Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

**Department of
Sociology**

Computer Analysis of Social Information and Data Visualization
Curriculum (Syllabus)

Course details	
Level of higher education	*Second (Master's)*
Field of knowledge	*C - social sciences, journalism, information and international relations*
Specialisation	*C5 Sociology*
Educational programme	*Social Data Analytics*
Status of discipline	*Mandatory*
Form of study	*Full-time (day)*
Year of study, semester	*1st year, 1st semester*
Scope of the discipline	*5 ECTS credits/150 hours: lectures – 30 hours, seminars – 30 hours, independent work – 90 hours.*
Semester control/control measures	*Exam, Calculation assignments, modular control work*
Class schedule	*https://schedule.kpi.ua/*
Language of instruction	*Ukrainian*
Information about course coordinator / lecturers	Lectures, seminars: *Candidate of Science, Associate Professor Gennadiy Oleksandrovych Korzhov, korzhovga@gmail.com*
Course location	*Google Classroom: https://classroom.google.com/c/ODAyMzY5NDgzNTU5?cjc=uukng5tq*

Course programme

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

In today's world, we are faced with huge amounts of information about various aspects of social life on a daily basis, much of which is presented in numerical form. Understanding what lies behind these figures, whether they are truly an objective reflection of social realities, is a task that everyone must tackle in order to make the right choices, plan their lives wisely and avoid becoming the object of subtle or cynical manipulation. The ability to find, process and analyse information is becoming a vital skill for every conscious citizen and educated person.

As a result of mastering the discipline, students will learn practical skills and abilities to work with various numerical information that characterises social structures, processes and phenomena; the ability to use specialised programmes to create their own databases and work with ready-made large arrays of social information available on the Internet. Students will have the opportunity to acquire basic skills and abilities

in processing and analysing statistical and sociological data, as well as the ability to work critically and creatively with large amounts of information, discover hidden social connections and patterns, and see individual facts of social reality through the prism of broader socio-cultural and socio-political processes.

In accordance with the requirements of the OPS, **the aim of the discipline** is to develop the following abilities in students:

- Ability to think abstractly, analyse and synthesise (SK 1)

- Ability to present the results of scientific research and prepare scientific reports and publications (FK 10)

    The task of the discipline is to develop the following learning outcomes**:**

- Analyse social phenomena and processes using empirical data and modern concepts and theories of sociology (PRN01)

- Apply scientific knowledge, sociological and statistical methods, digital technologies, and specialised software to solve complex problems in sociology and related fields of knowledge (PRN04)

- Summarise the results of their own scientific research and present them in scientific reports and publications (PRN11)

By mastering the content of the discipline, students will be able to creatively apply various methods of processing and analysing quantitative sociological information; formulate, substantiate and empirically verify descriptive and explanatory research hypotheses; create and modify databases (arrays), perform various transformations of variables in order to deepen the analysis; and discover latent, hidden social connections and patterns using quantitative analysis of sociological research data.

In today's world of information and communication technologies, every highly qualified specialist has to deal with large amounts of diverse information. Students will be able to use diverse numerical information about various spheres of life (economic, financial, social, demographic, political processes, views, attitudes and values of people, consciousness and behaviour of certain groups, etc.) more effectively in their professional activities and everyday life. This will not only promote a more conscious and creative use of information, improve skills in collecting, processing, transforming, modifying, analysis and interpretation of information sources, but also improve existing skills and acquire new ones, which will help them feel more confident in the labour market and compete more effectively for better, meaningful, creative and prestigious jobs.

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

Prerequisites: it is desirable to have basic skills in working with specialised software for processing and analysing quantitative social information (e.g., OSA, PSPP or R), with sociological data archives (e.g.,

National Bank of Sociological Data "Kyiv Archive", GESIS, etc.), basic level of English proficiency not lower than A2.

Concurrently studied: "Computer Analysis of Social Information and Data Visualisation" with the following educational components: "Analytical Sociology and Social Behaviour: Contemporary Approaches", "Methodology and Methods of Sociological Research in the Digital Age".

The knowledge, skills and abilities acquired during the study of this discipline can be successfully applied in the study of other specialised and industry-specific sociological disciplines.

3. Contents of the academic discipline

Section 1. Basic computer analysis of sociological information
Topic 1. Fundamentals of statistics for the analysis of sociological data
Topic 2. One-dimensional analysis of sociological data
Topic 3. Data selection and transformation
Topic 4. Data visualisation: Graphs
Topic 5. Analysis of two-dimensional tables
Topic 6. Analysis of multiple responses
Topic 7. Nonparametric criteria. Measures of comparison
Section 2. Principles and procedures of multidimensional analysis of sociological data
Topic 8. Regression analysis
Topic 9. Logistic regression
Topic 10. Discriminant analysis
Topic 11. Analysis of variance
Topic 12. Factor Analysis
Topic 13. Path Analysis (PAT Analysis)
Topic 14. Cluster analysis
Topic 15. Data Visualisation: Interactive Modes of Working with Graphs

4. Teaching materials and resources

4.1. Basic literature:

1. Panina N.V. Sociology Research Technology: Lecture Course. – Kyiv, 2000.
2. Paniotto V.I., Maksimenko V.S., Kharchenko N.M. Statistical Analysis of Sociological Data. – Kyiv: KMA, 2004.
3. Practical Course in Mathematical Statistics in Psychology. Examples in the SPSS System: Textbook / R.M. Bilous, V.P. Chernenko. – Kremenchuk: PP Shcherbatykh O.V., 2020.

4.2. Supplementary literature

1. Gorbachik A.P., Salnikova S.A. Analysis of sociological research data using SPSS: Textbook. – Lutsk: Vezha; Volyn National University named after Lesya Ukrainka, 2008. – 164 p.
2. Ng A., Su K. Master the Numbers! Data Science for Non-Specialists. Kharkiv: Fabula, 2024.
3. Pinkner S. Rationality. Kyiv: Laboratory, 2024.
4. Spiegelhalter D. The Art of Statistics: Making Informed Decisions Based on Data. Kyiv: KM-Books, 2023.
5. Albers M. Introduction to Quantitative Data Analysis in the Behavioral and Social Sciences. Hoboken, N.J.: Wiley, 2017.
6. Antonius R. Interpreting Quantitative Data with SPSS. London: Sage, 2003.
7. Druckman D. Doing Research: Methods of Inquiry for Conflict Analysis / Daniel Druckman/

SAGE Publication. 2005. 387 p.

8. Greasley P. Quantitative Data Analysis Using SPSS An Introduction for Health & Social Science. Maidenhead: Open University Press, 2008.
9. Hallsworth M., Kirkman E. Behavioural Insights. Cambridge: MIT Press, 2020.
10. Ho, R. Handbook of univariate and multivariate data analysis and interpretation with SPSS. Boca Raton: Chapman & Hall, 2006.
11. Welch S., Comer S. Quantitative methods for public administration: Techniques and applications.[3rd]ed. Long Grove: Waveland Press, 2006.

4.3. Online educational resources

1. http://www.socio-journal.kpi.kiev.ua. Sociology. Political Science. Law.
2. http://i-soc.com.ua/journal/content.php – Sociology: theory, methods, marketing.
3. http://www.nbuv.gov.ua – V.I. Vernadsky National Library of Ukraine.
4. https://prometheus.org.ua – Online courses in Ukraine and worldwide.
5. https://coursera.org – Online courses.
6. www.ec.europa.eu/eurostat – Statistical information about European Union countries.
7. www.stat.gov.ua – Statistics Service of Ukraine
8. http://www.gesis.org – Archive of data from international comparative sociological studies.
9. http://ukraine.survey-archive.com – National Bank of Sociological Data "Kyiv Archive".

All of the above sources are available online or on the course page in Google Classroom, as well as in the methodology room of the Department of Sociology (room 503, building 7). Required reading will be indicated during the study of relevant topics.

Educational content

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

Lectures

Lecture 1. Fundamentals of statistics for analysing sociological data

Basic concepts of sociological research methodology. Three main paradigms of sociological research. Quantitative (positivist, statistical) paradigm. Qualitative (understanding, interpretative) paradigm. Critical social science. Comparative characteristics of the three paradigms: the purpose of research, the nature of social reality and human beings, the relationship between science and common sense, the essence of explanation and theory, criteria for the truthfulness of knowledge, the place of values in scientific research. Statistical (quantitative) and humanitarian (qualitative) approaches in sociology.

Assignment for independent study:
1. Create a table entitled "Comparison of three paradigms of sociological research."
2. Find an article in a scientific sociological journal that presents the results of quantitative scientific research on a topic similar to your master's thesis. Identify the type of research. Identify the essence of the scientific problem, the object and subject, the purpose and objectives of the research, hypotheses and operational definitions of key concepts, methodology and main results.

Lecture 2. One-dimensional analysis of sociological data

Data matrix. Frequency, proportion. Statistical series and their ordering. Tables of one-dimensional distribution. The problem of "compressing" social information, selecting the most informative features. Use of descriptive statistics in analysis.

Measures of central tendency. Arithmetic mean, its properties and calculation. Measures of central tendency for qualitative features: median, mode. Measures of variation. Dispersion and its properties. Coefficient of variation.

Assignments for independent study:
1. Consider the procedures for ordering statistical series.

2. Familiarise yourself with the requirements for forming intervals in distribution series.
3. Calculate the mean, mode, and median for the proposed metric variables, in which individual values are combined into categories with ranges.

Lecture 3. Data selection and transformation

Selection of observations. Classification of operators. Random sampling. Sorting observations. Distributing observations into groups. Creating a new variable using various procedures (Compute, Recode, Count). Converting variables from one type to another.

Logical expressions and functions. Indices in sociological research. Indirect measurement. Construction of indices as a measurement technique and as a component of empirical information analysis. Logical indices in sociology. Indices for comparing groups. Creating indices of summary ratings (Likert scale). Basics of working with the syntax editor.

Assignment for independent study:
1. Familiarise yourself with one of the examples of an innovative project for collecting and analysing sociological information.
2. Find an online resource that can be used to create web questionnaires. Familiarise yourself with its capabilities and limitations.
3. Select one study on the website of the National Bank of Sociological Data "Kyiv Archive", download the array and methodological documentation. Familiarise yourself with the topics and variables of the selected study.
4. For metric variables (age, work experience), recode them to create combined categories. Check the correctness of the modification.
5. Create an index based on 2-3 primary variables. Explain the logic behind your actions. Present the results.

Lecture 4. Data visualisation: Graphs.

Graphical representation of variable behaviour. Building and editing graphs. Types of graphs. The importance of graphical data presentation.

Assignment for independent study:
1. Construct different types of graphs of one-dimensional data distribution for nominal, ordinal, and metric variables. Explain the choice of one type of graph or another.
2. Edit the graphs you have created.

Lecture 5. Analysis of two-dimensional tables.

Two-dimensional table as a tool for studying the relationship between two characteristics: structure and reading rules. Marginal column and marginal row. Situations in which the use of contingency tables is inappropriate, and ways to deal with them. The concept of statistical correlation. Analysis of the degree of correlation between two nominal variables.

The chi-square criterion: purpose, description and limitations. Calculation and interpretation of the chi-square coefficient. Number of degrees of freedom. Use of tables to calculate the chi-square significance level. Chi-square-based coefficients.

Method of refinement in the analysis of the relationship between characteristics. The "false correlation" method. Model with an intermediate variable.

Task for independent study:
1. Using the absolute indicators given in the contingency table, calculate the relative indicators.
2. Based on the tables of two-dimensional distributions, analyse the attitude of the Ukrainian population towards the authorities and various events in public life depending on age, gender, social status and region.

Lecture 6. Analysis of multiple responses

Dichotomous method. Determination of sets. Frequency tables for dichotomous sets. Contingency tables with dichotomous sets. Categorical method. Determination of sets. Frequency tables for categorical sets. Contingency tables with categorical sets. Comparison of dichotomous and categorical methods.

Assignment for independent study:

Compare dichotomous and categorical methods.

Lecture 7. Non-parametric criteria. Measures of comparison

Parametric and non-parametric criteria. Characteristics of measures of comparison. Averages. T-test for one sample, for comparing two independent samples, for paired samples. One-way analysis of variance.

Assignment for independent study:

Practical application of variance analysis.

Lecture 8. Regression analysis

Simple linear regression. Regression line, regression coefficient and their construction. Methods of using multiple regression: stepwise and hierarchical. Features of including independent variables in the regression equation. Problems caused by multicollinearity and options for solving them.
Nonlinear regression.

Assignment for independent study:

Graphical representation of regression.

Lecture 9. Logistic regression.

The difference between logistic regression and linear regression. The concepts of probability, odds and natural logarithm of odds and their use in the logistic equation. Logarithmic likelihood. Distribution of predicted probabilities. Ordinal regression. Probit analysis.

Assignment for independent study:

Interpretation of logistic regression results.

Lecture 10. Discriminant analysis.

The concept of discriminant analysis. Methods of introducing predictors into discriminant analysis (standard, hierarchical, statistical). Determination of the best discriminators based on mean values and standard deviations. The order and features of constructing discriminant functions. Reference to the coefficients of the discriminant equation and intragroup correlations between predictors. Evaluation of the effectiveness of discriminant analysis.

Assignment for independent study:

Interpretation of the coefficients of the discriminant equation and intragroup correlations between predictors. Evaluation of the effectiveness of discriminant analysis.

Lecture 11. Analysis of variance

The concept of analysis of variance. The difference between analysis of variance and Student's t-test. Calculation scheme in analysis of variance (calculation of within-group and between-group sums of squares). Assessment of statistical significance in analysis of variance. Methods of multiple comparisons. Kreskel-Wallis analysis of variance. Characteristics of different measures of comparison: rules of application. Analysis of variance using repeated measurements.

Assignment for independent study:

Practical application of Kruskal-Wallis analysis of variance.

Lecture 12. Factor analysis.
The concept of factor analysis. The purpose of factor analysis. Sequence of stages in factor analysis. Formulation of the problem. Analysis of the correlation matrix. Principal component method. Criteria for determining the number of factors (Kaiser, Rocky Slope). Rotation method.
Assignment for independent study:
Compare the results of factor analysis using two different methods – principal components and rotation.

Lecture 13. Path analysis.
The relationship between the dependent variable, independent variable and residual. The essence of path analysis. Use of multiple equations. Types of models of relationships between three variables. Stages of path analysis (construction of a causal diagram, establishment of the strength of relationships, construction of a path diagram, calculation of path coefficients, quality control, interpretation of results).
Assignment for independent study:
Using the available data from one of the studies, develop a path analysis model and conduct its empirical verification.

Lecture 14. Cluster analysis.
The concept of cluster analysis. The purpose of cluster analysis. Stages of cluster analysis. Selection of variables. Euclidean distance method. The need for data normalisation. Hierarchical and non-hierarchical clustering methods. Ways of presenting results: dendrogram and accumulation diagram. Ways to determine the number of clusters: theoretical considerations, cluster association distance, cluster size. Cluster reliability verification operations: using different distance measurement methods, using different clustering approaches, splitting data into two parts, discarding individual variables.
Assignment for independent study:
Perform cluster reliability verification operations.

Lecture 15. Data visualisation: Interactive modes of working with graphs.
Transferring statistical results and diagrams to Word. Exporting summary tables and diagrams as HTML documents.
Bar charts. Line charts. Area, pie, and box charts. Histograms. Scatter plots.
Interactive modes of working with graphs. Correction of interactive graphs. Building a chart based on data from a summary table.
Homework assignment:
Build a chart based on data from a summary table.

<p align="center">**Seminar (practical) classes**</p>

The main objectives of the practical classes are to assimilate the material from the lectures and the results of the students' independent work, to deepen the knowledge acquired, to develop skills in preparing presentations, formulating and defending one's own position, as well as to acquire skills in analysing sociological information using specialised software.

Practical class No. 1. Formulating research hypotheses and justifying methods for their empirical verification.
Plan

1. Based on the proposed set of empirical indicators, formulate different types of hypotheses (descriptive and explanatory, primary and secondary, basic and consequential hypotheses, alternative hypotheses). Provide a logical (theoretical) justification for the proposed hypotheses.
2. Propose methods for empirical verification of hypotheses.
3. Indicate the conditions under which hypotheses can be considered fully or partially confirmed and under which they should be rejected.
   Write a report.

Practical lesson No. 2. Designing different types and kinds of scales for measuring individual social indicators.

Plan

1. Based on the hypotheses put forward (see practical work No. 1), identify 10-15 variables that will be used to test the hypotheses.
2. Propose 2-3 (if possible) measurement methods for each variable.
3. Divide the variables into three groups depending on the type of measurement scales.
4. For 3 ordinal and 3 metric variables, perform a transformation (modification) to a lower level of measurement scale. What are the advantages and disadvantages of this type of transformation? When should it be used?
5. Write a report.

Practical exercise No. 3. Practising data management and conversion skills in the PSPP software environment.

Plan

1. Creating a new variable using various procedures (Compute, Recode, Count).
2. Recoding variables.
3. Converting variables from one type to another.
4. Basics of working with the syntax editor.
5. Report.

Practical lesson No. 4. One-dimensional analysis of sociological data.

Plan

1. Construction of frequency and percentage distributions of data.
2. Describe the frequencies obtained (valid, missing values, absolute, relative and cumulative frequencies). Construct graphs of one-dimensional distribution.
3. Use of statistical characteristics for the analysis of one-dimensional distributions.
4. Performing standardisation of indicators (*Save z-values*).
5. Writing a report.

Practical lesson No. 5. Data visualisation: Graphs.

Plan

1. Construct a one-dimensional distribution of the three proposed variables. Create a summary table.
2. Present the properties of variables in graphical form.
3. Construct different types of graphs. Explain the advantages and disadvantages of each of them.
4. Edit the graphs. Describe the graphs obtained.
5. Write a report, paying particular attention to the functions and significance of graphical data presentation.

Practical lesson No. 6. Analysis of two-dimensional tables

Plan

1. From the list of variables provided, create 5 pairs by combining independent and dependent variables. Formulate a hypothesis about the relationships between the variables.
2. Create a two-dimensional table to study the relationship between two characteristics. Examine its structure and describe the results obtained. Describe the marginal column and marginal row.
3. Calculate the chi-square coefficient. Conduct a statistical analysis and meaningful interpretation.
4. Taking into account the number of degrees of freedom, use tables to calculate the significance level of chi-square. Compare with the results obtained in PSPP.
5. Apply coefficients based on chi-square to variables of different measurement levels.
6. Analyse the relationship between two nominal variables using a two-dimensional table, chi-square and the main coefficients of paired relationships between nominal variables.
7. Add a third variable to test the hypothesis. Describe the three-dimensional table.
8. Write a report focusing on the heuristic possibilities of applying the chi-square coefficient, the procedure for its application, the calculation algorithm, and the model for interpreting the results obtained.

Practical lesson No. 7. Analysis of multiple responses

Plan

1. Perform a frequency distribution of data using the multiple dichotomy method.
2. Perform a frequency distribution of data using the multiple category method.
3. Construct two-dimensional tables using dichotomous sets.
4. Construct two-dimensional tables using categorical sets.
5. Compare dichotomous and categorical methods. Draw conclusions.

Practical lesson No. 8. Measures of comparison

Plan

1. Compare means using the *Compare means* command.
2. Apply the T-test for a single sample, describe the results.
3. Apply the T-test to compare two independent samples, describe the results.
4. Apply the T-test for paired samples, describe the results, draw conclusions.
5. Perform a one-way analysis of variance. Interpret the coefficients and draw meaningful conclusions.
6. Write a report, drawing conclusions about the features and limitations of different measures of comparison.

Practical lesson No. 9. Linear regression

Plan

1. Calculate the equation of simple linear regression.
2. Construction of a regression line.
3. Creating a theoretical model of multiple linear regression.
4. Performing multiple linear regression using PSPP. Calculating the equation of multiple linear regression.
5. Interpretation of multiple linear regression coefficients.
6. Report.

Practical lesson No. 10. Logistic regression

Plan

1. Characteristics of the differences between logistic and linear regression.
2. Use of probability, odds and natural logarithm of odds in the logistic equation.
3. Logarithmic likelihood.
4. Distribution of predicted probabilities.
5. Application of ordinal regression.
6. Brief report on the results.

Practical lesson No. 11. Discriminant analysis

Plan

1. Application of the forced inclusion method.
2. Statistics
3. Classification.
4. Analysis of results obtained. Calculation of forecast
5. Model quality assessment.
6. Application of the step-by-step method.
7. Report.

Practical lesson No. 12. Dispersion analysis

Plan

1. Learning the calculation scheme in variance analysis (calculation of intra-group and inter-group sums of squares).
2. Assessment of statistical significance in variance analysis.
3. Application of multiple comparison methods.
4. Conducting a Kruskal-Wallis analysis of variance.
5. Application of various comparison measures: rules and interpretation of results.
6. Performing analysis of variance using repeated measurements.
7. Report.

Practical lesson No. 13. Factor analysis

Plan

1. Formulation of the problem.
2. Analysis of the correlation matrix.
3. Application of the principal component method.
4. Criteria for determining the number of factors (Kaiser, Rocky Slope).
5. Application of the rotation method.
6. Writing a report on the results obtained.

Practical lesson No. 14. Path analysis

Plan

1. Construction of a cause-and-effect diagram.
2. Establishing the strength of interrelationships.
3. Constructing a path diagram.
4. Calculating path coefficients.
5. Quality control.
6. Interpretation of results.
7. Writing a report.

Practical lesson No. 15. Modular control work

6. Independent work of the student/postgraduate

Independent work by the applicant includes:
- preparation for classroom sessions – 46 hours;
- preparation for Calculation assignments– 10 hours;
- preparation for the modular control work – 4 hours;
- preparation for the exam – 30 hours.
Total – 90 hours.

7. Academic discipline policy (educational component)

Attendance and completion of assignments

Attendance at lectures is desirable. During the lectures, theoretical approaches to data analysis within the quantitative paradigm, mathematical and statistical methods of processing, generalisation and analysis of sociological data will be considered. In addition, the lecturer will present numerous and varied examples of the practical application of each individual method with a demonstration of the algorithm in specialised software. An important part of the lecture will be the interpretation of the results obtained as a result of quantitative analysis, the presentation and justification of meaningful conclusions based on statistical expertise. Thus, the lecture combines both theoretical and methodological and practical components of the analytical process with quantitative sociological information. For students who wish to achieve excellent or good results in their studies, active participation in lectures is a prerequisite. However, it is not necessary to make up for missed lectures.

Attendance at practical (seminar) classes is mandatory. Missed practical (seminar) classes should be completed independently and made up during consultations.

The student's rating will largely be based on the results of their work in practical (seminar) classes. Each missed practical class (regardless of the reason for the absence) lowers the student's final rating in the discipline. A student who has missed practical classes may receive a low rating, which will not allow such a student to take the exam. In this case, the topics from the missed seminars must be studied, and the practical tasks must be completed by the student. The student's knowledge (understanding) of the missed topics (completion of assignments) will be assessed during communication with the lecturer according to the consultation schedule available on the website of the Department of Sociology, or during a break in the class ("during the lesson"). Students who complete the relevant tasks (answer the questions) will receive the corresponding points for their rating depending on the quality of their answers (completion of the task).

Forms of work

The lectures cover the main theoretical and methodological principles of quantitative analysis of various social processes, including social conflicts, consider various case studies and examples of the use of specialised software to solve specific analytical problems, algorithms for applying a particular method are provided, and interpretations of the results obtained are offered. During the lectures, the lecturer will provide a comprehensive overview of the various methods of processing and analysing quantitative social information, focusing on the most popular and effective methods that have gained recognition in empirical research, both fundamental and applied. Using examples from well-known research programmes and projects, students will have the opportunity to learn about the best contemporary examples of combining theory and empirical research aimed at verifying hypotheses based on conceptual positions. The topics of the lectures are outlined in the course syllabus. Questions from students to the lecturer during the lecture are welcome. The lecturer may ask questions to individual students or the audience as a whole. Dialogue between students and the lecturer during the lecture is welcome.

Students are expected to be able to apply theoretical principles in practice. Practical classes will discuss problematic aspects of using various methods of computer analysis of sociological information. Practical classes are aimed at developing practical skills and abilities to apply specialised computer software for processing and analysing sociological data. During practical classes, the teacher will summarise and analyse the mistakes and shortcomings of the students' work on processing and analysing quantitative sociological information, answer students' questions, and students will work on each other's mistakes and shortcomings. The classes will use various case studies, work with various databases, and active methods of learning in pairs and microgroups. During practical and laboratory classes, students will work with various sources of quantitative sociological information and learn to process and analyse it using specialised

computer software. In laboratory classes, students will learn to use the basic methods of descriptive statistics, two-dimensional and multidimensional analysis of sociological information.

During the semester, each student will prepare and write a modular control work on a chosen topic in the form of their own research project using available data sets. While working on the modular control work, students will acquire competencies in writing analytical sociological texts based on their own analysis of sociological data, using descriptive statistics, one-dimensional, two-dimensional and basic multidimensional methods.

Rules of conduct in class

During classes, it is recommended to turn off phones in order to achieve a higher level of attention and focus on learning activities. At the same time, on the recommendation of the teacher, you can use communication tools to search for information on the discipline's ul-disk or on the Internet.

During classes, both seminars and lectures, students are expected to be active, participate in discussions, complete practical tasks, exercises and assignments, ask questions, contribute to group discussions, etc.

When answering questions during practical classes, students should not read from their smartphones, tablets or laptops. They should use their own notes, summaries of the material they have read and data analysis carried out independently at home or in pairs.

Deadline and resit policy

Each written homework assignment, which will be announced in advance by the teacher, must be completed before the start of the corresponding practical (seminar) class. Completed assignments must be submitted one day before the date of the corresponding class (posted on the course page in Google Classroom for distance (online) learning, or sent to the teacher's email address for in-person learning). Points will be deducted for late homework assignments (see

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 behaviour

The standards of ethical behaviour 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: 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)**

   A student's rating consists of points they receive for:
   1) answers in seminars;
   2) modular control work
   3) Calculation assignments
   4) Exams

1. Answers in seminars.

Weighting score – 5 points for answering one question. The maximum number of points for all seminars is equal to r_{sem} = 5 points*5 = 25 points.

For each question answered, the student receives:

– "excellent", complete answer (at least 90% of the required information) if the student demonstrates a deep knowledge of the material, presents it logically and consistently, gives reasoned conclusions, freely operates with specific data, and answers the questions easily and convincingly – 5 points;

– "good", a sufficiently complete answer (at least 75% of the required information), or a complete answer with minor inaccuracies, answering most of the questions asked – 4 points;

– "Satisfactory", incomplete answer (at least 60% of the required information) and significant errors, answers questions poorly or does not answer at all – 3 points;

– "unsatisfactory", no work in the seminar – 0-2 points.

2. Modular control work.

Weighting – 5 points.

Assessment criteria:

- "excellent", the topic is fully covered (at least 90% of the required information), the work is written independently, meets the established requirements and is submitted on time – 5 points;

- "good", the topic is not fully covered (at least 75% of the required information), there are minor deviations from the established requirements, submitted on time – 4 points;

- "satisfactory", the topic is poorly covered and/or there are significant deviations from the established requirements and/or the work is submitted with a significant delay – 3 points;

- "unsatisfactory", the work does not meet the requirements – 0-2 points.

3. Calculation assignments.

Weighting – 20 points.

The work is assessed according to the completeness of the task, the correctness of the description of the results, the theoretical and factual content, and the depth of analysis.

Assessment criteria:

- "excellent", the work fully meets the task, is done independently, provides a correct and clear description of the results, contains a sufficient theoretical and factual basis, demonstrates in-depth analysis, all requirements are met – 18-20 points;

- "good" – the work generally meets the requirements, there may be minor deviations from the requirements or minor inaccuracies in the description of the results, the level of analysis is sufficient – 15-17 points;

- "Satisfactory": the work contains only some of the necessary elements of the task or is superficially completed, there are significant deviations from the requirements, insufficient theoretical or factual basis, limited or weak analysis – 12-14 points;

- "unsatisfactory", the work does not meet the established requirements: key parts of the task are missing, the content is incomplete or not independent, the analysis is absent or grossly erroneous – 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 (no more than 10 points for all types of work):

- for research activities (participation in conferences, "FSP Science Days", student competitions, publications);

- participation in faculty competitions in academic disciplines and national 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 to receive a preliminary rating of at least 24 points.

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)

Requirements for Calculation assignments

The work is performed using the PSPP statistical programme for processing social data. The volume of work should be 7-10 pages of text with 1.5 spacing and 14-point Times New Roman font (excluding tables and graphs). Both the Calculation assignments itself and its defence during one of the practical classes according to the schedule of presentations are assessed.

1. Formulate a scientific problem that you would like to investigate using secondary analysis of empirical research data. It is recommended to choose a topic related to the research planned to be conducted as part of your future bachelor's thesis. Review the available sociological research data sets and select the one that will allow you to investigate your chosen problem. The data set can be obtained from open archives of sociological information known to you, e.g., the National Bank of Sociological Data "Kyiv Archive". To make the right choice, you need to be well versed in the content and nature of the data in this study. Briefly justify the scientific problem and formulate the research question. It is necessary to describe in detail the research methodology, the data set, and cite the source of the data (website). The tools and data set must be added to the Calculation assignments.
2. Select several variables (e.g., 8-10) from the data set that can be used to conduct a small independent secondary study. Some of the variables should correspond to the main topic of your study, while others should contain socio-demographic characteristics of the respondents.
3. Come up with several hypotheses (e.g., 3-5) that reflect the scientific problem your mini-research will focus on. The hypotheses and variables you select should correspond to each other. At least one of your hypotheses should be causal (explanatory).
4. Consider a model for empirical verification of your hypotheses using both descriptive statistics and statistical analysis methods.
5. Test your hypotheses using various methods of analysis, including one-dimensional and two-dimensional, correlation, regression, variance, factor, cluster, etc. Provide a statistical and substantive interpretation of the results obtained. Draw conclusions about the validity of your hypotheses. Summarise your findings.

As a result of completing the task, you must submit 3 files:

1) **Calculation assignments (Word file) (7-10 pages),**

2) **presentation (PowerPoint file) (15+ slides),**

3) **PSPP calculation file (output).**

List of questions for the modular control work:
1. Define the three main paradigms of sociological research.
2. Explain the differences between quantitative and qualitative paradigms of social data analysis.
3. Describe the critical social science view of the nature of social reality.
4. Compare the approaches of the three paradigms to the criteria for the truth of knowledge.
5. Explain the relationship between scientific knowledge and common sense in different paradigms.
6. Indicate the role of values in positivist, interpretive, and critical traditions.
7. Give an example of a sociological problem and define its object and subject in the context of quantitative research.

8. Identify the type of quantitative sociological research based on a brief description (exploratory, descriptive, analytical).
9. Explain the concept of a "data matrix" and give an example of its structure.
10. Describe the procedure for calculating frequency and proportion for a one-dimensional distribution of a variable.
11. Construct a table of one-dimensional distribution based on the proposed data set.
12. Explain the problem of "compression" of social information and the role of selecting informative features.
13. Calculate the arithmetic mean for the given values of the variable.
14. Calculate the mode and median for data grouped into interval categories.
15. Calculate the variance and coefficient of variation for a given statistical series.
16. Explain the difference between measures of central tendency for quantitative and qualitative features.
17. Explain the principles of forming intervals in distribution series.
18. Give an example of a situation in which it is appropriate to use the median rather than the mean.
19. Describe the procedure for selecting a random sample from the available data.
20. Formulate a logical expression for filtering observations under given conditions.
21. Explain the difference between the Compute, Recode, and Count procedures in data processing.

22. Construct a new variable using type conversion (e.g., from text to numeric format).
23. Give an example of an index in sociological research and explain its purpose.
24. Explain the essence of logical indices in sociology and give an example of their use.
25. Explain the principle of constructing a summary rating index (Likert scale).
26. Compile an index for comparing two groups based on the proposed ratings.
27. Describe the importance of sorting observations in the data analysis process.
28. Give an example of a variable that needs to be recoded and explain why.
29. Explain the differences between one-dimensional, two-dimensional, and multidimensional analysis (briefly).
30. Explain the role of the syntax editor in working with data and the advantages of using it.

List of questions for the semester exam:

1. Quantitative analysis as a model of social processes.
2. Factors in choosing a specific method of quantitative data analysis. One-dimensional and multidimensional analysis.
3. The logic and main stages of computer analysis of sociological data. Levels of sociological analysis of empirical data.
4. Procedures for interpreting and operationalising concepts.
5. The concept of measurement errors and their types.
6. Point and interval estimation.
7. Sociological indices, methods of their calculation, scope of application.
8. Integral indices and their role in quantitative analysis of sociological data.
9. Creating a new variable using various procedures.
10. Converting variables from one type to another.
11. Basics of working with the syntax editor.
12. Data management. Merging and splitting files. Dividing cases into groups. Selecting and sorting cases.

13. Arithmetic mean as a statistical indicator. Interpretation of means in the analysis of social data.
14. Median and mode as statistical indicators; methods of determination, interpretation.
15. Measures of variation: calculation, interpretation, consideration in the analysis of social processes. Coefficient of variation of categories.
16. Reliable probability and confidence interval: concept and interpretation. Interval estimation for binomial distribution.
17. Use of statistical characteristics for the analysis of one-dimensional distributions. Descriptive statistics.
18. Standardisation of indicators.
19. Conversion of z-scores to normalised scales.
20. Contingency table as a tool for studying the relationship between two characteristics.
21. Chi-square criterion: purpose, description, limitations, calculation and interpretation.
22. Chi-square-based association coefficients.
23. Method of refinement in the analysis of the relationship between characteristics. The "false correlation" method. Model with an intermediate variable.
24. The concept of statistical dependence. Types of relationship and strength of relationship.
25. Correlation coefficients for characteristics measured on a nominal scale: calculation and interpretation of values.
26. Correlation coefficients for traits measured on an ordinal scale: calculation and interpretation of values.
27. Correlation coefficients for characteristics measured on a metric scale: calculation and interpretation of values.
28. The essence of statistical hypothesis testing procedures.
29. Characteristics of measures of comparison. Averages. T-test for one sample.
30. T-test for comparing two independent samples.
31. T-test for paired samples.
32. Procedure for analysis of variance.
33. One-factor analysis of variance.
34. Methods of multiple comparisons.
35. Cressel-Wallis analysis of variance.
36. General algorithm for analysing the relationship between variables. Functional and correlation relationship.
37. Linear and nonlinear relationships. Covariance. The concept of statistical dependence. Strength of relationship.
38. Pearson's pair correlation coefficient: formula, calculation rules, range of values, conditions of application, interpretation, level of significance. Typical errors in the use and interpretation of the correlation coefficient.
39. Rank correlation. Spearman's rank correlation coefficient: rank covariance, calculation rules, range of values, interpretation.
40. Kendall's rank correlation coefficient: calculation and interpretation.
41. Graphical representation of variable behaviour. Plotting and editing graphs. Types of graphs. The importance of graphical data presentation.
42. Comparison of dichotomous and categorical methods of multiple response analysis.
43. Dichotomous method of multiple response analysis: definition of sets, frequency and two-dimensional tables for dichotomous sets.

44. Categorical method of multiple response analysis: definition of sets, frequency and two-dimensional tables for categorical sets.
45. Types of variance analysis.
46. The essence of covariance analysis.
47. Interpretation of results in variance analysis.
48. Factor analysis and its purpose.
49. Sample size in factor analysis.
50. Determining the number of factors in factor analysis.
51. Regression and prediction.
52. Simple linear regression.
53. Regression line, regression coefficient and their construction. Methods of using multiple regression: stepwise and hierarchical.
54. Non-linear regression.
55. The sequence of inclusion of independent variables in the equation in stepwise regression.
56. Multicollinearity in multiple regression.
57. Features of discriminant analysis.
58. Discriminant functions.
59. Verification of the effectiveness of discriminant analysis.
60. The essence of path analysis.
61. Basic model in path analysis.
62. Path diagram in path analysis.
63. Stages of cluster analysis.
64. Interpretation and profiling of clusters.
65. Ways of presenting results in cluster analysis.
66. Logistic regression.
67. Data export.
68. Interactive tables.

Informal distance and online courses

Certificates of completion of distance or online courses on relevant topics may be accepted. In particular, we recommend the online course "Data Analysis. Applied Problems of Statistical Data Analysis: Interrelationships, Trends, Forecasts, Classifications." The course is available on the Coursera educational platform at: https://www.coursera.org/specializations/analiz-dannykh?#courses. Other available options include the English-language course "Survey Data Collection and Analytics" (https://www.coursera.org/specializations/data-collection) and the Ukrainian-language courses "Data Visualisation" (https://courses.prometheus.org.ua/courses/IRF/DV101/ 2016_T3/about) "Practical Sociology for Media Professionals" (MEDIASOC101) (https://courses.prometheus.org.ua/courses/course-v1:Prometheus+MEDIASOC101+2020_T3/about), "Sociology and Social Research: What, How, Why?" (SOC101) (https://courses.prometheus.org.ua/courses/IRF/SOC101/2015_T1/about). Other massive open online courses (in whole or in part) may be used, subject to agreement with the lecturer on their subject matter and content, as well as other online educational resources, e.g., PSPP for beginners (https://www.youtube.com/watch?v=ZpwZS3XnEZA). Other massive open online courses (in whole or in part) may be used, provided that their topics and content are agreed upon with the lecturer.

Inclusive learning
Permitted

The working programme of the academic discipline (syllabus):

Prepared by: Associate Professor of the Department of Sociology, Candidate of Sociological Sciences, Associate Professor Gennadiy Oleksandrovych Korzhov

Approved by**:** Department of Sociology (Minutes No. 14 dated 23 June 2025)

Approved by: Methodological Commission of the Faculty of Sociology (Minutes No. 4 dated 24 June 2025)