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

2025

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)
PC-5	Able to manage projects, plan research activities, analyze risks, manage the project team	**PC-5.1.** Capable of planning when organizing research activities
PC-11	Carrying out work on the processing and analysis of scientific and technical information and research results	**PC-11.1** Ability to process scientific and technical information; **PC-11.2** Ability to analyze the results of scientific research

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*
PC-5	Able to manage projects, plan research activities, analyze risks,	-	State exam

Code	Competence	Previous disciplines/modules, practices	Subsequent disciplines/modules, practices*
	manage the project team		
PC-11	Carrying out work on the processing and analysis of scientific and technical information and research results	Function spaces	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 (**<u>full-time training</u>**)**

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.	Lecture, seminar

Classroom type	Classroom equipment	Specialized educational/laboratory equipment, software and materials for mastering the discipline
	Newton's method. Aitken convergence acceleration	

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 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:

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