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**FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF  
HIGHER EDUCATION PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA  
NAMED AFTER PATRICE LUMUMBA  
RUDN UNIVERSITY**

**Faculty of Economics**

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**COURSE SYLLABUS**

**PYTHON AND SQL**

**FOR ECONOMISTS**

**Recommended by the Didactic Council for the Education Field of  
38.03.01 Economics**

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(code and name of the direction of training/specialty)

**The course instruction is implemented within the professional education  
programme of higher education**

**International Economic Relations**

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(name (profile/specialization))

**2026**

## 1. COURSE GOALS

The goal of mastering the discipline "Python and SQL for Economists" is to equip students with practical programming and data-analysis skills required for solving applied economic problems using Python and SQL, with AI as a co-pilot tool.

The main objectives of the course are:

- forming an AI-native co-pilot mindset for responsible and efficient use of generative AI in economic analysis;
- mastering foundational Python programming: variables, data types, conditional operators, loops, and functions;
- learning to collect, structure, and validate economic data using Python (pandas, NumPy) and AI-assisted workflows;
- developing the ability to solve deterministic economic case studies — from data collection and calculation to interpretation and policy recommendation;
- acquiring basic SQL skills for querying relational databases and retrieving structured economic data;
- building competence in data visualization (Matplotlib, Seaborn) and exploratory data analysis (EDA) applied to real-world economic scenarios;
- developing critical thinking: distinguishing headline figures from actual economic reality, testing assumptions against data, and articulating limitations of any analysis.

## 2. LEARNING OUTCOMES

Studying the discipline "Python and SQL for Economists" is aimed at the formation of the following competencies (parts of competencies) in students:

*Table 2.1. List of competencies formed by students during the development of the discipline (results of the development of the discipline)*

<b>Competence code</b>	<b>Competence</b>	<b>Competence indicators</b>
GC-12	Able to: search for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital	GC-12. Able to: search for the necessary sources of information and data, perceive, analyze, memorize and transmit

Competence code	Competence	Competence indicators
	means, as well as using algorithms when working with data received from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data	information using digital means, as well as using algorithms when working with data received from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data
		GC-12. Know how to search for the necessary sources of information and data, to perceive, to analyze, to memorize and to transmit information using digital means, as well as using algorithms when working with data received from various sources in order to effectively use the information received to solve problems

### 3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Python and SQL for Economists" refers to the part formed by the participants of the educational relations of the mandatory component

Within the framework of the educational program, students also master other disciplines and/or practices that contribute to achieving the planned results of mastering the discipline "Python and SQL for Economists".

Table 3.1. The list of the components of the educational program that contribute to the achievement of the planned results of the development of the discipline

Code	Competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GPC-2	Able to: search for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data received from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data	Computer science; Statistics for Economists; Economic informatics; International statistical databases; Interdisciplinary coursework; Interdisciplinary course project; Business process modeling; Geographic Information Systems: Visualization of Spatial Data; Business on the Internet; Basics of international trade; Electronic commerce in international business.	Project-technological internship; Undergraduate practice; Final state examination procedures; Degree thesis procedures.

#### 4. COURSE WORKLOAD AND LEARNING ACTIVITIES

The total laboriousness of the discipline "Python and SQL for Economists" is 2 credits.

TABLE 4.1. Types of academic activities during the period of the HE programme mastering

Type of educational work		TOTAL, academic hours	Semester
			7
<i>Contact,, ac.h</i>		34	34
Lectures		0	0
Lab work		0	0
Seminars (workshops/tutorials)		34	34
<i>Self-study (ies), academic hours</i>		20	20
<i>Evaluation and assessment academic hours</i>		18	18
Overall laboriousness of the discipline	<i>academic hours</i>	72	72
	credits	2	2

## 5. COURSE MODULES AND CONTENTS

Table 5.1. The content of the discipline (module) by type of academic work

Course Modules and Contents	Modules and Topics (Units/Themes)	Type of educational work*
<b>Section 1. Python Foundations and AI Co-Pilot</b>	1.1. AI-native approach and co-pilot mindset. Responsible use of generative AI in programming and economic analysis.	Seminars
	1.2. First code with AI: variables, basic data types, input/output. Understanding code structure to control AI-generated output.	Seminars
	1.3. Conditional operators and branching (if / elif / else). Encoding business rules and handling edge cases in code.	Seminars
	1.4. Loops and iterations (for / while). Automating repetitive calculations on economic data series.	Seminars

<b>Course Modules and Contents</b>	<b>Modules and Topics (Units/Themes)</b>	<b>Type of educational work*</b>
<b>Section 2. Applied Economic Analysis with Python</b>	2.1. Personal inflation case study (Moscow). Collecting price data into structured tables; computing percentage changes and averages in Python; benchmarking against official CPI.	Seminars
	2.2. Micro-PPP case study (cross-country basket). Building comparable datasets across countries; computing ratios and PPP indices in Python; FX vs. PPP comparison.	Seminars
	2.3. Budget constraint and trade-offs. Modeling a fixed-income budget in Python: dictionaries for categories, conditional allocation, scenario variants.	Seminars
	2.4. Anatomy of labor income: gross, net, employer cost. Writing Python functions for multi-step income transformations (tax brackets, insurance contributions, take-home pay).	Seminars
	2.5. Income, expenses, and budget balance. Multi-layer budget analysis: disposable income, opportunity cost of time, imputed income; iterative recalculation with Python loops and functions.	Seminars
	2.6. Comparing job offers A/B. Comparative analysis in Python: net income + mandatory expenses + disposable income side-by-side; basic data visualization with Matplotlib.	Seminars
<b>Section 3. Data Verification,</b>	3.1. Risk, scenarios, and robustness of decisions. Parameterized Python functions for sensitivity	Seminars

<b>Course Modules and Contents</b>	<b>Modules and Topics (Units/Themes)</b>	<b>Type of educational work*</b>
<b>SQL and Robustness</b>	analysis; iterating over exchange-rate and inflation scenarios with loops.	
	3.2. What drives cost-of-living differences. Structural decomposition with groupby aggregation and bar charts (pandas + Matplotlib/Seaborn). Introduction to SQL: SELECT, WHERE, ORDER BY for querying economic databases.	Seminars
	3.3. Economic myths and data-driven verification. Exploratory data analysis (EDA) in Python; filtering and logical checks. SQL queries with GROUP BY and aggregate functions to retrieve and verify statistical claims.	Seminars
<b>Section 4. Integration, SQL Practice and Capstone</b>	4.1. Integration rehearsal: full economic case pipeline. End-to-end Python + SQL workflow: query data (SQL) → clean and transform (Python) → analyze → visualize → conclude.	Seminars
	4.2. Capstone — solving and defending an economic conclusion. Independent case resolution using Python and SQL; preparing a data-backed argument with code, tables, and charts.	Seminars
	4.3. Consultation and refinement. SQL practice: JOINS, subqueries, views. Refining capstone code quality and analysis depth.	Seminars
	4.4. Project defense. Presenting and defending a complete Python + SQL economic analysis	Seminars

<b>Course Modules and Contents</b>	<b>Modules and Topics (Units/Themes)</b>	<b>Type of educational work*</b>
	before the group.	

- *is filled only in the full-time form of training: LC - lectures; LR - laboratory work; SC - seminar classes*

## **6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS**

*Table 6.1. Material and technical support of the discipline*

<b>Type of audience</b>	<b>Equipment of the audience</b>	<b>Specialized educational/laboratory equipment, software and materials for the development of the discipline (if necessary)</b>
Lecture hall	An auditorium for conducting lecture-type classes, equipped with a set of specialized furniture; a board (screen) and technical means of multimedia presentations.	
Seminary	An auditorium for conducting seminar-type classes, group and individual consultations, ongoing monitoring and interim certification, equipped with a set of specialized furniture and multimedia presentation equipment.	The list of specialized software installed on computers for mastering the discipline: Windows, Microsoft Office, Anaconda Navigator, Dbeaver, Superset, Internet access.
Computer	A computer classroom for conducting classes, group and	The list of specialized software installed on computers for

Type of audience	Equipment of the audience	Specialized educational/laboratory equipment, software and materials for the development of the discipline (if necessary)
class	individual consultations, ongoing monitoring and intermediate certification, equipped with personal computers (in the number of pcs.), a blackboard (screen) and multimedia presentation technical means.	mastering the discipline: Windows, Microsoft Office, Anaconda Navigator, Dbeaver, Superset, Internet access
For independent work of students	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to EIOS.	

- *the audience for independent work of students is MANDATORY!*

## **RESOURCES RECOMMENDED FOR COURSE STUDY**

### ***Main reading (sources)***

1. McKinney W. Python for Data Analysis, 3rd ed. O'Reilly, 2022. ISBN 978-1-098-10403-0.
2. Lutz M. Learning Python, 5th ed. O'Reilly, 2013. ISBN 978-1-449-35573-9.
3. Downey A. Think Python: How to Think Like a Computer Scientist, 2nd ed. O'Reilly, 2015. ISBN 978-1-491-93936-9.
4. Forta B. SQL in 10 Minutes a Day, Sams Teach Yourself, 5th ed. Sams Publishing, 2019. ISBN 978-0-135-18262-5.
5. Beaulieu A. Learning SQL, 3rd ed. O'Reilly, 2020. ISBN 978-1-492-05761-1.

6. VanderPlas J. Python Data Science Handbook, 2nd ed. O'Reilly, 2023. ISBN 978-1-098-12122-8.
7. Halterman R.L. Learning to Program with Python, 2021 (open access).
8. Sweigart A. Automate the Boring Stuff with Python, 2nd ed. No Starch Press, 2019. ISBN 978-1-593-27992-9.
9. <https://wombat.org.ua/AByteOfPython/AByteofPythonRussian-2.01.pdf>

### **Additional (optional) reading (sources)**

1. Computer Science for economists: Textbook / Edited by V.M.Matyushka. — 2nd ed. reprint. and additional — M.: INFRA-M, 2016. — 460 p. + Additional. Materials [Electronic resource; Access mode <http://www.znaniy.com> ]. (Higher education: Bachelor's degree). — [www.dx.doi.org/10.12737/6602](http://www.dx.doi.org/10.12737/6602).

### *Resources of the Internet information and telecommunication network:*

1. EBS RUDN and third-party EBS, to which university students have access on the basis of concluded contracts:
  - Electronic library system of RUDN — EBS RUDN <http://lib.rudn.ru/MegaPro/Web>
  - EBS "University Library online" <http://www.biblioclub.ru>
  - ABS Yurayt <http://www.biblio-online.ru>
  - EBS "Student Consultant" [www.studentlibrary.ru](http://www.studentlibrary.ru)
  - EBS "Doe" <http://e.lanbook.com/>
  - EBS "Trinity Bridge"

### *Databases and search engines:*

- electronic fund of legal and regulatory and technical documentation <http://docs.cntd.ru/>
- Yandex search engine <https://www.yandex.ru/>
- Google search engine <https://www.google.ru/>
- SCOPUS abstract database <http://www.elsevierscience.ru/products/scopus/>

*Educational and methodological materials for independent work of students during the development of the discipline/module:*

1. Case study materials and datasets for each unit (posted in TUIS).
2. Source Jupyter Notebooks with code templates for seminar assignments.
3. SQL practice scripts and sample databases (SQLite/PostgreSQL).

• *all teaching materials for independent work of students are placed in accordance with the current procedure on the discipline page in the TUIS!*

## **8. ASSESSMENT TOOLKIT AND GRADING SYSTEM\* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION**

Evaluation materials and a grading system\* for assessing the level of formation of competencies (part of competencies) based on the results of mastering the discipline "Python and SQL for Economists" are presented in the Appendix to this Course Syllabus of the discipline.

### **DEVELOPERS:**

**Associate Professor of the  
Department of Economic  
and Mathematical Modeling**

**Shaposhnikov A.M.**

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Position, ED

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Signature

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Surname.

### **HEAD OF THE ED:**

**Department of Economic and  
Mathematical Modeling**

**Balashova S.A.**

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Position, BUP

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Signature

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Surname.

Head of the Higher Education Program(me)  
Doctor of Economics, Professor of International  
economic relations

**I.V.Andronova**