression Time series analysis and forecasting: autoregressive integrated moving average (ARIMA) models Panel data analysis: fixed effects and random effects models Case studies and examples of business applications for advanced linear models	Lecture	
4	Lecture 4: Nonlinear Models and Optimization Introduction to nonlinear models: exponential growth models, power law models Nonlinear optimization techniques: gradient descent, Newton's method Nonlinear regression analysis and parameter estimation Hands-on exercises in solving optimization problems and fitting nonlinear models	Lecture	
5	Lecture 5: Classification and Decision Trees Introduction to classification models: logistic regression, decision trees Performance evaluation metrics: accuracy, precision, recall, F1-score Ensemble methods: random forests, gradient boosting Applications of classification models in business decision-making	Lecture	
6	Lecture 6: Neural Networks and Deep Learning Fundamentals of neural networks: architecture, activation functions Training neural networks: backpropagation, gradient descent Deep learning models: convolutional neural networks (CNNs), recurrent neural networks (RNNs) Real-world applications of neural networks and deep learning in business - Variance decomposition.	Lecture	
7	Lecture 7: Model Interpretability and Explainable AI Interpreting linear models: coefficient analysis, hypothesis testing Explainable AI techniques: feature importance, SHAP values Ethical considerations and challenges in using complex models for decision-making Case studies and discussions on the interpretability of linear and nonlinear models	Lecture	

Bibliography

- Hastie, Trevor, Robert Tibshirani, and Martin Wainwright. 2021. Statistical Learning with Sparsity: The Lasso and Generalizations. CRC Press.
- Agresti, Alan, and Barbara Finlay. 2021. Statistical Methods for the Social Sciences. 5th ed. Pearson.
- Brockwell, Peter J., and Richard A. Davis. 2016. Introduction to Time Series and Forecasting. 3rd ed. Springer.
- Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. 2016. Deep Learning. MIT Press.
- www.quantlet.de
- www.quantinar.com

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Lab 1: Introduction to Statistical Software and Data Preparation Introduction to statistical software (e.g., R, Python, or SPSS) Loading and manipulating datasets Data cleaning and preprocessing techniques Exploratory data analysis and visualization	PC class	
2	Lab 2: Linear Regression and Variable Selection Implementing linear regression models using the chosen software Performing variable selection using stepwise regression and other techniques Model diagnostics and interpretation: residual analysis, multicollinearity, heteroscedasticity Hands-on exercises on linear regression and variable selection with real-world datasets	PC class	
3	Lab 3: Nonlinear Regression and Optimization Fitting nonlinear regression models using statistical software Implementing optimization techniques for parameter estimation Model assessment and comparison: goodness of fit, AIC, BIC Applying nonlinear models to business datasets	PC class	
4	Lab 4: Generalized Linear Models and Time Series Analysis Implementing logistic regression models for classification problems Time series analysis using autoregressive integrated moving average (ARIMA) models Model evaluation and prediction in time-dependent datasets Case studies and exercises on generalized linear models and time series analysis	PC class	
5	Lab 5: Decision Trees and Ensemble Methods Building decision tree models using the chosen software Ensemble methods: random forests and gradient boosting Evaluating and visualizing decision trees Applying classification models to business scenarios	PC class	
6	Lab 6: Neural Networks and Deep Learning Implementing neural networks using libraries such as TensorFlow or Keras Training and tuning neural networks for business applications Visualizing neural network architectures and performance Hands-on exercises on neural networks and deep learning	PC class	
7	Lab 7: Model Interpretation and Explainable AI Interpreting linear and nonlinear models: coefficient analysis, hypothesis testing Explainable AI techniques: feature importance, SHAP values Evaluating model interpretability and trade-offs	PC class	
8	Lab 8: Handling Missing Data and Outliers Techniques for handling missing data: imputation methods, deletion strategies Detecting and dealing with outliers in business datasets	PC class	
9	Lab 9: Panel Data Analysis and Fixed Effects Models Panel data analysis using fixed effects models Implementing fixed effects models using statistical software	PC class	
10	Lab 10: Advanced Nonlinear Models Implementing advanced nonlinear models: exponential growth models, power law models Nonlinear regression analysis and parameter estimation techniques	PC class	
11	Lab 11: Classification Models and Performance Metrics Implementing logistic regression models for classification problems Performance evaluation metrics: accuracy, precision, recall, F1-score	PC class	

12	Lab 12: Model Evaluation and Cross-Validation Model evaluation techniques: train-test split, k-fold cross-validation Comparing and selecting models based on performance measures	PC class	
13	Lab 13: Time Series Forecasting and ARIMA Models Implementing time series forecasting using ARIMA models Model evaluation and accuracy assessment in time series forecasting	PC class	
14	Lab 14: Real-world Applications and Case Studies Applying linear and nonlinear models to real-world business scenarios Case studies and discussions on the application of linear and nonlinear models in various industries	PC class	

Bibliography

- Hastie, Trevor, Robert Tibshirani, and Martin Wainwright. 2021. Statistical Learning with Sparsity: The Lasso and Generalizations. CRC Press.
- Agresti, Alan, and Barbara Finlay. 2021. Statistical Methods for the Social Sciences. 5th ed. Pearson.
- Brockwell, Peter J., and Richard A. Davis. 2016. Introduction to Time Series and Forecasting. 3rd ed. Springer.
- Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. 2016. Deep Learning. MIT Press.
- www.quantlet.de
- www.quantinar.com

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C) L/P(L/P)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Tests	10.00
10.2. L/P(L/P)	Attendance at course and seminars and involvement in discussing issues	Number of course and seminar attendance and interventions Tests	20.00
10.3. Final assessment	PROJECT	Presentation	70.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. The project can be done alone or in groups of up to 4 masters students. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
01/07/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Applied Mathematics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	English
1.9. Academic year	2024-2025

2. Information on the discipline

2.1. Name	**Optimization and Simulation Methods for Analytics**								
2.2. Code									
2.3. Year of study	**2**	2.4. Semester	**1**	2.5. Type of assessment	**V**	2.6. Status of the discipline	**A**	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)	**prof.univ.dr. Cristinca FULGA**	fulga@csie.ase.ro
	S(S)	**prof.univ.dr. Cristinca FULGA**	fulga@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	2.00
		S(S)	1.00
3.3. Total hours from curriculum	42.00	of which	
		C(C)	28.00
		S(S)	14.00
3.4. Total hours of study per semester (ECTS*25)	150.00		
3.5. Total hours of individual study	108.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	15.00
Preparation of seminars, assignments, portfolios and essays	15.00
Tutorials	2.00
Examinations	2.00
Other activities	34.00

4. Prerequisites

4.1. of curriculum	● Basic Statistics ● Probability Theory
4.2. of competences	● Excel

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the S(S)	The seminars will be held in rooms with Internet access and multimedia teaching equipment

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through optimization and simulation methods for operations analytics.
7.2. Specific objectives	• On successful completion of this course the Master Student (MS) will have a deep understanding of the optimization and simulation methods and will be able to use them in business analytics. • MS will be able to understand the characteristics of different types of problems, to construct correct models of current business problems and choose and use the correct optimization and simulation approach. • From the viewpoint of communicating abilities, personal and academic, there will be progress in developing MS's critical thinking and capacity of objective analysis of current business problems.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction. Part I. Optimization methods in settings with low uncertainty. General presentations of optimization methods developed to optimize real, non-simulated systems. Examples of optimization models for real-life problems.	Lecture based on multimedia presentations and interaction with students.	Previous study of the indicated bibliography.
2	Linear Programming (LP). • Revision of LP mathematical solution techniques. • Real-life resource allocation problem, optimization with Solver, and alternative data inputs. • Matching demand and supply across a network – Network optimization.	Idem	Idem
3	Mixed Integer Linear Programming (MILP). • Modelling structures using Mixed Integer Programming. • Types of MILP problems. • Case Studies in Integer Programming.	Idem	Idem
4	Part II. Optimization in settings with high uncertainty and simulation methods. • Decision making in low-uncertainty versus high-uncertainty settings. Case study. • Simulating uncertain outcomes. • Interpreting and visualizing simulation results.	Idem	Idem
5	Simulation methods. • Generating pseudo-random numbers. • Sampling from general distributions. The Inverse Transform, the Composition, and the Acceptance-Rejection methods.	Idem	Idem
6	Generating from commonly used distributions. • Generating continuous random variables. • Generating discrete random variables.	Idem	Idem
7	Random vector generation. • Vector Acceptance-Rejection Method. • Generating Variables from a Multinormal Distribution.	Idem	Idem

	• Generating Uniform Random Vectors Over a Simplex.		
8	Generating Poisson processes. • Generating a homogeneous / nonhomogeneous Poisson process. • Simulating a two-dimensional / *n*-dimensional Poisson process.	Idem	Idem
9	The Discrete Event simulation approach • Simulation via Discrete Events. • The general framework and key elements in a discrete event simulation. • Case study: Single-server queueing system.	Idem	Idem
10	• Statistical Analysis of Simulated Data. The sample mean and sample variance. Interval estimates of a population mean. The Bootstrapping technique for estimating Mean Square Errors. • Statistical Validation Techniques. Goodness of fit tests.	Idem	Idem
11	Variance Reduction Techniques • Stratified Sampling. • Applications of Stratified Sampling: Analysing systems having Poisson arrivals, computing multidimensional integrals of monotone functions, compound random vectors.	Idem	Idem
12	• Importance Sampling. • Applications of Importance Sampling.	Idem	Idem
13	Simulation in the field of insurance mathematics. • Simulating the compound Poisson risk model. Using Monte Carlo simulation to estimate the probabilities of ruin in the compound Poisson risk model. • Monte Carlo simulation of risk measures: Estimating Value at Risk, and Conditional Value at Risk.	Idem	Idem
14	Summary.	Idem	Idem

Bibliography

1. Josef Kallrath (2021) Business Optimization Using Mathematical Programming, Second Edition, Springer International Series in Operations Research & Management Science, Springer, ISBN: 978-3-030-73236-3.
2. Reuven Y. Rubinstein, Dirk P. Kroese (2016) Simulation and the Monte Carlo Method, Third Edition, Wiley Series in Probability and Statistics, Wiley, ISBN: 978-1-118-63216-1.
3. Sheldon M. Ross (2013) Simulation, Fifth Edition, Academic Press Elsevier, ISBN: 978-0-12-415825-2.
4. Huu Tue Huynh, Van Son Lai, Issouf Soumare (2008) Stochastic Simulation and Applications in Finance with MATLAB Programs, John Wiley & Sons Ltd, Chichester, ISBN 978-0-470-72538-2.
5. Paolo Brandimarte (2014) Handbook in Monte Carlo Simulation. Applications in Financial Engineering, Risk Management, and Economics, Wiley, ISBN 978-0-470-53111-2.

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Linear Programming (LP). • Simplex algorithm — A brief overview. A case study. • Network optimization. Applications.	Applications and Case Studies. Permanent interaction with students.	Previous study of the indicated bibliography.
2	Mixed Integer Linear Programming (MILP). • Case Studies in Integer Programming	idem	idem
3	Generating from commonly used distributions. • Generating continuous classical random variables such as the exponential distribution, Gamma distribution, normal distribution. • Generating discrete random variables. Generating a sequence of independent Bernoulli variables, Poisson random variables, Binomial random variables.	idem	idem
4	• Generating a homogeneous / nonhomogeneous Poisson process. Applications. • Generating a *n*-dimensional Poisson process. Applications.	idem	idem
5	Simulation via Discrete Events. Applications: • Multiple-server queueing system. • Inventory stocking model. • Model for a repair facility.	idem	idem
6	• Importance Sampling. • Applications of Importance Sampling.	idem	idem
7	Simulation in the field of insurance mathematics. Applications.	idem	idem

Bibliography

1. Josef Kallrath (2021) Business Optimization Using Mathematical Programming, Second Edition, Springer International Series in Operations Research & Management Science, Springer, ISBN: 978-3-030-73236-3.
2. Reuven Y. Rubinstein, Dirk P. Kroese (2016) Simulation and the Monte Carlo Method, Third Edition, Wiley Series in Probability and Statistics, Wiley, ISBN: 978-1-118-63216-1.
3. Sheldon M. Ross (2013) Simulation, Fifth Edition, Academic Press Elsevier, ISBN: 978-0-12-415825-2.
4. Huu Tue Huynh, Van Son Lai, Issouf Soumare (2008) Stochastic Simulation and Applications in Finance with MATLAB Programs, John Wiley & Sons Ltd, Chichester, ISBN 978-0-470-72538-2.
5. Paolo Brandimarte (2014) Handbook in Monte Carlo Simulation. Applications in Financial Engineering, Risk Management, and Economics, Wiley, ISBN 978-0-470-53111-2.

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. C(C)	Attendance and involvement in discussing issues	Project Test	10.00
10.2. S(S)	Attendance and involvement in discussing issues	Project Test	30.00
10.3. Final assessment	Verification	Written	60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	To pass the exam the student must achieve at least grade 5 at the written verification.		

Date of listing,
03/02/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and Statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	
1.8. Language of study	
1.9. Academic year	

2. Information on the discipline

2.1. Name	**Bayesian Methods**								
2.2. Code									
2.3. Year of study	**2**	2.4. Semester	**1**	2.5. Type of assessment	**V**	2.6. Status of the discipline	**A**	2.7. Number of ECTS credits	**6**

2.8. Leaders	C(C)		
	S(S)		

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	3.00	of which	
		C(C)	2.00
		S(S)	1.00
3.3. Total hours from curriculum	42.00	of which	
		C(C)	28.00
		S(S)	14.00
3.4. Total hours of study per semester (ECTS*25)	150.00		
3.5. Total hours of individual study	108.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	40.00
Additional documentation in the library, on specialized online platforms and in the field	24.00
Preparation of seminars, labs, assignments, portfolios and essays	40.00
Tutorials	2.00
Examinations	2.00
Other activities	

4. Prerequisites

4.1. of curriculum	● Probability theory and Mathematical Statistics ● Basic Statistics
4.2. of competences	● Statistical software: Excel, R.

5. Conditions

for the C(C)	The courses take pace in rooms with white or blackboards, Internet access and multimedia equipment
for the L/P(L/P)	The seminars take place in rooms with white or blackboards, multimedia equipment, computers having installed appropriate software: Excel, R and IDE RStudio.

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Provide a grounding in Bayesian statistical methods that are relevant in statistical analysis.
7.2. Specific objectives	● To explain the fundamental concepts of Bayesian statistics and use them in computing Bayesian estimators; ● To design, carry out Bayesian analyses, and to interpret the results; ● To be familiar with specific R functions for Bayesian analysis.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction: classical view, the frequency view, the subjective view of a probability, the Bayesian approach, the Bayes theorem, the law of total probability;	1 course Classical presentation and PowerPoint or other electronic support	
2	Review of random variables and probability distributions: discrete random variables; continuous random variables; main discrete probability distributions (Bernoulli, Binomial, Negative Binomial, Poisson); main continuous probability distributions (Uniform, Normal, Gamma); joint distributions; numerical characteristics of distributions; simulation;	2 courses Classical presentation and PowerPoint or other electronic support	Students will read the materials prior to class
3	Likelihood theory and estimation; Bayesian inference methods: prior distributions, posterior distributions, conjugate priors;	2 courses Classical presentation and PowerPoint or other electronic support	Students will read the materials prior to class
4	Bayesian methods for one parameter models: estimating a population proportion, Poisson model, the normal model;	3 courses Classical presentation and PowerPoint or other electronic support	Students will read the materials prior to class
5	Introduction to multiparameter models;	1 course Classical presentation and PowerPoint or other electronic support	Students will read the materials prior to class
6	Markov Chain Monte Carlo simulation methods (Gibbs sampling, Metropolis-Hastings algorithm);	2 courses Classical presentation and PowerPoint or other electronic support	Students will read the materials prior to class
7	Bayesian regression models, Bayesian Hierarchical Models;	2 courses Classical presentation and PowerPoint or other electronic support	Students will read the materials prior to class

8	Written final examination	1 course	

Bibliography

- Cowles, M. K., *Applied Bayesian Statistics With R and OpenBUGS Examples*, Springer, 2013.
- Albert, J., Hu, J., *Probability and Bayesian Modeling*, Chapman and Hall/CRC Press, 2019.
- Hoff, P. D., *A First Course in Bayesian Statistical Methods*, Springer, 2009.
- Gill, J., *Bayesian Methods: A Social and Behavioral Sciences Approach*, 3rd ed, Chapman and Hall/CRC Press, 2015.

Preda, V., *Teoria deciziilor statistice*, Ed. Academiei, 1992.

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Exercises on the probabilities, probability distributions, conditional distributions; summarizing and graphing probability distributions in R; simulation in R;	2 seminars Classical way of solving exercises; use of R statistical software	Students will read the materials prior to class
2	Exercises for deriving posterior distribution for a parameter	1 seminar Classical way of solving exercises; use of R statistical software	Students will read the materials prior to class
3	Exercises on Bayesian inference for one parameter models	1 seminar Classical way of solving exercises; use of R statistical software	Students will read the materials prior to class
4	Markov Chain Monte Carlo simulation methods	1 seminar Use of R statistical software	Students will read the materials prior to class
5	Bayesian regression models (simple and multiple linear regression models, logistic regression, generalized linear models), Bayesian Hierarchical Models	2 seminars Classical way of solving exercises; use of R statistical software	Students will read the materials prior to class
6	Recap	1 seminar Classical way of solving exercises; use of R statistical software	Students will read the materials prior to class

Bibliography

- Cowles, M. K., *Applied Bayesian Statistics With R and OpenBUGS Examples*, Springer, 2013.
- Albert, J., Hu, J., *Probability and Bayesian Modeling*, Chapman and Hall/CRC Press, 2019.
- Hoff, P. D., *A First Course in Bayesian Statistical Methods*, Springer, 2009.

- Gill, J., *Bayesian Methods: A Social and Behavioral Sciences Approach*, 3rd ed, Chapman and Hall/CRC Press, 2015.
- Preda, V., *Teoria deciziilor statistice*, Ed. Academiei, 1992.

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. S(S)	Attendance at seminars and active participation	Counting the number of attendances and noting the active participation	10.00
10.2. S(S)	Homework	Accuracy and completeness of solutions	30.00
10.3. Final assessment	Written final examination	Accuracy and completeness of solutions	60.00
10.4. Modality of grading	Whole grades 1-10		
10.5. Minimum standard of performance	The final grade is calculated as a weighted average of all activities.		

Date of listing,
01/24/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Economic Cybernetics, Statistics and Informatics
1.5. Cycle of studies	Master
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analitics
1.8. Language of study	English
1.9. Academic year	2020-2021

2. Information on the discipline

2.1. Name									
2.2. Code									
2.3. Year of study	**2**	2.4. Semester	**2**	2.5. Type of assessment	**Exam**	2.6. Status of the discipline	**O**	2.7. Number of ECTS credits	**5**

2.8. Leaders	C(C)	**prof.univ.dr. ROMAN Monica Mihaela**	monica.roman@csie.ase.ro
	S(S)	**prof.univ.dr. ROMAN Monica Mihaela**	monica.roman@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	2.00	of which	
		C(C)	1.00
		S(S)	1.00
3.3. Total hours from curriculum	28.00	of which	
		C(C)	14.00
		S(S)	14.00
3.4. Total hours of study per semester (ECTS*25)	125.00		
3.5. Total hours of individual study	97.00		

Distribution of time for individual study	
Study by the textbook, lecture notes, bibliography and student's own notes	20.00
Additional documentation in the library, on specialized online platforms and in the field	25.00
Preparation of seminars, labs, assignments, portfolios and essays	25.00
Tutorials	10.00
Examinations	17.00
Other activities	0

4. Prerequisites

4.1. of curriculum	
4.2. of competences	

5. Conditions

for the C(C)	Room equipped with computer, internet access, zoom application
for the S(S)	Room equipped with computer, internet access, zoom application

6. Acquired specific competences

	C1	Using the concepts, theories, principles and methods for investigating the economic phenomena and processes

7. Objectives of the discipline

7.1. General objective	Developing critical thinking skills and understanding the role of ethics in relation to research activities and data science
7.2. Specific objectives	Understanding, acquiring and implementing an ethical research framework in data science

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction to research ethics in Data science. Concepts, definitions and fundamental principle	Lecture	
2	Ethics and integrity in scientific research	Lecture	
3	Publishing ethics, plagiarism, anti-plagiarism software	Lecture	
4	Ensuring the normative framework of ethics and academic integrity Ethics in the protection and use of data.	Lecture	
5	IT security policy in the university environment. The normative framework of data protection. GDPR regulation	Lecture	
6	Ethics in social media and mobile data. Ethics and artificial intelligence.	Lecture	
7	The national and international normative framework of ethics in data science	Lecture	

Bibliography

- Code of Ethics and Professional Conduct. Association for Computing Machinery. DOI=https://www.acm.org/about-acm/acm-code-of-ethics-and-professional-conduct
- Macfarlane, B. (2010). *Researching with integrity: The ethics of academic enquiry*. Routledge.
- Markham, A. N., Tiidenberg, K., & Herman, A. (2018). Ethics as methods: doing ethics in the era of big data research—introduction. *Social Media+ Society*, *4*(3), 2056305118784502.
- O'Leary, D. E. (2016). Ethics for big data and analytics. *IEEE Intelligent Systems*, *31*(4), 81-84.
- Taylor, L. (2016). No place to hide? The ethics and analytics of tracking mobility using mobile phone data. *Environment and Planning D: Society and Space*, *34*(2), 319-336.

- Taylor, L. (2016). The ethics of big data as a public good: which public? Whose good?. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *374*(2083), 20160126.
- Shaw, J. (2019). Artificial intelligence and Ethics. *Harvard Magazine*, *30*.

8.2. S(S)		Teaching/Work methods	Recommendations for students
1	Introduction to research ethics in Data science. Concepts, definitions.	2 Interactive seminars	
2	Principles of ethics in research and Data science	2 Interactive seminars	
3	Deviations from ethical norms regarding research. Anti-plagiarism check of academic papers	2 Interactive seminars	
4	Practical aspects regarding good conduct in the elaboration of scientific research papers by students	2 Interactive seminars	
5	Academic integrity. Good practices and deviations from the norms of conduct in the university environment.	2 Interactive seminars	
6	Ethical practices in Data science	2 Interactive seminars	
7	Recap. Preparation for assessment	2 Interactive seminars	

Bibliography

- Code of Ethics and Professional Conduct. Association for Computing Machinery. DOI=https://www.acm.org/about-acm/acm-code-of-ethics-and-professional-conduct
- Macfarlane, B. (2010). *Researching with integrity: The ethics of academic enquiry*. Routledge.
- Markham, A. N., Tiidenberg, K., & Herman, A. (2018). Ethics as methods: doing ethics in the era of big data research—introduction. *Social Media+ Society*, *4*(3), 2056305118784502.
- O'Leary, D. E. (2016). Ethics for big data and analytics. *IEEE Intelligent Systems*, *31*(4), 81-84.
- Taylor, L. (2016). No place to hide? The ethics and analytics of tracking mobility using mobile phone data. *Environment and Planning D: Society and Space*, *34*(2), 319-336.
- Taylor, L. (2016). The ethics of big data as a public good: which public? Whose good?. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *374*(2083), 20160126.
- Shaw, J. (2019). Artificial intelligence and Ethics. *Harvard Magazine*, *30*.

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9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

Course content is consistent with expectations epistemic community representatives and representatives of the business requirements in the field.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. S(S)	Seminar attendance	Homework assessment and seminar answers	20.00
10.2. S(S)	Knowledge assesment	Written test	20.00
10.3. Final assessment	Knowledge assesment	Oral evaluation	60.00
10.4. Modality of grading	Integer scores 1-10		
10.5. Minimum standard of performance	•		

Date of listing,

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Economic Cybernetics, Statistics and Informatics
1.3. Departments	Department of Statistics and Econometrics
1.4. Field of study	Cybernetics and statistics
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Applied Data Analytics
1.8. Language of study	Romanian
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	Scientometrics and Bibliometrics								
2.2. Code									
2.3. Year of study	**1**	2.4. Semester	**1**	2.5. Type of assessment	**End of course assessment**	2.6. Status of the discipline	A	2.7. Number of ECTS credits	**7**

2.8. Leaders	C(C)	**Prof. Univ. Dr. ANDREI Tudorel**	andrei.tudorel@csie.ase.ro
	L/P(L/P)	**Prof. Univ. Dr. ANDREI Tudorel**	andrei.tudorel@csie.ase.ro

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		L/P(L/P)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		L/P(L/P)	28.00
3.4. Total hours of study per semester (ECTS*25)	100.00		
3.5. Total hours of individual study	44.00		
Distribution of time for individual study			
Study by the textbook, lecture notes, bibliography and student's own notes	15.00		
Additional documentation in the library, on specialized online platforms and in the field	10.00		
Preparation of seminars, labs, assignments, portfolios and essays	10.00		
Tutorials	2.00		
Examinations	2.00		
Other activities	5.00		

4. Prerequisites

4.1. of curriculum	● Time Series Analysis and ● Nonparametric Statistics ● Probability theory and Mathematical Statistics ● Bayesian Methods
4.2. of competences	● Statistical software: Eviews, SPSS, R

5. Conditions

for the C(C)	The lectures will be held in rooms with Internet access and multimedia teaching equipment
for the L/P(L/P)	The seminars will be conducted in rooms with computers which have appropriate software: R, Eviews, Tableau and videoprojector

6. Acquired specific competences

PREFESSIONAL	C3	Application of statistical software in data collection, use and dissemination.
PREFESSIONAL	C4	Development of procedures for organization and monitoring of statistical researches with applications in social economical field.

7. Objectives of the discipline

7.1. General objective	Providing the necessary tools for the analysis through quantitative methods of investment projects in the spatial econometrics
7.2. Specific objectives	• Understanding the role and the importance of main spatial indicators in research area; • Using spatial econometrics and territorial indicators in research projects

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introduction in spatial econometrics and the role of spatial econometrics models	Lecture based on multimedia presentations and interaction with students.	
2	General presentation of the Spatial Econometric Models	Idem	
3	Spatial autoregressive regression models	Idem	
4	Model estimation of the parameters	Idem	
5	Estimates of dispartion for the parameters	Idem	
6	Log-determinants and Spatial Weights	Idem	
7	Model Comparisons (spatial vs non-spatial models)	Idem	
8	Spatiotemporal and Spatial Models	Idem	
9	Spatial Econometrics Interaction Models	Idem	
10	Monte – Carlo Simulation in Spatial Econometrics	Idem	
11	Matrix Exponential Spatial Models	Idem	
12	Limited Dependent Variable Spatial Models	Idem	
13	Calibration in Spatial Econometrics	Idem	
14	Applications	Idem	

Bibliography

Ferrari, C., Bottasso, A., et. all, Economic Role of Transport Infrastructure: Theory and Models, Elsevier, 2018
Pierre-Philippe Combes, Laurent Gobillon, Handbook of Regional and Urban Economics, ScienceDirect, 2015
Arbia, Giuseppe. 2014. *A Primer for Spatial Econometrics: With Applications in R*. Palgrave Macmillan.

8.2. L/P(L/P)		Teaching/Work methods	Recommendations for students
1	Introduction in spatial econometrics and the role of spatial econometrics models	Lecture based on multimedia presentations and interaction with students.	
2	General presentation of the Spatial Econometric Models	Idem	
3	Spatial autoregressive regression models	Idem	
4	Model estimation of the parameters	Idem	
5	Estimates of dispartion for the parameters	Idem	
6	Log-determinants and Spatial Weights	Idem	
7	Model Comparisons (spatial vs non-spatial models)	Idem	
8	Spatiotemporal and Spatial Models	Idem	
9	Spatial Econometrics Interaction Models	Idem	
10	Monte – Carlo Simulation in Spatial Econometrics	Idem	
11	Matrix Exponential Spatial Models	Idem	
12	Limited Dependent Variable Spatial Models	Idem	
13	Calibration in Spatial Econometrics	Idem	
14	Applications	Idem	

Bibliography

Ferrari, C., Bottasso, A., et. all, Economic Role of Transport Infrastructure: Theory and Models, Elsevier, 2018
Pierre-Philippe Combes, Laurent Gobillon, Handbook of Regional and Urban Economics, ScienceDirect, 2015
Arbia, Giuseppe. 2014. *A Primer for Spatial Econometrics: With Applications in R*. Palgrave Macmillan.

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The proposed course and seminar topics are consistent with national and international literature, as well as employers' requirements both in terms of theoretical knowledge and software packages used.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. L/P(L/P)	Written test	Written assessment	10.00
10.2. L/P(L/P)	Written test	Written assessment	10.00
10.2. L/P(L/P)	Individual project	Presentation of the project	20.00
10.3. Final assessment	Written exam		60.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	Project presentation during the seminar. To pass the exam the student must achieve at least grade 5 at the written exam		

Date of listing,
4/6/2023

Signature of the discipline leaders,

Date of approval in the department

Signature of the Department Director,

Signature of the Dean,