



Methods of Multivariate Analysis in Sociology

Curriculum (Syllabus)

Course details

Level of higher education	<i>Second (Master's)</i>
Field of knowledge	<i>05 Social and behavioural sciences</i>
Specialisation	<i>054 Sociology</i>
Educational programme	<i>Social Data Analytics</i>
Status of discipline	<i>Compulsory</i>
Form of study	<i>Full-time (day)</i>
Year of study, semester	<i>2nd year, 1st semester</i>
Scope of the discipline	<i>5 credits (150 hours): lectures – 18 hours, practical classes – 36 hours, independent work – 96 hours.</i>
Semester control/control measures	<i>Exam, Modular control work, essay</i>
Class schedule	<i>https://schedule.kpi.ua/</i>
Language of instruction	<i>Ukrainian</i>
Information about course director / lecturers	<i>Lecturer: Doctor of Pedagogical Sciences, Professor Lyubov Panchenko, +380963352397, lubov.felixovna@gmail.com Practical / Seminar: Lyubov Panchenko Laboratory: Lyubov Panchenko</i>
Course location	<i>https://do.ipu.kpi.ua/course/view.php?id=5491</i>

Curriculum

1. Description of the academic discipline, its purpose, subject matter and learning outcomes

Within the framework of the discipline, students will acquire knowledge and skills in the use of multidimensional data analysis methods in sociology and the interpretation of such analysis. The course covers modern information technologies and means of visualising the data obtained. The planned types of classes include lectures, practical and laboratory work, Modular control work, and calculation work.

The aim of the discipline is to develop students' ability to choose appropriate methods of analysis and use multidimensional methods for analysing sociological data and research data, in particular research on peace and conflict.

The main objectives of the course are:

- to provide students with basic information about the essence of multidimensional statistics, its classification and use in sociology;
- to form an understanding of discriminant analysis, multidimensional scaling, longitudinal analysis, survival analysis, structural equation modelling and other multidimensional methods;
- to teach them how to correctly use the capabilities of computer tools for multidimensional analysis of research data in sociology, in particular for peace and conflict studies;

- to develop in master's students the need for further development of knowledge and skills in the application of multidimensional methods of analysis and computer tools in their future professional activities.

Competencies acquired during the study of the discipline:

General competencies:

- ZK01 Ability to think abstractly, analyse and synthesise.

Professional competencies:

- FK01 Ability to analyse social phenomena and processes.
- FK04 Ability to collect and analyse empirical data using modern methods of sociological research.
- FK11 Ability to analyse open source intelligence (OSINT), analyse qualitative information and text data, and use intelligent analysis for social data.
- PC12 Ability to apply modern statistical methods, models, digital technologies, and specialised software for modelling social processes.

Programme learning outcomes:

- PRN04 Apply scientific knowledge, sociological and statistical methods, digital technologies, and specialised software to solve complex problems in sociology and related fields of knowledge.
- PRN 09 Plan and carry out scientific research in the field of sociology, analyse results, and justify conclusions.
- PRN14 Apply the R and Python programming languages to analyse social data.

While studying the discipline, students will also be able to:

- understand the main areas of application of multidimensional statistical methods in sociology, their specifics and typical difficulties in use;
- master the key concepts of multidimensional statistics and the purpose of methods such as multidimensional variance analysis, discriminant analysis, factor and cluster analysis, multidimensional scaling, log-linear analysis, survival analysis, and structural equation modelling;
- learn the main stages of each of the multidimensional statistical methods and the statistics underlying them;
- familiarise oneself with the capabilities of modern computer packages for statistical processing of multidimensional sociological information and presentation of the results obtained;
- determine the class of sociological problems, particularly in the field of peace and conflict analysis, for which it is appropriate to apply multidimensional statistical methods;
- apply multidimensional analysis methods in practical research;
- analyse and interpret empirical research data using multidimensional statistical approaches;
- select methods appropriate to the research tasks set;
- use modern software tools for statistical data processing;
- present research results using digital tools, including online.

2. Prerequisites and post-requisites of the discipline (place in the structural-logical scheme of training under the relevant educational programme)

The course builds on students' knowledge of general sociology, methodology and methods of sociological research, mathematical and statistical methods of sociological information analysis.

Prerequisites: PO01 Computer analysis of social information and data visualisation, PO06 R and Python programming languages in statistical calculations, PO08 Methodology and methods of sociological research in the digital age.

Post-requisites: ZO06 International Project and Grant Activities and Start-up Management.

3. Course content

Topic 1. Fundamentals of multidimensional statistics and its use in social research. Computer tools. R as a tool for multidimensional statistics.

Topic 2. Preparing data for multidimensional analysis.

Topic 3. Multivariate analysis of variance and its use in social research data analysis.

Topic 4. Discriminant analysis and its use for analysing social research data.

Topic 5. Longitudinal analysis in social research

Topic 6. Survival analysis and time series analysis

Topic 7. Multivariate scaling in sociological and marketing research, peace and conflict studies

Topic 8. Multivariate methods in social network research (multivariate correlations and regressions, correspondence analysis, multivariate scaling, cluster analysis).

Topic 9. Structural equation modelling in sociological research.

4. Teaching materials and resources

Basic literature:

1. Hrushetskyi, A., Paniotto, V. War and Transformation of Ukrainian Society (2022 - March 2025). Kyiv, Dukh i Litera, 2025.
2. Complex measurement tools in sociological research: development, adaptation, justification of reliability / E. Golovakha, S. Dembitsky, N. Panina et al.; edited by E. Golovakha and S. Dembitsky. Kyiv: Institute of Sociology of the National Academy of Sciences of Ukraine, 2022.
3. Panchenko, L.F. Mathematical and statistical methods of analysis of sociological information. Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2018
4. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2021). Multivariate data analysis (8th ed.). Cengage Learning.
5. Mertler, C. A., Vannatta, R. A., & LaVenja, M. H. (2021). Advanced and multivariate statistical methods: Practical application and interpretation (7th ed.). Routledge.
6. Tabachnik B., Fidell L. Using multivariate statistics. 6th edition. – Pearson, 2013.

Additional reading:

1. Kislova, O. M. Digital methods in sociology. Bulletin of Science and Education, 2022, (3), 3.
2. Paniotto, V., Hrushetskyi, A. Is modelling still alive? The history of social modelling in Ukraine and the agent-oriented approach using the example of forecasting the language situation in Ukraine. — Modern Methods of Data Collection and Analysis in Sociology / Edited by Ye. I. Golovakha and T. Ya. Lyubyva. – Kyiv: Institute of Sociology of the National Academy of Sciences of Ukraine, 2013. – 140 p.
3. Panchenko L.F. On the use of quantitative methods in conflict studies // Bulletin of the National Technical University of Ukraine "Kyiv Polytechnic Institute". Political Science. Sociology. Law: collection of scientific works. – Kyiv, 2018. – No. 3 (39). – P. 21–27.
4. Panchenko L.F., Adamenko O.V. Computer data analysis. Luhansk, Taras Shevchenko National University of Luhansk, 2010.
5. Panchenko L.F. Training future sociologists in computer analysis of demographic processes and structures // Information Technologies and Learning Tools. – 2018. – Vol.65(3). – pp. 166–183.
6. Panchenko L.F. Practical Course in Data Analysis. – Luhansk, Taras Shevchenko National University of Luhansk, 2013. – 269 p.
7. Mathematical Methods of Intelligent Data Analysis: [textbook] / Tetiana Shabelnyk, Oksana Dyachenko. Mariupol: MDU, 2021. 163 p.

8. Yatsenko M. A., Chanyshv R. I., Information Technologies and Data Mining in Social Sciences: Teaching and Methodological Manual for Higher Education. higher education in the field of knowledge 05 "Social and behavioural sciences", specialisation 054 "Sociology", NU OUA, Odessa: Phoenix, 2024 - 706 p.
9. Quiroz Flores, A. (2022). Survival analysis: A new guide for social scientists. Cambridge University Press.
10. Kline, R. B. (2023). Principles and practice of structural equation modelling (5th ed.). Guilford Press.
11. Field, A. Discovering Statistics Using SPSS Second Edition.
12. Loglinear Models Angela
Jeanssone <http://lib.slon.pp.ru/ComputerScience/Compression/Log%20Linear%20Models.pdf>
13. Agresti, A. (2021). Categorical data analysis (3rd ed.). Wiley.
14. Elff, Martin. 2020. Data Management with R: A Guide for Social Scientists. London: SAGE Publications. <https://www.elff.eu/book/data-management-r/>
15. Buhl A., Zofel P. SPSS: Introduction to Modern Data Analysis under Windows. Addison-Wesley. 2002.
16. Cramer D. Advanced Quantitative Data Analysis (Understanding Social Research). Open University Press. 2003.

Educational content

5. Methodology of mastering the academic discipline (educational component)

Classes in the discipline "Methods of Multivariate Analysis in Sociology" are conducted in the form of lectures and practical classes. During lectures, the teacher introduces master's students to key statistical concepts and basic statistical methods used to analyse social research data. Lectures are held in a dialogue format with the use of multimedia presentations, questions and discussion. Practical classes are held with the use of computer devices, where students perform computer practical tasks on data analysis in Excel, PSPP and R environments. Modular control work and essays are designed to assess the knowledge and skills of master's students in formulating statistical hypotheses, selecting multidimensional methods appropriate to the tasks, using software tools for data analysis, interpreting the results obtained, and providing reports.

All classes are accompanied by materials and assignments in the Moodle distance learning system.

Lectures

Lecture 1. Fundamentals of multidimensional statistics and its use in social research. Purpose and essence of multidimensional analysis. Dependent and independent variables. Experimental and non-experimental research. Continuous, discrete and dichotomous data. Samples and general populations. Descriptive statistics and hypothesis testing. Orthogonality (independence of variables): standard and sequential analysis. Linear combination of variables. Number and nature of variables included in the analysis. Statistical power. Data in multidimensional analysis. Choosing a method of multidimensional analysis. Course objectives and tasks. Software for multidimensional analysis : Microsoft Excel, PSPP, R, Amos, etc. *R* as a tool for multidimensional statistics (Advantages of *R*. *R* packages. Basic data types in *R*. Vectors, factors, matrices, lists, data tables. Data export and import. RStudio shell. Multivariate capabilities of *R*. Packages for sociologists).

Lecture 2. Preparing data for multidimensional analysis. Algorithm for screening ungrouped data. Checking input, missing data, distributions, and univariate outliers. Linearity and homoscedasticity. Variable transformations. Finding multidimensional outliers. Variables that cause outliers. Multicollinearity.

Lecture 3. Multivariate analysis of variance. Purpose of multivariate analysis of variance and its use in sociology. Data examples. Step-by-step calculation algorithms. Presentation of results: descriptive statistics, Box's criterion, multivariate criteria, criterion of homogeneity of variance. Interpretation of results.

Lecture 4. Discriminant analysis and its use in sociology. Purpose of discriminant analysis and its use in sociology. Examples. Discriminant function. Stages of implementation. Presentation of results: group

statistics, group mean identity test, correlation matrix, eigenvalues, Wilks' lambda, canonical coefficients of the discriminant function, classification matrix. Interpretation of results.

Lecture 5. Longitudinal analysis in social research. Purpose of analysis. Comparison of variance and longline analysis. Chi-square criterion of maximum likelihood ratio for main variables and their interaction. Testing interactions of k-order and higher order. Estimation of model parameters. Stepwise elimination method. Interpretation of results.

Lecture 6. Survival analysis. Time series analysis. General purpose and description of survival analysis. Research examples. Types of research questions. Limitations of survival analysis. Fundamental equations for survival analysis. Life tables. Life table graphs. Test for group differences.

Purpose of time series analysis. Research examples. Types of research questions. Autocorrelation patterns. Seasonal cycles and trends. Forecasting. Intervention effect. Limitations of time series analysis. Basic equations of ARIMA models. Interpretation of results.

Lecture 7. Multidimensional scaling and its use in sociology and marketing. Purpose of multidimensional scaling. Examples of use in sociology and marketing. Metric and non-metric methods. Spatial maps. Implementation stages. Statistics used: similarity assessment, preference rankings, stress, unfolding, stimulus coordinates. Interpretation of results.

Lecture 8. Multidimensional methods in social network research. Multidimensional correlations and regressions, correspondence analysis, multidimensional scaling, cluster analysis. Software for social network analysis. Capabilities of NodeXL, Gephi, R.

Lecture 9. Structural equation modelling in sociological research. Purpose of the SEM method. Use of SEM in sociology and behavioural sciences. Basic graphic elements: explicit variable, latent variable, directed connection, covariance (bidirectional connection). Structural models of correlation, multiple regression, factor analysis. Stages. Models: path model, confirmatory factor analysis, structural model. Model evaluation and correction. SEM software. Amos PSPP.

Practical classes

Full texts of computer workshop assignments with detailed instructions, tasks for independent work, and test questions are available in the Moodle system.

Practical class 1. Data in multidimensional analysis

Key issues: Construction of correlation, variance-covariance matrices, and sum of squares and cross-product matrices, and finding correspondences between them using Excel.

Assignments for independent work: Solving problems in SPSS and R.

Practical class 2. Screening of ungrouped data

Key issues: screening ungrouped data before applying multidimensional analysis: checking data accuracy, checking whether variable distributions correspond to normal distribution, analysing missing data, outliers, correlations, etc.

Homework assignment: Perform screening of ungrouped data using your own example.

Practical lesson 3. Screening grouped data

Key questions: screening grouped data before applying multidimensional analysis: checking data accuracy, checking whether variable distributions correspond to normal distribution, analysing missing data, outliers, correlations, etc.

Homework assignment: Perform screening of grouped data using your own example.

Practical lesson 4. Multivariate analysis of variance in SPSS

Key issues: data preparation, calculation, interpretation of multivariate tests by Pillay, Wilks, etc.

Assignment for independent study: Perform multidimensional analysis of variance using your own examples and examples for independent work.

Practical lesson 5. Multivariate analysis of variance in R

Key issues: data preparation, calculation, interpretation of multivariate tests by Pillay, Wilks, etc.

Assignment for independent study: Perform multidimensional analysis of variance in R using your own examples and examples for independent work.

Practical class 6. Discriminant analysis in sociology

Key issues: data preparation, calculation of canonical correlation, eigenvalues, Wilks' lambda, discriminant function coefficients. Interpretation of the classification table.

Assignment for independent study: Perform discriminant analysis using your own examples and examples for independent work.

Practical lesson 7. Training and test samples in discriminant analysis.

Key questions: training sample, test sample. Building a model on a training sample, saving the model, scoring.

Assignment for independent study: perform analysis using examples for independent study.

Practical lesson 8. The relationship between multivariate variance analysis and discriminant analysis.

Key issues: building a model of multidimensional variance analysis and discriminant analysis on the same data. Dependent variables and independent variables in multidimensional variance analysis; dependent variable and independent variables in variance analysis. Comparison of results.

Assignment for independent work: perform analysis using examples for independent work.

Practical class 9. Cluster analysis.

Key issues: data preparation, stages of hierarchical cluster analysis, data standardisation, dendrogram, cluster profiles, interpretation.

Assignment for independent study: perform analysis using examples for independent work or your own data.

Practical class 10. Factor analysis

Key issues: data preparation, stages of factor analysis, interpretation of the Scree Plot diagram and factor loadings matrix.

Assignment for independent work: perform analysis using examples for independent work and/or your own data.

Practical class 11. Longitudinal analysis.

Key issues: saturated model, stepwise backward elimination, interpretation of the resulting model.

Assignment for independent study: perform analysis using examples for independent work or your own data.

Practical class 12. Survival analysis

Key issues: purpose, data preparation, survival tables, graphical representation

Assignment for independent study: perform analysis using examples for independent work and/or your own data.

Practical class 13. Time series.

Key issues: purpose, data preparation, calculation of lags, autocorrelation coefficients

Assignment for independent study: perform analysis using examples for independent work and/or your own data.

Practical class 14. Multidimensional scaling.

Key issues: purpose, data preparation; square symmetric distance matrix; asymmetric, construction of a distance matrix based on data; interpretation of a spatial map.

Assignment for independent study: perform analysis using examples for independent work and/or your own data.

Practical class 15. Multidimensional methods in networks.

Key issues: hierarchical cluster analysis for network data; correspondence analysis for visualising network data; multidimensional scaling for visualising network data.

Assignment for independent study: perform analysis using examples for independent work and/or your own data.

Practical session 16. Multivariate correlation and regression for network data.

Key questions: hypothesis testing in networks, the essence of multidimensional correlation; example of a network and implementation in the R environment. QAP; the essence of multidimensional regression and its implementation using the R environment; interpretation of calculations.

Assignment for independent work: perform analysis using examples for independent work and/or your own data.

Practical class 17. Modelling with structural equations.

Key issues: purpose, data preparation, notation for writing formulas in R, SEM package, model calculation and interpretation.

Assignment for independent work: perform analysis using examples for independent work and/or your own data.

Practical class 18.

Modular control work

6. Independent work by students/postgraduates

Types of independent work: preparation for practical classes (reviewing materials from the current lecture), completing assignments for independent work from the manual, completing calculation work. All deadlines are listed in the Moodle system on a weekly basis.

Independent work includes:

preparation for classroom sessions – 52 hours;

preparation for the Modular control work – 4 hours;

preparation for the exam – 30 hours.
preparation of a term paper – 10 hours.
Total – 96 hours.

Discipline policy

7. Academic discipline policy (educational component)

Class attendance

Attendance at lectures and practical classes is compulsory.

Missed assessment tests

A missed module assessment can be retaken, but only before the interim assessment is issued, taking into account the time required by the lecturer to check the work.

Procedure for appealing assessment results

Students have the opportunity to raise any issue related to the assessment procedure and expect it to be considered in accordance with pre-defined procedures. To appeal against an assessment, a student must submit a statement indicating the reason for the appeal and providing evidence of the teacher's bias. The teacher must discuss this statement with the student in person during a consultation. The commission may decide to repeat the assessment or reject the appeal. The commission's decision is final and cannot be appealed.

University policy

Academic integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honour of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". For more details, see: <https://kpi.ua/code>.

Standards of ethical conduct

The standards of ethical conduct for students and employees are defined in Section 2 of the Code of Honour of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". For more information, please visit: <https://kpi.ua/code>.

Artificial intelligence policy

The policy on the use of artificial intelligence and its principles are regulated by the order "Policy on the use of artificial intelligence for academic activities at Igor Sikorsky Kyiv Polytechnic Institute". For more information, please visit: <https://osvita.kpi.ua/node/1225>.

8. Types of control and the learning outcomes assessment rating system (LOAS)

Assessment and control measures

A student's rating in an academic discipline consists of points awarded for:

- completion of modular control work;
- completion of practical work;
- assessment of a data analysis case study (essay)
- exam

1. Modular control work. Weighted score – 6 points.

- "Excellent" – complete answer (at least 90% of the required information) – 6 points;
- "Good" – sufficiently complete answer (at least 75% of the required information), or complete answer with minor inaccuracies – 4-5 points;
- "Satisfactory" – incomplete answer (at least 60% of the required information) and minor errors – 3 points;
- "unsatisfactory" – answer does not meet the requirements for "satisfactory" – 0-2 points.

2. Practical work in the computer lab is graded on a scale of 3 points each.

The maximum number of points for all practical classes is $3 \text{ points} * 8 = 24 \text{ points}$.

Assessment criteria:

- "excellent" – the task is completed in full (at least 90% of the required work), without significant errors. The student demonstrates confident mastery of the software, performs the task logically and consistently, explains their actions in a reasoned manner and answers all questions asked – 3 points;
- "Good" – the task is completed sufficiently (at least 75% of the required work) or completely, but with minor errors. The student mostly understands the algorithm of the work, makes some inaccuracies, corrects them after the teacher's prompts, answers most of the questions asked – 2 points;
- "Satisfactory" – the task is partially completed (at least 60% of the required work) and contains significant errors. The student is poorly oriented in the work, cannot correct errors independently, answers questions uncertainly or cannot explain their actions – 1 point;
- "Unsatisfactory" – the work has not been completed – 0 points.

3. Assessment of the data analysis case study (essay) – 20 points.

The case study is devoted to visualising the scientific landscape in the field of the student's master's thesis. It includes searching for and collecting source data in Scopus, storing it, and visualising it using VosViewer.

- "Excellent" - the task is completed in full (at least 90% of the required work), appropriate data analysis methods are used, and a deep understanding of the problem is demonstrated. The student presents the results in a logical and structured manner, makes reasonable conclusions, is able to interpret the data and explain their approach. The case is optimised, correctly documented, and correct visualisations are used – 18-20 points;
- "Good", the task is completed sufficiently (at least 75% of the required work), appropriate analysis methods are used, but there are minor inaccuracies or minor aspects are missing. The conclusions are logical but need clarification. The case contains some shortcomings or is not effective enough, the data visualisation is correct but could be improved – 15-17 points;
- "Satisfactory" – the task has been partially completed (at least 60% of the required work), there are significant errors in the analysis or interpretation of the results. The methods used may not be entirely relevant, and the conclusions may be superficial or incomplete. The case contains significant errors, there is no explanatory documentation, and the data visualisation is weak or does not accurately reflect the results – 12-14 points.
- "Unsatisfactory" – less than 60% of the task has been completed, or it has not been completed at all. There is no logical justification for decisions, the methods of analysis have been chosen incorrectly, the results are not interpreted or contain critical errors. Data visualisation is incorrect or missing – 0-11 points.

4. Exam.

Weighting score – 50.

The exam involves oral answers to questions, a list of which is provided in Appendix 2.

Assessment criteria:

- 40-50 points – the student answers almost all exam questions, demonstrates a deep knowledge of the material, presents it logically and consistently, gives reasoned conclusions, freely operates with specific data, expresses their own position on controversial issues, demonstrates signs of theoretical thinking and sociological imagination;
- 30-39 points – the student answers most of the exam questions, demonstrates a good level of knowledge of the material;
- 20-29 points – the student answers about half of the exam questions, demonstrates rather superficial knowledge;
- 0-19 points – the student answers only some of the exam questions, does not have their own position, and makes significant inaccuracies.

Bonus points

A total of no more than 10 points for the following types of work:

- for research activities (participation in conferences, student competitions, publications);
- participation in faculty competitions in the discipline and all-Ukrainian competitions.

Conditions for a positive interim assessment:

To receive a "pass" on the first interim assessment, a student must have at least 12 points; to receive a "pass" on the second interim assessment, a student must have at least 24 points.

Conditions for admission to the exam:

The condition for a student's admission to the exam is the completion of a Modular control work and an essay.

Table of correspondence between rating points and grades on the university scale:

Rating of the applicant (points)	University scale of grades for the level of acquired competencies (learning outcomes)
100-95	Excellent
94	Very good
84	Good
74-65	Satisfactory
64-60	Sufficient
Less than 60	Unsatisfactory

Possible marks in the semester control report:

Not admitted	Failure to meet the conditions for admission to semester control
Removed	Violation of the principles of academic integrity or moral and ethical standards of conduct
Did not appear	The applicant was admitted but did not appear for the exam

Review of the rating system of assessment during the semester

The RSO may be reviewed upon a reasoned request from the applicant studying the OK, the student self-government body or the student trade union committee, submitted to the head of the supporting department. The review procedure is defined in Section 7 of the Regulations on the System of Assessment of Learning Outcomes at Igor Sikorsky KPI
https://osvita.kpi.ua/sites/default/files/downloads/Pologennia_RSO_2025.pdf

9. Additional information on the discipline (educational component)

Informal distance and online courses

At the request of the applicant, in conditions that do not facilitate regular attendance of classes, it is permissible to study individual content parts of the discipline in asynchronous mode, in particular through mastering distance courses on the Phrometeus, Coursera, Data Camp platforms and other forms of informal learning. To confirm completion of informal learning, the student must provide a relevant document (certificate) indicating the name of the courses and their duration in hours. Recognition of the results of informal education takes place in accordance with the procedure set out in the relevant Regulations of Igor Sikorsky KPI: <https://osvita.kpi.ua/node/179>.

The **individual assignment (data analysis case study)** is devoted to bibliometric search for sources on the topic of master's theses and visualization of the scientific landscape using VOSviewer. A detailed description is provided in the Moodle system, in the "Control Measures" section.

The working programme of the academic discipline (syllabus):

Compiled by the professor of the department, Doctor of Pedagogical Sciences, Professor Panchenko L.F.

Approved by the Department of Sociology (Minutes No. 12 of 24.05.2024)

Approved by the Methodological Commission of the Faculty (Minutes No. 9 of 26 June 2024)

Questions for preparation for the Modular control work

1. What is multidimensional statistics and what is it used for in social research?
2. Definition of dependent and independent variables in multidimensional analysis.
3. What types of data are there in multidimensional analysis?
4. What is the difference between experimental and non-experimental research?
5. Sample and population
6. What is orthogonality in statistical analysis?
7. Linear combination of variables: meaning and application.
8. What is statistical power and why is it important?
9. What software tools are used for multidimensional analysis?
10. Basic data types in R.
11. Algorithm for preparing data for multidimensional analysis.
12. What is missing data and how to detect it?
13. Methods for checking univariate and multivariate outliers.
14. Linearity and homoscedasticity in statistical analysis.
15. What is multicollinearity and how does it affect analysis?
16. The purpose of multidimensional variance analysis.
17. What is discriminant analysis and where is it used?
18. The main stages of performing discriminant analysis.
19. What are eigenvalues and Wilks' lambda in discriminant analysis?
20. Comparison of variance and longline analysis.
21. What methods are used to estimate parameters in longline analysis?
22. What is survival analysis and where is it used?
23. Basic equations of survival analysis.
24. What types of research questions does time series analysis address?
25. Basic equations of ARIMA models.
26. The purpose of multidimensional scaling in sociology.
27. Basic statistics in multidimensional scaling.
28. What multidimensional methods are used in social network analysis?
29. Basic graphic elements in structural equation modelling.
30. How to choose the optimal method of multidimensional analysis for sociological research?

Questions for exam preparation

1. The concept of multidimensional analysis and its significance in sociological research.
2. Types of variables in multidimensional analysis.
3. What is statistical power and how does it affect analysis?
4. What are the advantages of using R for multidimensional analysis?
5. Basic R packages for sociological research.
6. Methods of preparing data for multidimensional analysis.
7. Identifying and handling missing data.
8. How is the normality of variable distribution tested?
9. What is homoscedasticity in multidimensional analysis?
10. Methods of variable transformation in statistics.
11. Methods for detecting and eliminating multicollinearity.
12. Basic assumptions of multivariate analysis of variance.
13. Basic indicators in multivariate analysis of variance.
14. What are the advantages of discriminant analysis in sociological research?
15. How is the test of equality of group means performed in discriminant analysis?
16. What are the canonical coefficients of the discriminant function?
17. What methods of assessing variable interactions are used in longitudinal analysis?
18. Basic criteria for evaluating models in longitudinal analysis.
19. The purpose of survival analysis in sociology.
20. Life tables: what are they and how are they constructed?
21. How are group differences determined in survival analysis models?
22. What are time series and how are they used in sociology?
23. What components are taken into account in ARIMA models?
24. Basic forecasting methods in time series.
25. Multidimensional scaling: concepts and methods.
26. How are spatial maps interpreted in multidimensional scaling?
27. Basic methods of multidimensional analysis of social networks.
28. What software tools are used for social network analysis?
29. The main stages of SEM (structural equation modelling) and their significance.
30. What are the advantages and limitations of structural equation modelling (SEM) in sociological research?