Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
RUDN University

Faculty of Physics, Mathematics and Natural Sciences

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

Mathematical models and databases
course title

Recommended by the Didactic Council for the Education Field of:

01.04.01 Mathematics
field of studies / speciality code and title

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

«Functional methods in differential equations and interdisciplinary research»

higher education programme profile/specialisation title

2025

1. COURSE GOAL(s)

The purpose of mastering the discipline "Mathematical models and databases" is to further master the skills of working with SQL statements, which requires an understanding of a deeper approach to writing database queries.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline "Mathematical models and databases" is aimed at developing the following competencies (parts of competencies):

Table 2.1. List of competences that students acquire through the course study

Code	Competence	Competence achievement indicators (within this discipline)
PC-7	Able to develop and optimize business plans for scientific and applied projects	PC-7.1. Capable of drawing up business models in research activities
		PC-7.2. Ability to solve modern problems of business informatics and mathematical economics
PC-8	Able to develop corporate standards and functional standardization profiles for applications, systems, information infrastructure	PC-8.1. Development and use of corporate standards

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Mathematical models and databases" refers to the part formed by the participants in the educational relations of block B1 of the EP HE.

As part of the EP HE, students also master other disciplines and / or practices that contribute to the achievement of the planned results of mastering the discipline "Mathematical models and databases".

Table 3.1. The list of the higher education programme components/disciplines that contribute to the achievement of the expected learning outcomes as the course study

Code	Competence	Previous disciplines/modules, practices	Subsequent disciplines/modules, practices*
PC-7	Able to develop and optimize business plans for scientific and applied projects	-	State examination
PC-8	Able to develop corporate standards and functional standardization profiles for applications, systems, information infrastructure	-	State examination

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total labor intensity of the discipline "Mathematical models and databases" is 3 credits.

*Table 4.1. Types of academic activities during the periods of higher education programme mastering (**full-time training**)**

Type of study work		TOTAL, a.h.	Semester			
			1	2	3	4
Contact work, academic hours		*40*		*40*		
Lectures (LC)		20		20		
Lab work (LW)						
Seminars (workshops/tutorials) (S)		20		20		
Self-studies		*41*		*41*		
Evaluation and assessment (exam/passing/failing grade)		*27*		*27*		
Course workload	a.h.	**108**		**108**		
	credits	**3**		**3**		

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course Module Title	Brief Description of the Module Content	Type of study work
Section 1. Work of subqueries, nested queries	Topic 1.1. Statements that allow you to work with subqueries, nested SELECT statements	Lecture, seminar
Section 2. Correlated subqueries	Topic 2.1. Subqueries that allow you to work with candidate shirts for checking the predicate	Lecture, seminar
Section 3. Conditions of the first order in the classical problem of the calculus of variations	Topic 3.1. Action of EXISTS operators with correlated subqueries	Lecture, seminar
Section 4. Special operator ANY (or SOME)	Topic 4.1. Alternative operators to the EXIST operator, more convenient for subqueries	Lecture, seminar
Section 5 Special operator ALL	Topic 5.1. An alternative operator that checks information in all rows	Lecture, seminar
Section 6. Combining multiple queries into one	Topic 6.1. Queries with the same structure in the SELECT clause can be combined into one and executed as a single entity	Lecture, seminar

Section 7. EXEPT and INTERSECT statements	Topic 7.1. Operators that use the minus and intersection operation, according to the operations of set theory	Lecture, seminar
Section 8. Introduction to representation	Topic 8.1. Creation of virtual tables that are used to work with data in order to hide it from the user	Lecture, seminar

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Classroom type	Classroom equipment	Specialized educational/laboratory equipment, software and materials for mastering the discipline
Lecture	An auditorium for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multimedia presentations.	-
Seminar	An auditorium for conducting seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations.	-
For independent work of students	An auditorium for conducting seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations.	-

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main literature:

1. T. Connolly, K Begg. Database. Design, implementation and support. Theory and practice. 3rd edition.: Per. From English. - OOO I.D. Williams, 2001.
2. K. J. Date. Introduction to database systems. 7th edition. Moscow: I.D. Williams", 2001
3. Bill Jelen, Michael Alexander. Pivot tables in Microsoft Excel 2007.: Per. From English. - M.: I.D. Williams", 2008
4. Martin Graber. SQL. Translation from English. - publishing house "Lori" 2000

Additional literature:

1. A.A. Barseghyan, M.S. Kupriyanov, V.V. Stepanenko, I.I. Cold. Data analysis technology. Data Mining, Visual Mining, Text Mining, OLAP. BHV - Petersburg, 2007.

Resources of the information and telecommunications network "Internet":

1. RUDN ELS and third-party ELS, to which university students have access on the basis of concluded agreements:
- RUDN Electronic Library System - RUDN EBS http://lib.rudn.ru/MegaPro/Web
- ELS "University Library Online" http://www.biblioclub.ru
- EBS Yurayt http://www.biblio-online.ru
- ELS "Student Consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/
- EBS "Trinity Bridge"

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

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

Evaluation materials and a point-rating system* for evaluating the level of formation of competencies (parts of competencies) based on the results of mastering the discipline " Mathematical models and databases» are presented in the Appendix to this Work Program of the discipline

Developer:

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