

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
FEDERAL STATE AUTONOMOUS EDUCATIONAL
INSTITUTION OF HIGHER EDUCATION
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Methodical Guidelines

on Practical Lessons

on the discipline

**WRITING AND ACADEMIC COMMUNICATION FOR INTERNATIONAL
ELECTRONICS JOURNALS / НАПИСАНИЕ ТЕКСТОВ И НАУЧНАЯ
КОММУНИКАЦИЯ ДЛЯ МЕЖДУНАРОДНЫХ ЖУРНАЛОВ ПО ЭЛЕКТРОНИКЕ**
for students of the Master's program
02.04.01 Mathematics and Computer Sciences
profile: Training Program for Electronic Information

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INTRODUCTION

1. Discipline Purpose and Position in the Educational Program

The discipline “Writing and Academic Communication for International Electronics Journals / Написание текстов и научная коммуникация для международных журналов по электронике” (Index: B1.O.04) belongs to Block 1, Mandatory Part of the Master’s educational program 02.04.01 Mathematics and Computer Sciences. It is implemented in Semester 1 and carries 4 credit units. The course is the most important prerequisite for advanced modules in Semester 3, including Scientific Research Work.

Purpose of the Laboratory Component:

To provide students with a systematic theoretical and practical basis in the field of academic writing, publication strategy and organization of scientific research, allowing them to independently prepare, design and publish the results of scientific work in peer-reviewed journals and conferences. The discipline establishes the necessary competence base for effective communication with the scientific community, compliance with academic ethics and successful completion of all stages of research work.

List of planned learning outcomes in the discipline (module) correlated with the planned outcomes of the educational program

Competency code, description	Indicator code, description	Planned learning outcomes in the discipline (module) characterizing the stages of competencies and indicators formation
UC-4 Able to apply modern communication technologies, including in a foreign language(s), for academic and professional interaction	ID-1 uses the basics of establishing different types of communication (oral, written, business, intercultural, network, etc.) when solving professional tasks	Competently and fully uses the basics of establishing various types of communication (oral, written, business, intercultural, network, etc.) when solving professional tasks.
	ID-2 uses various types of communication technologies for academic and professional interaction	Competently applies various types of communication technologies for academic and professional interaction.
OPC-1 Able to apply fundamental knowledge and modern programming technologies to solve professional problems	ID-1 Implements basic machine learning algorithms for classification (Python/NumPy)	Implements machine learning models; demonstrates an understanding of complexity trade-offs; includes comprehensive testing; works correctly with programming results.
	ID-2 Able to work with code, understands the logic and meaning of the program	He is able to work with the code, understands the logic and meaning of the program, can answer questions about the code, is able to independently change the code or its logic.

2. Structure of Laboratory Sessions

Each laboratory session follows a 2-hour format:

- **First 30 minutes:** Brief theoretical recap and task clarification
- **Next 75 minutes:** Hands-on implementation with instructor consultation
- **Final 15 minutes:** Results demonstration and preliminary discussion

3. Technical Requirements

- Python 3.9+ with NumPy
- LaTeX distribution kit (TeX Live - for local work) or Overleaf online editor

PRACTICAL LESSON №1

Typology of scientific publications

Objective:

Master the classification of scientific publications, learn to distinguish between an article, review, preprint, abstract, and patent by annotation and structural features.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Genre differentiation of scientific publications.
- Target audience and tasks for each publication type.
- Features of annotations and keywords.

Tasks:

1. **Learn the difference criteria: article, review, preprint, abstract, patent.**
2. **Analyze 20-25 articles from real sources.**
3. **Practical task: determine the type of publication based on the proposed abstract with justification.**

Questions for Self-Check:

1. How does a preprint differ from a peer-reviewed article?
2. What mandatory elements should be included in the patent annotation?

Report Requirements:

- A table with attributes for each type of publication.
- Results of annotation classification with explanations.

PRACTICAL LESSON №2

Working with sources and databases, selecting suitable articles

Objective:

Develop the ability to effectively search for scientific literature in international databases for further research.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Principles of operation of Scopus, Web of Science, and ResearchGate.
- Стратегии Search query strategies.
- Управление Bibliography management.

Tasks:

1. **Formulate a search query for your topic**
2. **Select 30-40 current literature sources (no older than 5-7 years)**

Questions for Self-Check:

1. Which advanced search operators improve the accuracy of the sample?
2. How does ResearchGate differ from Scopus in terms of the type of content published?

Report Requirements:

- Screenshots of search strategies
- A list of 30 to 40 sources in a standardized format.

PRACTICAL LESSON №3

Critical selection and relevance assessment of literature sources

Objective:

Master the methods of assessing the relevance of scientific sources to form a qualitative review base.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Relevance criteria: relevance, credibility, reproducibility.
- Exclusion of predatory logs.
- Evaluation дизайна of the study design.

Tasks:

1. **Apply relevance criteria to selected 30 to 40 sources.**
2. **Select 20-25 sources for further use.**
3. **Make a brief justification for excluding sources.**

Questions for Self-Check:

1. Достаточно ли Is the impactfactor sufficient to assess relevance?
2. How can I check if a magazine is "predatory"?

Report Requirements:

- A final list of 20-25 sources.
- A table with evaluation criteria and a decision on inclusion/exclusion.

PRACTICAL LESSON №4

Writing a literature review and citation

Objective:

Learn how to coherently present a literature review with correct citations and highlighting key results of previous works.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Structure of the literature review.
- Techniques for synthesizing sources (topics, contradictions, and gaps).
- Rules for citation in a scientific text.

Tasks:

1. **Write a literature review (≈1500 words) based on 20-25 sources.**
2. **Highlight the main research principle and the results obtained.**
3. **Arrange citations in the same style (IEEE/APA/Harvard).**

Questions for Self-Check:

1. How can I avoid compilation quoting (link cascade)?
2. How does a literature review differ from an abstract?

Report Requirements:

- Text of the literature review.
- Bibliographic list.

PRACTICAL LESSON №5

Analysis of literature sources

Objective:

Conduct a comparative analysis of the selected sources, identify their strengths and weaknesses.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Methods of comparative analysis of scientific papers.
- Criteria: methodology, sample size, validity of conclusions.
- Formats for presenting analysis (tables).

Tasks:

1. **Create a comparison table for 20-25 sources.**
2. **Include columns: author, year, method, key results, constraints.**
3. **Draw conclusions about gaps in existing research.**

Questions for Self-Check:

1. How can I account for the difference in sample size when comparing results?
2. What should I do if two sources contradict each other?

Report Requirements:

- Comparison table.
- Text outputs (2-3 pages).

PRACTICAL LESSON №6

LaTeX – design of the text, headings, and sections of the article

Objective:

Master the basic layout of a scientific document in LaTeX: headings, sections, subsections, text formatting.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Structure of the LaTeX document (preamble, `\begin{document}`).
- КомандыThe `\section`, `\subsection`, and `\subsubsection` commands..
- Font selections (`\textit`, `\textbf`, etc.).

Tasks:

1. Create an article template with a title page.
2. Arrange headings and sections accordingly.
3. Embed a table of contents (`\tableofcontents`).

Questions for Self-Check:

1. How does `\section*` differ from `\section`?
2. How do I change the depth level of the table of contents?

Report Requirements:

- The source code is `.tex`.
- Compiled PDF.

PRACTICAL LESSON №7

LaTeX - design of the list of references

Objective:

Learn how to create and format a list of references in LaTeX using BibTeX.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Files.bib.
- Ключи Citation keys\cite{ }.
- Styles \bibliographystyle{IEEEtran} and others.

Tasks:

1. To create.bibfile from selected 20-25 sources.
2. Set up citation in the article text.
3. Compile a PDF with correct references and references.

Questions for Self-Check:

1. What causes the "Citation undefined" error and how can I fix it?
2. What is the difference between compiling pdfLaTeX → BibTeX → pdfLaTeX and single-pass compilation?

Report Requirements:

- Файл .The .bib file..
- Source code .tex with citations.
- PDF with bibliography.

PRACTICAL LESSON №8

Creating a Timeline

Objective:

Learn how to visualize the research timeline using LaTeX or image editors.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Principles of constructing chronological charts.
- Пакеты LaTeX: tikzpicture, chronology, modigram.
- Industry standards for the presentation of time plans.

Tasks:

1. **Create a timeline of research stages (goal setting-review-ML analysis-report).**
2. **Implement timeline in LaTeX (tikz) or vector format.**
3. **Embed a timeline in a cross-referenced document.**

Questions for Self-Check:

1. How does a horizontal timeline differ from a vertical one for a scientific article?
2. Which LaTeX package gives you the best control over timelines?

Report Requirements:

- Исходный код Timeline source code (if LaTeX) or SVG source code.
- A drawing embedded in the PDF.

PRACTICAL LESSON №9

Introduction, relevance and objectives of the study

Objective:

Develop the skill of writing the introduction of a scientific article with justification of relevance, formulation of the problem, goals and objectives of the study.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Introduction structure: background-problem-space-goal-tasks.
- Methods of justification of relevance (figures, citations, contradictions).
- Setting SMART goals.

Tasks:

1. **Write an introduction (≈500 words) for your research paper.**
2. **Clearly state the relevance, problem, goal and objectives.**
3. **Provide 3-5 key literature references to support relevance.**

Questions for Self-Check:

1. How does a goal differ from a task?
2. Where should I indicate scientific novelty in the introduction?

Report Requirements:

- Text of the introduction.
- Separate "Goals and Objectives" block (bulleted list).

PRACTICAL LESSON №10

Conducting research, preparing a Dataset

Objective:

master the stages of data preprocessing for machine learning tasks (omissions, outliers, feature encoding).

Competencies Assessed: OPC-1.1, OPC-1.2

Theoretical Background:

- Types of missing data (MCAR, MAR, MNAR).
- Methods for filling in gaps (mean, median, KNN, MICE).
- Identification of outliers (IQR, Z-score).
- Encoding of categorical variables (One-Hot, Label).

Tasks:

4. Upload the dataset (your own or suggested one).
5. Analyze the gaps → fill in the appropriate method.
6. Identify and process outliers.
7. Convert categorical attributes to numeric ones.

Questions for Self-Check:

3. In which cases is it preferable to delete lines with omissions rather than fill them in?
4. How Label Encoding can Label Encoding harm tree models?

Report Requirements:

- Pythonscript / Jupyter Notebook.
- A brief description of each processing step.
- Final dataset (link or description).

PRACTICAL LESSON №11

Conducting research, working with ML models

Objective:

Learn how to train basic machine learning models and perform forecasting on the prepared data.

Competencies Assessed: OPC-1.1, OPC-1.2

Theoretical Background:

- Split the sample (train/test/validation).
- Classification: Logistic Regression, Random Forest, XGBoost.
- Regression: Linear Regression, Ridge, Lasso.
- Basic principles of learning and prediction.

Tasks:

1. **Divide the dataset into training and test samples.**
2. **Train at least 3 machine learning models.**
3. **Perform a forecast based on the test sample.**
4. **Save the results of predictions.**

Questions for Self-Check:

1. Why do I need a validation sample if there is a test sample?
2. What happens if you don't shuffle the data before splitting?

Report Requirements:

- Code for training models.
- Значения Hyperparameter values (or how to select them).
- Saved predictions.

PRACTICAL LESSON №12

Conducting research, working with the results of forecasting

Objective:

Master basic classification metrics, cross-validation methods, and interpretation of results.

Competencies Assessed: OPC-1.1, OPC-1.2

Theoretical Background:

- Metrics: Accuracy, Precision, Recall, F1, ROC-AUC.
- Матрица Error matrix (confusion matrix).
- K-Fold cross-validation.
- Balancing classes.

Tasks:

1. Calculate classification metrics for each trained model.
2. Perform cross-validation (K-Fold, k=5 or 10).
3. Compare models by ROC-AUC and F1.
4. Choose the best model.

Questions for Self-Check:

1. Why Accuracy can be deceptive for problems with class imbalances?
2. How does K-Fold help you evaluate model stability?

Report Requirements:

- A table of metrics for all models.
- Graph of ROC curves.
- Output about the model selection.

PRACTICAL LESSON №13

Methodology and results of the study

Objective:

Learn to describe the methodology of the experiment and visualize the results obtained in accordance with the requirements of scientific journals.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Structure of the "Methodology" section.
- Presentation of results (tables, graphs, statistical tests).
- Rules for the design of figures and tables (legends, captions).

Tasks:

1. **Write the "Methodology" section (description of the dataset, preprocessing, models, and validation schemes).**
2. **Prepare visualizations: compare metrics, ROC-AUC, and feature importance.**
3. **Write the "Results" section with interpretation.**

Questions for Self-Check:

1. What must be specified in the methodology for reproducibility?
2. Can I include descriptions of failed experiments in the results?

Report Requirements:

- Text of the methodology.
- Figures and tables with captions.
- Text of the results.

PRACTICAL LESSON №14

Conclusion, inputs, abstract, keywords

Objective:

Master the final elements of a scientific article: conclusion, analytical conclusions, annotation, and keyword selection.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Difference between conclusions or and conclusions.
- Annotation structure (IMRAD in miniature).
- Selection of keywords (controlled dictionaries, frequency).

Tasks:

1. **Write a conclusion (≈ 300 words).**
2. **Formulate 4-6 points of conclusions (each based on the result).**
3. **Write an abstract (150-250 words).**
4. **Choose 5-8 keywords.**

Questions for Self-Check:

1. Is it possible to conclude with new results that are not available in the article?
2. How to avoid repetitions between conclusions and conclusions?

Report Requirements:

- Abstract + keywords.
- Conclusions (bulleted list).
- Conclusion.

PRACTICAL LESSON №15

Reviewing

Objective:

Master the skills of blind peer review of scientific work using a checklist for relevance, reproducibility and validity of conclusions.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Types of peer review (single-blind, double-blind, open).
- Criteria for a high-quality review (constructiveness, validity, ethics).
- Typical ошибки reviewer errors.

Tasks:

1. Get a fellow student's work for review (anonymously).
2. Rate by checklist: relevance, reproducibility, validity of conclusions.
3. Write a 1-2-page review with a recommendation (accept/modify/reject).

Questions for Self-Check:

1. Should I include specific grammar errors in the review?
2. What should I do if a conflict of interest is detected?

Report Requirements:

- Completed checklist.
- Text of the review.
- Final recommendation.

PRACTICAL LESSON №16

Report and presentation of research results

Objective:

Prepare an oral presentation and presentation to defend the research results in front of an audience.

Competencies Assessed: UC-4.1, UC-4.2

Theoretical Background:

- Structure of the scientific report (5-15 minutes).
- Presentation design (minimum text, maximum visualizations).
- Techniques of attention retention and answers to questions.

Tasks:

1. **Prepare an oral presentation on your article (5-7 minutes or 10-15 minutes at your choice).**
2. **Create a presentation (8-12 slides).**
3. **Make a presentation in front of the group (or record a video).**
4. **Answer questions from fellow students.**

Questions for Self-Check:

1. How much time is optimal for one slide?
2. What should I do if the question doesn't have a ready answer?

Report Requirements:

- Presentation file (.pdf, .pptx, .key).
- Speech abstracts or a script.
- Group assessment (or self-assessment) based on the following criteria: clarity, timing, visualization.