

Документ подписан простой электронной подписью
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**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

Numerical analysis
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 "Numerical analysis" is to form an idea of numerical methods for studying mathematical models and the areas of application of these methods, to improve the mathematical culture of the student. The implementation of this goal includes a consistent presentation of theoretical material in lectures, in which all the main results are provided with rigorous proofs; development of methods for solving problems in practical classes; intermediate and final control reveal the degree of assimilation of the acquired skills

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline " Numerical analysis " 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

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline " Numerical analysis " 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 " Numerical analysis ".

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 results

Code	Competence	Previous disciplines/modules, practices	Subsequent disciplines/modules, practices*
GPC-1	Able to formulate and solve relevant and significant problems of mathematics	History and methodology of mathematics	Additional chapters of partial differential equations, Elements of perturbation theory, State exam

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total labor intensity of the discipline " Numerical analysis " is 2 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	36		36		
Lectures (LC)	18		18		
Lab work (LW)					
Seminars (workshops/tutorials) (S)	18		18		
Self-studies	36		36		
Evaluation and assessment (exam/passing/failing grade)					
Course workload	a.h.	72	72		
	credits	2	2		

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. Introduction	Topic 1.1. Practical relevance of finding numerical solutions. Problems of computational mathematics, convergence, accuracy.	Lecture, seminar
Section 2. Solution of nonlinear equations	Topic 2.1. Half division method. Simple iteration method. Newton's method. The secant method. Parabola method. Topic 2.2. Methods for finding the roots of systems of nonlinear equations. Seidel iteration method. Newton's method. Aitken convergence acceleration	Lecture, seminar

6. LOGISTICS AND TECHNICAL SUPPORT OF THE DISCIPLINE

Table 6.1. Logistics of discipline

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	-

Classroom type	Classroom equipment	Specialized educational/laboratory equipment, software and materials for mastering the discipline
	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.	Windows, Microsoft Office, Maple, TeX, WinEdt.
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. Kalitkin, N.N. Numerical methods / N.N. Kalitkin. - St. Petersburg: BHV, 2014. - 592 p.
2. Samarsky, A.A. Numerical methods of mathematical physics / A.A. Samarsky, A.V. Gulin. - M.: Alliance, 2016. - 432 p.
3. Bakhvalov, N.S. Numerical Methods in Problems and Exercises: Textbook / N.S. Bakhvalov, A.V. Lapin, E.V. Chizhonkov. - M.: Binom, 2015. - 240 p.

Additional literature:

1. Bakhvalov, N.S. Numerical methods./ Bakhvalov N.S., Zhidkov N.P., Kobelkov G.M. M.: BINOM. Knowledge Lab. 2004, 636 p.

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 "Numerical analysis» are presented in the Appendix to this Work Program of the discipline

Developer:



E.B. Laneev

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name and surname

**HEAD
OF HIGHER EDUCATION PROGRAMME:**



V.I. Burenkov

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**HEAD
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