DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KOVE FHI/ IIB21870/22	**Title of course:** Advanced Analytical Methods I
Type, load and method of teaching activities: **Form of course:** Lecture **Recommended load of course (number of lessons):** **Per week: Per course:** 16s **Method of study:** present	
Number of credits: 12	
Recommended semester/trimester of study: 1.	
Degree of study: III.	
Prerequisites:	
Requirements to complete the course: 15 % - active participation on lectures 25 % - semester project processed in statistical software and/or free software environment (e.g. R, Python, GAMS) 25 % - presentation of the semester project 35 % - final exam	
Student workload: 312 hours Distribution of study load Lectures participation: 16 hours Preparation for the lectures: 80 hours Elaboration of the semester project: 128 hours Preparation for the final exam: 88 hours	
Teaching results: In particular, students will acquire the following abilities: - knowledge of economic data analysis, - knowledge of the construction of mathematical models, Students will acquire in particular the following skills: - ability to construct and use mathematical models, - solving economic problems using adequate software. Students will acquire the following competencies: - skills and competences in the creation of mathematical models using adequate software.	
Indicative content: The course is focused on the creation of their own mathematical models usable in economic practice. Based on knowledge from economic theory, the principles of creating mathematical models are explained. Attention is paid to the issue of mathematical economics and its analysis based on optimization and economic-statistical models. Another area is the use of modern information tools focused on the construction of mathematical models. Software tools (eg R language, Python language, GAMS, Eviews) are used to solve tasks. • Decision theory.	

• Classification of models and methods for solving mathematical models.
• Mathematical programming and alternative ways of solving problems of mathematical programming.
• Modelling of economic systems.
• Modelling in the field of mathematical economics.
• Statistical-econometric modelling.

Support literature:

1. Banerjee, S. (2014). Mathematical Modeling: Models, Analysis and Applications (1st ed.). Chapman and Hall/CRC. https://doi.org/10.1201/b16526
2. Williams, H. P. (2013). Model building in mathematical programming. John Wiley & Sons.
3. Neogy, S. K., Bapat, R. B. and Dubey, D. (Eds.). (2018). Mathematical Programming and Game Theory. Springer Singapore.
4. Steele, Katie and H. Orri Stefánsson, "Decision Theory", The Stanford Encyclopedia of Philosophy (Winter 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2020/entries/decision-theory/>.
5. Davendra, D. and Zelinka, I. (2016). Self-organizing migrating algorithm. New optimization techniques in engineering.
6. Greene, W.H.: Econometric Analysis, 8th ed. Pearson, 2018

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 36

A	B	C	D	E	FX
55.56	33.33	11.11	0.0	0.0	0.0

Lecturer: prof. Mgr. Juraj Pekár, PhD.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KŠ FHI/IID22620/21	**Title of course:** Advanced Analytical Methods II
Type, load and method of teaching activities: **Form of course:** Lecture **Recommended load of course (number of lessons):** **Per week: Per course:** 16s **Method of study:** present	
Number of credits: 12	
Recommended semester/trimester of study: 2.	
Degree of study: III.	
Prerequisites:	
Requirements to complete the course: 15 % - active participation on lectures 25 % - semester project processed in statistical software and/or free software environment (e.g. SAS, SPSS, R, Python) 25 % - presentation of the semester project 35 % - final exam	
Student workload: Total study load (in hours): 312 hours Distribution of study load Lectures participation: 16 hours Preparation for the lectures: 80 hours Elaboration of the semester project: 128 hours Preparation for the final exam: 88 hours	
Teaching results: After successful completion of this course, students will understand a relatively large set of statistical methods falling under general and generalized linear models in a wide context and will be able to apply them effectively in their scientific work. In particular, students will acquire the following abilities: − Students will get acquainted with the unifying conceptual framework of the most frequently used statistical methods in the field of Data Science, such as t-test of two population means, ANOVA, ANCOVA and regression analysis, − Students will acquire knowledge for a comprehensive analysis of the impact of quantitative and qualitative factors on the target variable modelled through general and generalized linear models. Students will acquire in particular the following skills: - Students will be able to use the appropriate type of sum of squares to adequately evaluate the significance of the influence of factors on the target variable. - They will be able to choose the appropriate type of coding of categorical factors to solve the relevant scientific question and correctly interpret the estimated parameters of general and generalized linear models for the chosen type of coding.	

- Students will learn the general procedures of testing and estimating of estimable linear combinations and gain the ability to apply them through the statements LSMEANS, CONTRAST, ESTIMATE and LSMESTIMATE in the SAS programming language.
- They will acquire the skill to use the PROC GLM, PROC MIXED, PROC LOGISTIC, PROC GENMOD a PROC GLIMMIX procedures in SAS software and to make interventions in the SAS programming code in order to be able to use these procedures effectively in their scientific activities in solving specific tasks, or for deeper analysis.
Students will acquire the following competencies:
− Students will be able to analyse complex relationships between economic phenomena through general and generalized linear models (including mixed models).
− Students will learn to adequately apply the analysis of marginal means and contrast analysis, thanks to which they can make full use of the potential of statistical modelling in their empirical research.

Indicative content:
1. lecture: ANOVA, ANCOVA and linear regression in the form of general linear models. Method of generalized inverse. Parameter estimation in general linear models. Analysis of marginal means (LS means). Multiple comparison methods (Post hoc tests).
2. lecture: Estimable functions. General linear hypothesis. Testing linear hypothesis. Analysis of contrasts. Using of estimable functions in an analysis of contrast and in prediction.
3. lecture: Logistic regression and generalized linear models. Analysis of LS means and contrasts in logistic regression and generalized linear models.
4. lecture: General linear mixed models and generalized linear mixed models. Analysis of LS means and contrasts in general and generalized linear mixed models.

Support literature:
1. Searle, S. R., Gruber, M. H. J. (2017). Linear Models. 2nd ed. John Wiley & Sons.
2. Littell, R. C., Stroup, W. W., Freund, R. J. (2010). SAS for Linear Models. 4th ed. Cary, NC: SAS Institute Inc.
3. Kim, K., Timm, N. (2006). Univariate and Multivariate General Linear Models: Theory and Applications with SAS. Chapman and Hall/CRC.
4. Rutherford, A. (2001). Introducing ANOVA and ANCOVA: a GLM Approach. Sage.
5. Agresti, A. (2015). Foundations of Linear and Generalized Linear Models. New York: John Wiley & Sons.
6. Chen, H. (2008). Using ESTIMATE and CONTRAST Statements for Customized Hypothesis Tests. SAS Institute Inc. Paper SP09-2008.
7. Fox, J. (2015). Applied Regression Analysis and Generalized Linear Models. New York: Sage Publications.
8. Haans, A. (2018). Contrast analysis: A tutorial. Practical Assessment, Research, and Evaluation, 23(1), 9.
9. Lenth, R., V. (2016). Least-squares means: the R package lsmeans. Journal of Statistical Software. 69(1), 1-33.
10. SAS Institute Inc. (2017). The GLM Procedure. In SAS/STAT® 14.3 User's Guide. Cary, NC: SAS Institute Inc.
11. Stroup, W. W., Milliken, G. A., Claassen, E. A., Wolfinger, R. D. (2018). SAS for Mixed Models: Introduction and Basic Applications. Cary, NC: SAS Institute.
12. Šoltés, E., Zelinová, S., Bilíková, M. (2019). General Linear Model: An Effective Tool for Analysis of Claim Severity in Motor Third Party Liability Insurance. Statistics in Transition: new Series. 20(4), 13-31.

13. Šoltés, E., Vojtková, M., & Šoltésová, T. (2018). Work Intensity of Households: Multinomial Logit Analysis and Correspondence Analysis for Slovak Republic. Statistika: Statistics and economy journal, 98(1), 19-36.
14. Hummel, R. M., Claassen, E. A., & Wolfinger, R. D. (2021). JMP for Mixed Models. Cary, NC: SAS Institute.
15. Kuznetsova. A.. Brockhoff. P. B.. & Christensen. R. H. B. (2017). lmerTest package: tests in linear mixed effects models. Journal of Statistical Software. 82(13).
16. Schad, D. J., Vasishth, S., Hohenstein, S., & Kliegl, R. (2020). How to capitalize on a priori contrasts in linear (mixed) models: A tutorial. Journal of Memory and Language, 110, 104038.
Literature will be continuously updated with the latest scientific and professional titles.

Syllabus:

Language whose command is required to complete the course:
Slovak

Notes:

Assessment of courses
Total number of evaluated students: 39

A	B	C	D	E	FX
20.51	25.64	10.26	5.13	30.77	7.69

Lecturer: prof. Mgr. Erik Šoltés, PhD.

Date of the latest change: 07.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KAI FHI/IIA22550/22	**Title of course:** Conceptual Modeling
Type, load and method of teaching activities: **Form of course:** Lecture **Recommended load of course (number of lessons):** **Per week: Per course:** 16s **Method of study:** present	
Number of credits: 8	
Recommended semester/trimester of study:	
Degree of study: III.	
Prerequisites:	
Requirements to complete the course: 40 % assignments – individual project 60 % final exam	
Student workload: 8 credits x 26 hours = 208 hours Distribution of study load Lectures and seminar participation: 16 hours Preparation for seminars: 16 hours Written assignments: 76 hours Final exam preparation: 100 hours	
Teaching results: In particular, students acquire the following abilities: The aim of the course is to provide basic theoretical knowledge and practical competencies for building the knowledge base of modeling techniques and the development of skills in mapping real events and structures that form the subject of scientific research. Further development of the ability to analyze and present ideological solutions to the researched issues at the conceptual level. The domain areas for the application of acquired knowledge and skills is the area of the corporate agenda in both components, i. both structural and procedural.. Students acquire in particular the following skills: The student will: a) understand the principles of creating conceptual models, b) know the methodology and relevant tools for analyze of problems and proposed solutions using conceptual modeling techniques Students will acquire the following competencies: (a) design of conceptual models describing the investigated structures, phenomena or proposed solutions from pre-defined relevant perspectives so that they can serve for the purposes of subsequent analysis or presentation of the proposed solutions; (b) apply different methods using existing methodologies and conceptual models for the analysis of the systems examined; c) be able to use tools for creating of conceptual models in practice	
Indicative content:	

Introduction to terminology and theory of conceptual modeling;
2. The role and place of conceptual models in system analysis and problem solving;
3. Principles of model design;
4. Structure modeling and dynamics modeling, various purposes of modeling, global versus detailed view, static versus dynamic view of the modeled systems;
5. Standards for conceptual modeling;
6. Business modeling;
7. Methodologies of conceptual modeling and analysis;
8. Conceptual modeling tools;
9. The most common mistakes of conceptual modeling.

Support literature:

1. Dimitris Karagiannis, Heinrich C. Mayr, John Mylopoulos (eds.), Domain-Specific Conceptual Modeling: Concepts, Methods and Tools, Springer, 2016.
2. D.W. Embley and B. Thalheim (eds.), The Handbook of Conceptual Modeling: Theory, Practice, and Research Challenges, Springer, 2011.
3. A. Olivé, Conceptual Modeling of Information Systems, Springer, 2007.
4. O. Pastor and J.C. Molina, Model-Driven Architecture in Practice: A Software Production Environment Based on Conceptual Modeling, Springer, 2007.
5. B. Thalheim, Entity-Relationship Modeling: Foundations of Database Technology, Springer, 2000.
6. M.P. Papazoglou, S. Spaccapietra, and Z. Tari (eds.), Advances in Object-Oriented Data Modeling, The MIT Press, 2000.
7. P.P. Chen, J. Akoka, H. Kangassalo, B. Thalheim, Conceptual Modeling: Current Issues and Future Directions, Springer, 1999.
8. D.W. Embley, B.D. Kurtz, and S.N. Woodfield, Object-Oriented Systems Analysis: A Model-Driven Approach, Prentice Hall, 1992.
9. C. Batini, S. Ceri, S.B. Navathe, Conceptual Database Design: An Entity-Relationship Approach, Addison Wesley, 1991.
10. M.L. Brodie, J. Mylopoulos, J.W. Schmidt (eds.), On Conceptual Modelling: Perspectives from Artificial Intelligence, Databases, and Programming Languages, Springer, 1984.

Additional study literature:

"Conceptual Modeling - 40th International Conference, ER 2021, Virtual Event, October 18-21, 2021, Proceedings," A. K. Ghose, J. Horkoff, V. E. S. Souza, J. Parsons, and J. Evermann, Eds., 2021, vol. 13011: Springer, in Lecture Notes in Computer Science, doi: 10.1007/978-3-030-89022-3. [Online]. Available: https://doi.org/10.1007/978-3-030-89022-3
"Conceptual Modeling - 39th International Conference, ER 2020, Vienna, Austria, November 3-6, 2020, Proceedings," G. Dobbie, U. Frank, G. Kappel, S. W. Liddle, and H. C. Mayr, Eds., 2020, vol. 12400: Springer, in Lecture Notes in Computer Science, doi: 10.1007/978-3-030-62522-1. [Online]. Available: https://doi.org/10.1007/978-3-030-62522-1

Syllabus:

Language whose command is required to complete the course:
Slovak

Notes:

Assessment of courses
Total number of evaluated students: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Lecturer: doc. Ing. Martin Mišút, CSc.
Date of the latest change: 30.03.2022
Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KOVE FHI/ IIB21940/22	**Title of course:** Creative Scientific Activity

Type, load and method of teaching activities:
Form of course:
Recommended load of course (number of lessons):
Per week: Per course:
Method of study: present

Number of credits: 60

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:

Student workload:

Teaching results:

Indicative content:

Support literature:

Syllabus:

Language whose command is required to complete the course:

Notes:

Assessment of courses
Total number of evaluated students: 4

ABS	NEABS
100.0	0.0

Lecturer:

Date of the latest change: 30.03.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KOVE FHI/ IIB21860/22	**Title of course:** Decision Models and Game Theory

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 8

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
40 % final paper and continuous testing
60 % final exam

Student workload:
Total study load (in hours): 8 credits x 26 hours = 208 hours
Lectures participation: 16 hours
Preparation for lectures: 52 hours
Final paper preparation: 70 hours
Preparation for the final exam: 70 hours

Teaching results:
In particular, students acquire the following abilities:
- knowledge of various conflict decision-making situations, types of conflicts, decision-making and the possibility of taking an equilibrium strategy in a conflict decision-making situation
- knowledge of a wide range of practical application of game theory models
Students acquire in particular the following skills:
- skills to analyze and solve conflicting decision-making situations
Students will acquire the following competencies:
- - practical skills and competencies with the application of optimization methods in the field of conflict decision-making situations, their analysis and solving

Indicative content:
The course provides the student with the necessary knowledge to implement optimal decisions in conflict situations that occur in the practice of market economy as well as in the life of society. From the analysis of basic conflicts, we move on to the analysis of repeated and iterated conflicts. Possibilities of cooperation and analysis of the advantages of cooperative behavior of subjects are explored. Emphasis is placed on selected practical applications from various economic areas (area of imperfect competition, company location, logistics and others), but also other areas that directly influence the economic decision-making of subjects in areas (political science, international relations, sociology and others).
1, Game and decision theory, utility theory and related paradoxes

2, Two-player games in normal form, two-player games with constant and non-constant sum, basic differences and solutions, possibilities of software solving
3, Normal form games, cooperative solution, possibilities of software solving
4, Evolutionary algorithms for solving normal form games
5, Normal form games, various practical applications
6, Multiplayer games, cooperative and non-cooperative solution
7, Multiplayer games, voting games, demonstrations of various practical applications
8, Repeated games, repeated prisoner's dilemma, possibilities of software solving
9, Extensive form games, tree of game, examples of various practical applications
10, Decision making under risks and uncertainties, games against nature, examples of various practical applications
11, Multi-criteria games, examples of various practical applications
12, Evolutionary games, examples of various practical applications
13, Application of game theory in various fields (summarization)

Support literature:

Gibbons, R. Game theory for applied economics. Princenton University Press, Princenton, 1992
Osborne, M. J. : An Introduction to Game Theory, Oxford University Press, 2004.
Dixit, A., Skeath, S. : Games of Strategy, W.W.Norton, 2004
Friedman, J. W.: Game Theory with Applications to Economics, Oxford University Press, 1991
Osborne, M., Rubinstein, A.: A Course in Game Theory, The MIT Press, 1997
Bierman, H. S., Fernandez, L.: Game Theory with Economic Applications, Addison-Wessley, 1988

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Lecturer: doc. Ing. Zuzana Čičková, PhD.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KOVE FHI/ IIB21955/22	**Title of course:** Dissertation Thesis and its Defense

Type, load and method of teaching activities:
Form of course:
Recommended load of course (number of lessons):
Per week: Per course:
Method of study: present

Number of credits: 40

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:

Student workload:

Teaching results:

Indicative content:

Support literature:

Syllabus:

Language whose command is required to complete the course:

Notes:

Assessment of courses
Total number of evaluated students: 3

A	B	C	D	E	FX	NO	NOd	O	Od
66.67	0.0	33.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Lecturer:

Date of the latest change: 30.03.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KOVE FHI/ IIB21820/22	**Title of course:** Financial and Spatial Econometrics

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 10

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
Writing of projects
Combined final exam

Student workload:
10 credits x 26 hours = 260 hours
Distribution of study load
260 hours
16 hours participation in consultations
44 hours preparation for consultations
100 hours of project processing
100 hours exam preparation

Teaching results:
Upon successful completion of the course, students will acquire the following knowledge:
- knowledge of the possibilities of modeling the volatility of financial time series as well as knowledge of econometric techniques for modeling data with respect to their location in geographical space.

Upon successful completion of the course, students will acquire the following skills:
- ability to use advanced techniques of financial and spatial econometrics,
- practical skills associated with the use of selected econometric software, such as R software and GeoDa.

Upon successful completion of the course, students will acquire the following competencies:
- competencies associated with the use of models and methods of financial and spatial econometrics in solving specific financial / economic problems.

Indicative content:
The aim of teaching the subject in the third level of study is to provide extended knowledge about the possibilities of using financial and spatial econometric approaches in the analysis of economic processes using econometric software R and GeoDa software.
1. Volatility models. Autoregressive conditional heteroskedasticity and stochastic volatility. One-dimensional and multidimensional models.

2. Spatial econometric models for cross-sectional and panel data, spatial autocorrelation, spatial heterogeneity.
3. Application of financial and spatial econometric instruments in the analysis of the linkages among financial markets or among different spatial units. Analysis of "spillover" effects.

Support literature:

1. BAUWENS, L., HAFNER, C., LAURENTET, S. 2012. Handbook of Volatility Models and Their Applications. New Jersey: John Wiley & Sons.
2. WANG, P. 2009. Financial Econometrics. New York: Routledge.
3. CHOCHOLATÁ, M. 2016. Different approaches to stock market linkages : evidence from CEE-3 countries. In Advances in Applied Business Research: the L.A.B.S. initiative. New York: Nova Science Publishers, 49-70.
4. CHOCHOLATÁ, M. - FURKOVÁ, A. 2017. Does the location and institutional background matter in convergence modelling of the EU regions? Central European Journal of Operations Research, 25(3), 679-697.
5. ARDIA, D., BLUTEAU, K., BOUDT, K., CATANIA, L. 2018. Forecasting risk with Markov-switching GARCH models: A large-scale performance study. International Journal of Forecasting, 34 (4), 733–747.
6. ANSELIN, L., REY, S. J. 2014. Modern Spatial Econometrics in Practice. Chicago: GeoDa Press LLC.
7. CHI, G., ZHU, J. 2019. Spatial Regression Models for the Social Sciences. Thousand Oaks, CA: SAGE Publications.
8. ELHORST, J. P. 2014. Spatial Econometrics. From Cross-Sectional Data to Spatial Panels. Heidelberg: Springer-Verlag.
9. GENIAUX, G., MARTINETTI, D. 2018. A new method for dealing simultaneously with spatial autocorrelation and spatial heterogeneity in regression models. Regional Science and Urban Economics, 72, 74–85.

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 7

A	B	C	D	E	FX
42.86	0.0	14.29	0.0	28.57	14.29

Lecturer: doc. Ing. Michaela Chocholatá, PhD.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KAI FHI/IIA22500/22	**Title of course:** Fuzzy Logic in Data Science

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 8

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
20% seminar work,
20% short essay, resp. project,
60% written exam.

Student workload:
208 hours
Participation in lectures - 16 hours
Individual consultations - 42 hours
Project preparation and implementation - 100 hours
Preparation for the final exam - 50 hours.

Teaching results:
Semantic uncertainty or fuzziness is a key feature of many real-world tasks. Completion of this course presupposes the development of key competencies and skills for effective handling this type of uncertainty and solving diverse data science and decision-support tasks.
Knowledge and understanding Students will be able to understand the advanced concepts of computing with words by fuzzy sets and fuzzy logic and aggregation functions. This knowledge is a keystone for task ranging from collecting uncertain data to interpreting mined information linguistically.
Competence Based on the above knowledge, students will be able to model tasks such as: data querying by linguistic terms, modelling flexible dependencies, interpret mined information by short-quantified sentences, classify entities, evaluate entities by logic scores, recommend the most suitable entities and so on.
Skills In this course students will acquire skills related top handling fuzziness related to the data collection, processing and interpreting mined information from diverse data types. These skills are relevant for informing decision makers about the developments in a concise and understandable way.

Indicative content:
1. Theory of fuzzy sets and fuzzy logic
2. Type II fuzzy sets and intuitionistic fuzzy sets
3. Modelling hesitance in expert's knowledge
4. Distances and similarities between concepts without clear boundaries

5. Symmetric and asymmetric logic aggregation functions in evaluating entities
6. Fuzzy measures and capacities in decision making
7. Flexible recommender systems
8. Fuzzy rule-based systems and their explainability and interpretability
9. Theory and features of fuzzy cognitive maps
10. Soft computing evaluation logic in decision support
11. Pattern recognition and classification by fuzzy logic
12. Flexible querying and answering systems
13. Linguistically summarizing developments in data (classic, temporal and time series)

Support literature:

1. Alonso J. M., Castiello, C., Magdalena, L., Mencar, C.: Explainable Fuzzy Systems: Paving the way from Interpretable Fuzzy Systems to Explainable AI Systems. Springer. Cham, 2021.
2. Bojadziev, G., Bojadziev, M.: Fuzzy logic for business, finance and management. World Scientific Publishing, London, 2007.
3. Bouchon-Meunier B. Strengths of Fuzzy Techniques in Data Science. In: Kosheleva O., Shary S., Xiang G., Zapatrin R. (eds). Studies in Computational Intelligence, vol 835. Springer, Cham, 2020.
4. Dujmović, J. Soft Computing Evaluation Logic: The LSP Decision Method and Its Applications, IEEE Press and Wiley, 2018.
5. Grabisch, M., Marichal, J.-L., Mesiar, R., Pap, E.: Aggregation Functions. Encyclopedia of Mathematics and its Applications, Cambridge University Press, Cambridge, 2009.
6. Hudec, M.: Fuzziness in Information Systems - How to Deal with Crisp and Fuzzy Data in Selection, Classification, and Summarization. Springer, Cham, 2016.
7. Wang, X, Ruan, D, Kerre, E.E.: Mathematics of Fuzziness. Springer, Berlin Heidelberg, 2009.
8. Xu, Z.: Hesitant fuzzy set theory. Springer, Cham, 2014.
9. Xu, Z.: Linguistic decision making – Theory and Methods. Springer, Berlin Heidelberg, 2012.

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 1

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Lecturer: doc. Dr. Ing. Miroslav Hudec

Date of the latest change: 30.03.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KOVE FHI/ IIB21840/22	**Title of course:** Macroeconometrics

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 8

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
projects and presentations 40%, final paper 60%

Student workload:
student workload: 208 h, participation in lectures 16 h, elaboration of projects and presentations 68 h, elaboration of paper 124 h

Teaching results:
The graduate of the course will acquire the necessary apparatus necessary for the implementation of current econometric research in the field of macroeconomic analysis.
Skills:
Students will be able to use tools used in empirical macroeconomic and econometric analyzes, such as the formulation of dynamic general equilibrium models (DSGE); application of DSGE model solution tools such as recursive programming, Markov chains, state space, Kalman filter, Bayesian estimation; Bayesian estimation of vector autoregression models.
Findings:
A complex apparatus used in empirical macroeconomic and econometric analysis.
Competences:
Students will be able to conduct their own research in the macroeconomic field at the highest level.

Indicative content:
1. Markov chains.
2. Stochastic difference equations, Kalman filter.
3. Dynamic programming with stochastic term, linear-quadratic dynamic programming.
4. Search models.
5. Markov chains Monte Carlo, Metropolis algorithm, Gibbs sampler.
6. Bayesian estimation and analysis of econometric models.
7. Bayesian estimation of VAR models.
8. Bayesian estimation of RBC and DSGE models.

Support literature:
1. Bagliano, F.C., Bertola, G.: Models for Dynamic Macroeconomics. Oxford University Presss, 2004

2. Bårdsen, G., Eitrheim, Ø., Jansen, E.S., Nymoen, R.: The Econometrics of Macroeconomic Modelling, Oxford, 2005
3. Chan, J., Koop, G., Poirier, D., Tobias, J.: Bayesian Econometric Methods, Cambridge University Press, 2019
4. Durbin, J., Koopman, S.J.: Time Series Analysis by State Space Methods, Oxford University Press, Oxford, 2001.
5. Geweke, J.: Contemporary Bayesian Econometrics and Statistics, Wiley-Interscience, 2005
6. Ljungqvist, L., Sargent, T.J.: Recursive Macroeconomic Theory. 4. vydanie. MIT Press, 2018
7. Sargent, T.J., Stachurski, J.: Quantitative Economics in Discrete and Continous Time. quantecon.org, 2020
8. Stachurski, J.: Economic Dynamics: Theory and Computation. MIT Press, 2009
9. Szomolányi, K., Lukáčik, M., Lukáčiková, A.: Impact of Terms-of-Trade on Slovakia, the Czech Republic, and Croatia in the Short Run. Naše gospodarstvo/Our economy: Journal of Contemporary Issues in Economics and Business, roč. 63., č.1, 2017, s. 3-13. doi.org/10.1515/ngoe-2017-0001

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 1

A	B	C	D	E	FX
0.0	100.0	0.0	0.0	0.0	0.0

Lecturer: doc. Ing. Karol Szomolányi, PhD., prof. Ing. Martin Lukáčik, PhD.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KOVE FHI/ IIB21850/22	**Title of course:** Microeconometrics
Type, load and method of teaching activities: **Form of course:** Lecture **Recommended load of course (number of lessons):** **Per week: Per course:** 16s **Method of study:** present	
Number of credits: 10	
Recommended semester/trimester of study:	
Degree of study: III.	
Prerequisites:	
Requirements to complete the course: projects and presentations 40%, final paper 60%	
Student workload: student workload: 260 h, participation in lectures 16 h, elaboration of projects and presentations 88 h, elaboration of a final paper 156 h	
Teaching results: Upon successful completion of this course, students will have knowledge of scientific methods of microeconometric approach to the analysis and modelling of economic phenomena and processes and should be able to use econometric techniques and procedures for different types of data. Students will acquire practical skills and competencies with the application of microeconometric methods in the analysis of economic problems at the scientific level.	
Indicative content: The course is aimed at: - explaining the principles of quantification of economic processes using econometric models and methods; - creating and verifying various types of economic hypotheses; - mathematical justification of parameter estimation methods such as generalized least squares method, maximum likelihood method, generalized method of moments in specific cases; - presentation and possibilities their applications for different types of economic data 1. Causal and Noncausal Models 2. Linear panel models, Dynamic panel models 3. Models of nonlinear effects, Panel models of binary selection 4. Models of arranged options, Computable data models 5. Stratified and Clustered Samples, Bootstrap Methods 6. Transition Data: Survival Analysis 7. Models of Multiple Hazards 8. Stratified and Clustered Samples, Treatment Evaluation	
Support literature:	

1. Cameron, A.C., Trivedi, P.K.: Microeconometrics: Methods and Applications, Cambridge University Press, 2005
2. Wooldridge, J.: Econometric Analysis of Cross Section and Panel Data, MIT Press, 2010
3. Greene, W.H., Hensher, D.: Modeling Ordered Choices, Cambridge University Press, 2010
4. Pesaran, M.H.: Time Series and Panel Data Econometrics. Oxford University Press, 2015
5. Szomolányi, K., Lukáčik, M., Lukáčiková, A.: Estimation of Asymmetric Responses of U.S. Retail Fuel Prices to Changes in Input Prices based on a Linear Exponential Adjustment Cost Approach. Central European Journal of Operations Research, 2021. doi.org/10.1007/s10100-021-00783-0
6. Szomolányi, K., Lukáčik, M., Lukáčiková, A.: Asymmetric Retail Gasoline and Diesel Price Reactions in Slovak Market. Ekonomický časopis, roč. 68, č. 2, 2020, s. 115-133

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 14

A	B	C	D	E	FX
28.57	14.29	7.14	7.14	28.57	14.29

Lecturer: prof. Ing. Martin Lukáčik, PhD.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KOVE FHI/ IIB21880/22	**Title of course:** Modelling Stochastic Decision-Making Processes
Type, load and method of teaching activities: **Form of course:** Lecture **Recommended load of course (number of lessons):** **Per week: Per course:** 16s **Method of study:** present	
Number of credits: 10	
Recommended semester/trimester of study:	
Degree of study: III.	
Prerequisites:	
Requirements to complete the course: 40 % assignments; 60 % final paper	
Student workload: Total study load (in hours): 10 credits x 26 hours = 260 hours Distribution of study load 260 hours 16 hours participation in consultations 44 hours preparation for consultations 100 hours of project processing 100 hours exam preparation	
Teaching results: The course focuses on stochastic modeling and optimization methods for decision support and covers recent research contributions in several fields of operations management and economics. The topics of the course will be introduced using state-of-the-art overview articles and then be highlighted by the study of recent research papers in the respective field. The objective is to give both, an overview of research fields, typical research methodology, and to inspire own work in the field.	
Indicative content: • Uncertainty Modeling: Probability Theory, Stochastic Processes, Fuzzy Set Theory, Bayes Updating. • Stochastic Dynamic Programming and Approximate Dynamic Programming. • Markov Chains and Markov Decision Processes. The course is focused on stochastic modeling and optimization methods to support decision-making. The aim is to provide a brief overview of scientific knowledge in several areas of stochastic modeling processes and based on the acquired knowledge, to construct a mathematical model applicable in economic practice. Software tools such as R, Python, GAMS, Simul8, and Eviews are used to solve problems. The aim is also to provide an overview of research areas and typical research methodology and to inspire Ph.D. students for their own work in their field.	

• Stochastic Programming: Chance Constrained Programming, Two-Stage Models with Recourse, Sample Average Approximation, Sampling Strategies, Data-Driven Optimization-Machine Learning Interface.
• Fuzzy Optimization and Decision Making
• Simulation modelling.
• Applications: Queuing Theory, Queuing Networks, Inventory Theory, Operations Management

Support literature:

1. Stewart, W. J. (2009). Probability, Markov Chains, Queues, and Simulation. Princeton university press.
2. Tijms, H.C. (2003). A First Course in Stochastic Models. Wiley.
3. King, A.J., Wallace, S.W. (2012). Modeling with Stochastic Programming. Springer.
4. Powell, W. (2011). Approximate Dynamic Programming. Wiley.
5. Privault, N. (2013). Understanding Markov Chains. Examples and Applications, Springer
6. Kleijnen, J.P.C. (2008). Design and Analysis of Simulation Experiments. Springer.

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Lecturer: doc. Ing. Marian Reiff, PhD.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KOVE FHI/ IIB21810/22	**Title of course:** Models and Methods of Operations Research

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 10

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
- 20% - part-time work
- 40% - individual project
- 40% - combined test in the form of a test and problem solving, discussion

Student workload:
Total study load (in hours): 10 credits x 26 hours = 260 hours
Distribution of study load: 260 hours
Participation in consultations: 16 hours
Seminar preparation: 48 hours
Project processing: 70 hours
Final exam preparation: 126 hours

Teaching results:
Course objective: Scientific advances in economics and operational research make it possible to model dependencies and conditions more accurately, to quantify the stochasticity of input data encountered by the solver, to implement the time aspect, and to calculate the optimal solution to complex decision problems. Modern models and methods of operational research emphasize the stochastic aspect of input data and the dynamic aspect of solved economic processes. The application dimension of operational research models is currently focused on the environmental area, the area of distribution, energy efficiency and the like. The aim of the course is to more accurately model the dependencies and conditions, quantify the uncertainty encountered by the decision maker, implement the time aspect and calculate the optimal solution to complex decision problems.
Knowledge and understanding.
After studying this course, students should:
a) understand the principles and principles of creating complex operational research models,
b) know the methodologies and relevant tools of problem analysis.
Skills, characteristics and attributes.
After studying this course, students should be able to:
a) compile appropriate mathematical programming models emphasizing data uncertainty and the dynamic aspect of decision-making tasks;

b) apply different methods using existing methodologies and approaches to the analysis of the systems under investigation;
c) be able to use practical tools to create appropriate mathematical programming models;
d) make efficient use of tools to solve corresponding mathematical programming, stochastic programming, fuzzy mathematical programming and dynamized mathematical programming problems.
Upon successful completion of the course, students will acquire the following competencies:
- practical skills and competencies with the application of methods and algorithms in mathematical modeling of complex economic processes and subsequent problem solving.

Indicative content:
1. Models and methods of mathematical programming.
2. Data uncertainty in decision problems. Stochastic programming, fuzzy mathematical programming.
3. Dynamic aspect in decision problems. Dynamized problems of mathematical programming.
4. Algorithms for solving mathematical programming problems.
5. Graph theory models and methods. Graph theory algorithms.
6. Distribution models of mathematical programming and their specific character.
7. Environmental models of mathematical programming.

Support literature:
1. Pekár, J. – Brezina, I. – Čičková, Z.: Synchronization of Capacitated Vehicle Routing Problem, Ekonomický časopis, 65, 2017, č. 1, s. 66 – 78
2. Jensen , P.A. - Bard, J.F.:Operations Research Models and Methods 1st Edition, Wiley; 2002
3. Vanderbei, R.J.: Linear Programming: Foundations and Extensions. 4th ed. 2014, XXII, Springer, Berlin: 2014.
4. Eiselt, H. A. – Sandblom, C-L.: Operations Research: A Model-Based Approach, 2nd ed. 2012, Springer, Berlin: 2012.
5. International Series in Operations Research & Management Science, Springer, Berlin 2021
6. Sánchez, J.M.G.: Modelling in Mathematical Programming Methodology and Techniques. Springer, Berlin, 2021

Syllabus:

Language whose command is required to complete the course:
Slovak

Notes:

Assessment of courses
Total number of evaluated students: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Lecturer: prof. Ing. Ivan Brezina, CSc.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc.

Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KMA FHI/IIC21500/21	**Title of course:** Models of Life Insurance

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 8

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
The participation in consultations - 10%,
The project elaboration - 60%
The project presentation and oral exam - 30%

Student workload:
Total study load (in hours):
Participation in lectures - 16
Individual exercises - 42
Project preparation and implementation - 100
Preparation for the final exam - 50
Total load - 208

Teaching results:
The course aim is to provide advanced knowledge in the principles of modeling in life insurance with a special focus on stochastic models of premium and reserves valuation.
The graduate of the course will obtain:
Knowledge and understanding
- to expand knowledge of actuarial techniques used in modeling risks, premiums and reserves of life insurance products,
- to acquire knowledge of mortality patterns used in life insurance.
Skills
- students can solve fundamental problems of modelling mortality by using appropriate software systems,
- students will be able to use a stochastic approach to solving the issue of valuation in life insurance
Competence
- knowledge and skills that can be used in solving practical problems in the insurance practice.

Indicative content:
1. Survival models. Mortality models.
2. Classical and stochastic models for product pricing in life insurance.
3. Estimation and valuation of risks in product pricing in life insurance.
4. Stochastic models for determining reserves in life insurance. Modelling of insurer's loss from defined products

Support literature:

1. Borowiak, D. S., & Shapiro, A. F. (2003). Financial and actuarial statistics: an introduction. CRC Press.
2. Dickson, D. C. M., Hardy, M. R. & Waters, H. R. (2009). Actuarial Mathematics for Life Contingent Risks. New York: Cambridge University Press.
3. Kleinbaum, D. G. (1996). Survival Analysis: A Self-Learning Text, Springer-Verlag, New York.
4. Macdonald A. S., Richards & S. J., Currie, I. D. (2018). Modelling Mortality with Actuarial Applications. Cambridge University Press.
5. Olivieri, A., Pitacco, E. (2015). Introduction to insurance mathematics: technical and financial features of risk transfers. New York: Springer.
6. Rolski, T., Schmidli, H., Schmidt, V. & Teugels, J. L. (2009). Stochastic processes for insurance and finance (Vol. 505). John Wiley & Sons.
7. Rotar, V. I. (2014). Actuarial models: the mathematics of insurance (2nd ed.). Chapman and Hall/CRC.
8. Šoltésová, T., Šoltés, E. (2013). Embedded value as the value reporting tool of the life insurance companies. In The 7th professor Aleksander Zelias international conference on modeling and forecasting of socio-economic phenomena: proceedings, may 7-10, Zakopane, Poland.
9. Willemse, W. J. (2001). Computational Intelligence: Mortality models for the actuary. Delft. DUP Science.

Syllabus:

1. Survival models. Mortality models.
2. Classical and stochastic models for product pricing in life insurance.
3. Estimation and valuation of risks in product pricing in life insurance.
4. Stochastic models for determining reserves in life insurance. Modelling of insurer's loss from defined products

Language whose command is required to complete the course:

slovak

Notes:

Assessment of courses

Total number of evaluated students: 1

A	B	C	D	E	FX
0.0	100.0	0.0	0.0	0.0	0.0

Lecturer: doc. Mgr. Tatiana Šoltésová, PhD.

Date of the latest change: 01.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava	
Faculty: Faculty of Economic Informatics	
Course code: KŠ FHI/IID22640/21	**Title of course:** Multivariate Data Analysis

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 10

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
30 % semester project processed in statistical software or open software environment (e.g. SAS, SPSS, R, Python)
30 % presentation of the semester project
40 % final exam

Student workload:
Total study load (in hours): 260 hours
Distribution of study load
Lectures participation: 16 hours
Preparation for lectures: 64 hours
Elaboration of Semester project: 100 hours
Preparation for final exam: 80 hours

Teaching results:
This course is designed to provide an overview of an interesting, new and fast-growing area of multivariate data analysis. Individual multivariate statistical methods do not form closed circuits, but are constantly enriched with new approaches with multivariate solutions and the possibility of their application in practice.
After completing the course, students will acquire:
Knowledge:
- acquire knowledge of the latest findings in the field of multivariate statistical methods,
- by working on the course project, students will use this knowledge in solving practical tasks using any statistical program package;
Skills:
- develop an understanding of the main principles of multivariate data analysis,
- develop your ability to identify an appropriate multivariate statistical method and to evaluate its use in addressing real economic and social challenges in practice;
Competencies:
- will be able to formulate, solve and present the results of applied research;
- improved writing and presentation skills.

Indicative content:

This course is intended to supplement other courses of statistical data analysis, which are based on the analysis of a set of diverse features, the number of which sometimes reaches several tens. In these cases, the traditional one-dimensional approach to the solution is very difficult, often impracticable. The solution to this problem in statistics is addressed by a set of procedures and methods, which is called multivariate analysis.

Support literature:

R. S. (2021). Segmentation Analytics with SAS® Viya®: An Approach to Clustering and Visualization. Cary, North Carolina: SAS Institute Inc. ISBN 978-1-951684-06-8
2. Hair, J. F. - Black, W. C. - Babin, B. J. - Anderson, R. E. (2010). Multivariate data analysis. 7th ed. New York: Macmillan Publishing Company. ISBN 13: 978-0138132637
3. Kattamuri, Sarma, S. (2017). Predictive Modeling with SAS® Enterprise miner™. North Carolina : SAS Institute Inc. ISBN 978-1-62960-264-6
4. Khattree, R. – Naik, N. D. (200). Multivariate data reduction and discrimination with SAS® Software. Cary, North Carolina: SAS Institute Inc. ISBN 1-58025-696-1
5. Sharma, S. (1996). Applied multivariate techniques. New York: John Wiley & Sons. ISBN 0-471-31064-6
6. Rencher. A. C.. (1995) Methods of Multivariate Analysis. New York: John Willey & Sons. ISBN 0-471-57152-0
7. Tabachnick, B.G. – Fidell, L. S. (2014). Using Multivariate statistics. 6th ed., Edinburg : Pearson Education Limited. ISBN 13: 978-1-292-02131-7
8. Vojtková, M. - Sodomová, E. (2015). Classification of EU countries according to selected indicators from the field of business demography using self-organising maps. In Zeszyty naukowe. - Kraków : Uniwersytet Ekonomiczny w Krakowie. ISSN 1898-6447, no. 11, pp. 37-52.
9. Šoltés, E. - Vojtková, M. - Šoltésová, T. (2020). Changes in the Geographical Distribution of Youth Poverty and Social Exclusion in EU Member Countries Between 2008 and 2017. In Moravian Geographical Reports. Brno : The Czech Academy of Sciences. ISSN 1210-8812, vol. 28, no. 1, pp. 2-15 online.
10. Vojtková, M. - Kotlebová, E. - Sivašová, D. (2019). Determinants Affecting Health of Slovak Population and their Quantification. In Statistika : Statistics and Economy Journal. - Praha : Český statistický úřad, 2019. ISSN 1804-8765, vol. 99, no. 4, pp. 434-450 online.
11. Krasňanská, D. - Komara, S. - Vojtková, M. (2021). Keyword Categorization Using Statistical Methods. In Tem Journal: Technology, Education, Management, Informatics : Journal of the Association for Information Communication Technologies, Education and Science. - Novi Pazar : UIKTEN. ISSN 2217-8333, vol. 10, no. 3, pp. 1377#1384 online.
Literature will be continuously updated with the latest scientific and professional titles.

Syllabus:

The course is delivered in cycles with content aimed at expanding knowledge of:
1. Introduction to multivariate statistical methods. Description of multivariate data. Data preparation. Multivariate data analysis procedure. Classification of multivariate statistical methods.
2. Methods of analysis of hidden relationships: Method of principal components and factor analysis. Mathematical expression of the principal components, their properties, determination of their number and interpretation. Mathematical model of factor analysis, general procedure (estimation methods, factor rotation methods). Comparison of factor analysis and methods of principal components.
3. Methods of interdependency analysis: Cluster analysis. Measures of similarity of objects. Hierarchical and non-hierarchical clustering procedures. Clustering methods. Determination of the number of significant clusters and their interpretation. New trends in clustering./

Multidimensional scaling. / Correspondence analysis.
4. Methods of dependency analysis: Discriminant analysis. Assumptions of using discriminant analysis. Descriptive task of discriminant analysis. Interpretation of discriminant functions. Classification task of discriminant analysis. Verification of classification accuracy./
Logistic Regression. / Multivariate Analysis of Variance. / Conjoint Analysis.

Language whose command is required to complete the course:
Slovak

Notes:

Assessment of courses
Total number of evaluated students: 28

A	B	C	D	E	FX
60.71	17.86	10.71	10.71	0.0	0.0

Lecturer: doc. Ing. Mária Vojtková, PhD.

Date of the latest change: 07.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KOVE FHI/ IIB21950/22	**Title of course:** Project of Dissertation Thesis and Dissertation Exam

Type, load and method of teaching activities:
Form of course:
Recommended load of course (number of lessons):
Per week: Per course:
Method of study: present

Number of credits: 20

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:

Student workload:

Teaching results:

Indicative content:

Support literature:

Syllabus:

Language whose command is required to complete the course:

Notes:

Assessment of courses
Total number of evaluated students: 6

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Lecturer:

Date of the latest change: 30.03.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KOVE FHI/ IIB21830/22	**Title of course:** Quantitative Macroeconomics

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 8

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
40 % assignments; 60 % final exam

Student workload:
208 hours
participation in lectures 16 h, semester work: 68 hours, preparation for final exam: 124 hours

Teaching results:
The graduate of the course will acquire the necessary theoretical macroeconomic apparatus necessary for independent scientific research work in the field of economic analysis.
Abilities:
- Students will be able to formulate, solve and interpret economic models describing known economic phenomena and interactions at an advanced level.
Skills:
- Graduates will gain a comprehensive overview of existing macroeconomic theories.
Competencies:
- Students will be able to use a rich theoretical apparatus in the field of macroeconomic research.

Indicative content:
1. Neoclassical growth models, Dynamic programming, theory of optimal control and growth.
2. Overlapping generations growth models, Growth models with endogenous level of technology.
3. Real business cycle models, Small open economy real business cycle models.
4. Business cycles and financial rigidities, Trade shocks and business cycles.
5. Models of monetary economy.
6. Price stickiness and business cycles.
7. Neo-Fischer effect, Fiscal theory of inflation.
8. Credibility of monetary policy.

Support literature:
1. Acemoglu, D. (2009). Introduction to Modern Economic Growth. Princeton: Princeton University Press.
2. Cochrane, J. (2021). The Fiscal Theory of the Price Level. www.johnhcochrane.com.

3. Uribe, M., Schmitt-Grohéova, S. (2017). Open Economy Macroeconomics. Princeton: Princeton University Press.
4. Walsh, C.E. (2010). Monetary Theory and Policy. 3. vydanie. MIT Press.
5. Williamson, S. (2019). Neo-Fisherism and Inflation Control. Canadian Journal of Economics. 52(3), s. 882–913.
6. Szomolányi, K., Lukáčik, M., Lukáčiková, A.: Business Cycles in European Post-Communist Countries. Contemporary Economics, vol. 11, n. 2, 2017, pp. 171-186. doi.org/10.5709/ce.1897-9254.235

Syllabus:

Language whose command is required to complete the course:
Slovak, English

Notes:

Assessment of courses
Total number of evaluated students: 1

A	B	C	D	E	FX
0.0	0.0	100.0	0.0	0.0	0.0

Lecturer: doc. Ing. Karol Szomolányi, PhD.

Date of the latest change: 21.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KMA FHI/IIC21510/21	**Title of course:** Random Processes in Actuarial Science

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 8

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
40% written exam
60% elaboration and presentation of an individual semestral project at a joint colloquium

Student workload:
Total study load (in hours): 208
16 hours - participation in consultations,
42 hours - preparation for consultations,
100 hours – elaboration of a semestral project,
50 hours - self study in preparation for the exam

Teaching results:
Teaching results:
After completing the course Random Processes in Actuarial science, it is assumed that students will acquire knowledge and skills in the field of random processes, which will be able to apply in solving selected tasks in the field of actuarial science. Based on the software support of the R language, they will model these processes through simulations of their trajectories and use it to analyze the created studies.
Knowledge
Students will gain knowledge about random processes and their classification, specific knowledge of Markov processes, Poisson process and Wiener process (Brownian motion). Furthermore, they will gain knowledge about the possibilities of modeling these processes by using R(packages).
Competences
Within the new acquired competencies, students can, based on knowledge from the full range of presented random processes, orient themselves in the selection of a suitable model for solving the selected problem and use the knowledge of random process simulation to achieve the desired results.
Skills
According to the choice of issues in the presented project, students will be able to present practical skills on a data set in the environment of the R language, for example in the modeling of state development and the number of policyholders in the multi-state model, the number of claims in non-life insurance, the surplus of the insurance company in the collective risk model for longer periods of time, or in financial modeling.

Indicative content:

The focus of the object is an extension of the description of a random phenomenon by a random variable through a time sequence of random variables, ie by means of a random (stochastic) process. The main goal is to ensure that students orient themselves in the field of random processes and at the same time mastered the modeling of these processes using the environment of the R language. They must demonstrate the mentioned overview in the written part of the exam, they will demonstrate practical modeling and its use in the assigned issue within the individual solution of the project, which will be presented at a joint colloquium.

Support literature:

1. Dobrow, R.: Introduction to Stochastic Processes with R. John Wiley & Sons. 2016.
2. Pinsky, A. M., Karlin, S.: Introduction to Stochastic Modeling. Elsevier Inc. 2011.
3. Jons, W. P., Smith, P.: Stochastic Processes. An Introduction. Taylor & Francis Group. 2018.
4. Bakstein, D., Capasso, V.: An Introduction to Continuous Time Stochastic Processes. Springer. 2015.
5. Schilling, L. R., Partzsch, L.: Brownian motion. Walter de Gruyter GmbH & Co. KG, Berlin/ Boston. 2012.
6. Spedicato, A. G.: Discrete Time Markov Chains with R. The R Journal(9(2)), 84-104. doi:10.32614/RJ-2017-036. 2017.
7. Kaas, R., Goovaerts, M., Dhaene, J., Denuit, M.: Modern actuarial risk theory using R, Berlin: Springer.2008.
8. Dobrow, R.: Probability: With Applications and R. John Wiley & Sons. 2014.
9. Jackson CH.: "Multi-State Models for Panel Data: The msm Package for R." Journal of Statistical Software, 38(8), 1–29. URL http://www.jstatsoft.org/v38/i08/. 2011.
10. Brock, K.: poisson: Simulating Homogenous & Non-Homogenous Poisson Processes. https://CRAN.R-project.org/package=poisson. 2015.
11. Mucha, V., Páleš, M., Sakálová, K. Calculation of the capital requirement using the Monte Carlo simulation for non-life. In Ekonomický časopis. Bratislava : Ekonomický ústav SAV :Prognostický ústav SAV, 2016, roč. 64, č. 9.

Syllabus:

Language whose command is required to complete the course:
Slovak

Notes:

Assessment of courses
Total number of evaluated students: 2

A	B	C	D	E	FX
0.0	50.0	50.0	0.0	0.0	0.0

Lecturer:

Date of the latest change: 01.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.

DESCRIPTION OF COURSE

University: University of Economics in Bratislava

Faculty: Faculty of Economic Informatics

Course code: KŠ FHI/IID22600/21	**Title of course:** Statistical Inference Methods

Type, load and method of teaching activities:
Form of course: Lecture
Recommended load of course (number of lessons):
Per week: Per course: 16s
Method of study: present

Number of credits: 10

Recommended semester/trimester of study:

Degree of study: III.

Prerequisites:

Requirements to complete the course:
40 % semester project processed in statistical software or free software environment with project oral presentation during the lecture.
60 % written final exam

Student workload:
Total study load (in hours): 260 hours
Distribution of study load
Lectures participation: 16 hours
Preparation for lectures: 34 hours
Elaboration of Semester project: 70 hours
Preparation for final exam: 140 hours

Teaching results:
Completion of the course will expand and deepen knowledge of the methodological foundations and applications of parametric and nonparametric Statistical Inference so that students will properly apply them in subsequent scientific work and they will use them appropriately in various areas of economic practice.
In particular, students will acquire the following knowledge and abilities:
− to solve practical tasks of the Statistical Inference using statistical programming packages and Excel spreadsheet processor.
− They will master terminology, established symbols, underlying assumptions of the application in the various fields of economic practice.
− The methodological basis and techniques for application and correct presentation, and interpretation of the results of the inferential techniques in statistical analyses (in Time series analysis, Statistical Modelling for Risk Assessment, etc.).
Students will acquire in particular the following skills:
- to present their results of developed project with the explanation of practical problems of economic practice using diverse available statistical software for statistical inference applications.
- Students will deeper understanding of techniques, their steps and principles of application of the methods based on several methodological bases (moments, quantile, L-moments) in various fields of statistics,

- They will develop the ability to apply inference methods and properly present the results, with emphasis on the correct use of symbols and correct interpretation of solved real economic and social problems in practice.
Students will acquire the following competencies:
− Students will master the methods of inference statistics: from the tasks formulation, as well as obtained methodological assumptions to knowledge of the methods and skills of techniques of application and results of applied research presentation;
− Students will also improve their writing and presentation skills, in particular, they will use appropriate symbols and terminology, proper tasks formulation, correct techniques in software applications and the right interpretation of the results of inference methods in empirical research and economic practice.

Indicative content:
This course is designed to deepen knowledge and skills of Statistical inference.

Support literature:
1. Boos, D. D. , Stefanski, L. A. (2013). Essential Statistical Inference: Theory and Methods. Springer Science+Business Media New York. Hardcover ISBN978-1-4614-4817-4. eBook ISBN978-1-4614-4818-1. DOI https://doi.org/10.1007/978-1-4614-4818-1.
2. Cox, D.R. (2006). Principles of Statistical Inference, Cambridge University Press, USA. 236pp. ISBN: 0521685672.
3. Gillard, J. (2020). A First Course in Statistical Inference. Springer International Publishing. 164 pp. eBook ISBN: 978-3-030-39561-2. DOI: 10.1007/978-3-030-39561-2.
4. Held, L., Sabanés Bové, D. (2014). Applied Statistical Inference. Springer-Verlag Berlin Heidelberg. eBook ISBN: 978-3-642-37887-4. DOI: 10.1007/978-3-642-37887-4.
5. Hogg, R., Elliot Tanis, E. (2014). Probability and Statistical Inference, Global Edition. Pearson Education Limited. 560pp. ISBN: 1292062355.
6. Jindrová, P., Sipková, Ľ. (2014). Statistical Tools for Modeling Claim Severity. In European Financial Systems 2014 : proceedings of the 11th International Scientific Conference: June 12-13, 2014 Lednice, Czech Republic. - Brno : Masaryk University, 2014. ISBN 978-80-210-7153-7, p. 288-294 online. Dostupné na : <http://is.muni.cz/do/econ/sborniky/2014/proceedings-EFS-2014.pdf>.
7. Pacáková, V., Sipková, Ľ. (2011). Probability models of claim amounts. In Contemporary problems of transformation process in the Central and East European countries : proceedings of the 17th Ukrainian-Polish-Slovak scientific seminar held on September 22-24, 2010. - Lviv : Lviv Academy of Commerce Publishing House, s. 63-70.
8. Pacáková, V., Sipková, Ľ., Sodomová, E. (2011). Modelling with generalized lambda distributions. In Przestrzenno-czasowe modelowanie i prognozowanie zjawisk gospodarczych. - Kraków : Akademia Ekonomiczna w Krakowie, 2006. ISBN 83-7252-306-1, s. 263-275.
9. Sipková, Ľ., Boháčová, H., Sipko, J. (2011). Quantile models of losses in property insurance. In Studia ubezpieczeniowe : zarządzanie ryzykiem i finansami. - Poznań : Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu. ISSN 1689-7374, s. 297-307.
10. Sipková, Ľ. (2006). Quantile-based perspective on common statistical ideas. In Education of quantitative mathematical-statistical methods at the universities of economics referring to future needs : 13th Slovak-Polish-Ukrainian scientific seminar. - Bratislava : Faculty of Economic Informatics University of Economics in Bratislava. ISBN 978-80-225-2329-5, s. 105-116.
11. Wasserman, L. (2010). All of Statistics: A Concise Course in Statistical Inference. Publisher : Springer, 462 pp. ISBN-13: 978-1441923226. ISBN-10: 1441923225.
Literature will be continuously updated with the latest scientific and professional titles.

Syllabus:
Lectures:

1. Introduction to statistical inference methods. Classification into parametric and nonparametric methods of statistical inference. Their use according to the areas of their application in individual scientific areas of statistics. Basic concepts, symbols, random selection, probability distributions of discrete and continuous random variables, their shapes and parameters.
2. Hypothesis tests, the most powerful test, the Neyman-Pearson lemma, likelihood ratio tests, type I and II errors. The selected nonparametric methods – tests of homogeneity, test for independence. The rank tests of central tendency for independent and dependent two and more samples. Methodological foundations based on the likelihood, with a deeper explanation of concepts and procedures for parameter estimation and tests of statistical hypotheses. Sampling characteristics and sample probability distributions. Inductive judgments about the parameters of the distribution of economic random variables - point and interval estimates and tests of hypotheses about the parameters.
3. Modelling tasks in Statistical induction. Inductive conclusions about the shape of the probability distribution of an economic random variable (parametric and nonparametric tests on the shape of the distribution). Four forms of defining continuous probability distributions. Graphical and numerical analysis of the properties of empirical and theoretical distributions on a moment and quantile basis. Basics of mixture-models.
4. Methods of identification, estimation and verification of models of probability distributions of economic variables according to real data. Computationally oriented tasks: Bootstrap. Sampling. Methods of distributional simulation and use of Monte Carlo simulations in practice.

Language whose command is required to complete the course:
Slovak

Notes:
NA

Assessment of courses
Total number of evaluated students: 26

A	B	C	D	E	FX
80.77	15.38	3.85	0.0	0.0	0.0

Lecturer: doc. RNDr. Viera Labudová, PhD.

Date of the latest change: 07.02.2022

Approved by: Person responsible for the delivery, development and quality of the study programme prof. Mgr. Erik Šoltés, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Michaela Chocholatá, PhD., Person responsible for the delivery, development and quality of the study programme prof. Mgr. Juraj Pekár, PhD., Person responsible for the delivery, development and quality of the study programme doc. Ing. Marian Reiff, PhD., Person responsible for the delivery, development and quality of the study programme prof. Ing. Martin Lukáčik, PhD.