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

Computer technologies in science and education

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

1. COURSE GOAL(s)

The purpose of mastering the discipline "Computer technologies in science and education" is to acquaint the student with the main methods and programming languages, as well as typesetting and layout in the LaTex system

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline "Computer technologies in science and education" 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)
GPC-1	Able to formulate and solve relevant and significant problems of mathematics	GPC-1.1 Uses existing and receives new methods for solving mathematical problems
		GPC-1.2 Uses modern equipment, software and professional databases to solve problems in a chosen area of mathematics or related sciences
		GPC-1.3 Uses modern calculation-theoretical mathematical methods to solve professional problems
PC-1	Able to conduct scientific research and obtain new scientific and applied results independently and as part of a scientific team	PC-1.1. Draws up a general research plan and detailed plans for individual stages
		PC-1.2. Selects experimental and computational-theoretical methods for solving the problem based on the available material and time resources
PC-2	Able to develop and analyze conceptual and theoretical models of scientific problems and tasks to be solved	PC-2.1. Searches for specialized information in patent information databases
		PC-2.2. Analyzes and summarizes the results of a patent search on the subject of the project in the selected area of mathematics
PC-3	Able to develop and apply mathematical methods, system and application software for solving problems of scientific and design and technological activities	PC-3.1. Systematizes information obtained in the course of research, analyzes it and compares it with literature data
		PC-3.2. Determines possible directions for the development of work and prospects for the practical application of the results obtained

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Computer technologies in science and education" refers to the obligatory part 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 «Computer technologies in science and education»

Table 3.1. The list of components of the EP HE 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-1	Able to formulate and solve relevant and significant problems of mathematics	-	Additional chapters of partial differential equations, Nonlinear evolution equations, State exam
PC-1	Able to conduct scientific research and obtain new scientific and applied results independently and as part of a scientific team	-	Research work, State Exam
PC-2	Able to develop and analyze conceptual and theoretical models of scientific problems and tasks to be solved	-	Research work, Undergraduate practice
PC-3	Able to develop and apply mathematical methods, system and application software for solving problems of scientific and design and technological activities	-	Research work, Undergraduate practice

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total labor intensity of the discipline "Computer technologies in science and education" is 10 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		*112*	*36*	*36*	*40*	
Lectures (LC)						
Lab work (LW)		112	36	36	40	
Seminars (workshops/tutorials) (S)						
Self-studies		*212*	*72*	*63*	*77*	
Evaluation and assessment (exam/passing/failing grade)		*36*		*9*	*27*	
Course workload	a.h.	**360**	**108**	**108**	**144**	
	credits	**10**	**3**	**3**	**4**	

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. MS Excel	Topic 1.1. Scientific calculations in MS Excel Topic 1.2. Data analysis in MS Excel Topic 1.3. Programming in MS Excel	Laboratory works
Section 2. Registration of educational and scientific works in the LaTeX system	Topic 2.1. Typing in LaTeX. A set of mathematical formulas in LaTeX. Matrix set. Tags and links	Laboratory works
Section 3. VBA programming in MS Access	Topic 3.1. Development environment. Program structure. subroutines. Built-in functions. Working with MS Access objects	Laboratory works

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
A computer class	A computer class for conducting classes, group and individual consultations, current control and intermediate certification, equipped with personal computers (in the amount of 20), a board (screen) and technical means of multimedia presentations.	Python, MS Office, LaTex
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. Posypkin M., Lupin S. Technologies of parallel programming. M.: Infra-M, 2008.
2. Bogachev K.Yu. Fundamentals of parallel programming. M.: BINOM. Knowledge Lab, 2003.
3. Voevodin V.V., Voevodin Vl.V. Parallel computing. St. Petersburg: BHV-Petersburg, 2002.
4. Nemnyugin S., Stesik O. Parallel programming for multiprocessor computing systems. St. Petersburg: BHV-Petersburg, 2002.
5. Antonov A.S. Parallel Programming Using MPI Technology: Tutorial. M.: Publishing House of Moscow State University, 2004.
6. Bukatov A.A., Datsyuk V.N., Zhegulo A.I. Programming of multiprocessor computing systems. Rostov-on-D.: TsVVR LLC, 2003.

Additional literature:

1. Gergel V.P. Theory and practice of parallel computing. Moscow: Internet University of Information Technologies; BINOMIAL. Knowledge Lab, 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 "Computer technologies in science and education" are presented in the Appendix to this Work Program of the discipline

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