

Документ подписан простой электронной подписью
Информация о владельце:
ФИО: Ястребов Олег Александрович
Должность: Ректор
Дата подписания: 28.06.2024 17:40:08
Уникальный программный ключ:
ca953a0120d891083f939673078ef1a989dae18a

**Federal State Autonomous Educational Institution of Higher Education
"Russian Peoples' Friendship University named after Patrice Lumumba"**

Academy of Engineering

(name of the main educational unit (POU) - developer of the EP HE)

COURSE SYLLABUS

EQUATIONS OF MATHEMATICAL PHYSICS

(name of discipline/module)

Recommended by the Didactic Council for the Education Field of:

27.03.04 CONTROL IN TECHNICAL SYSTEMS

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

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

DATA ENGINEERING AND SPACE SYSTEMS CONTROL

(name (profile/specialization) EP HE)

1. GOAL OF DISCIPLINE MASTERING

The discipline “Equations of mathematical physics” is included in the bachelor’s program “Data Engineering and Space Systems Control” in the direction of 27.03.04 “Control in Technical Systems” and is studied in the 7th semester of the 4th year. The discipline is implemented by the Department of Mechanics and Control Processes. The discipline consists of 2 sections and 17 topics and is aimed at studying the equations of mathematical physics and methods for solving them

The purpose of mastering the discipline is for students to acquire knowledge and skills in the theory of second-order partial differential equations arising in mathematical physics, mastering methods for solving such equations, including analytical methods and numerical methods

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

Mastering the discipline “Equations of Mathematical Physics” is aimed at developing the following competencies (parts of competencies) in students:

Table 2.1. List of competencies formed in students when mastering the discipline (results of mastering the discipline)

Cipher	Competence	Indicators of Competency Achievement (within this discipline)
GPC -2	Able to formulate tasks of professional activity based on knowledge, specialized sections of mathematical and natural science disciplines (modules)	GPC -2.1 Proficient in mathematical methods, programming fundamentals and specialized programming systems for implementing algorithms for solving applied problems; GPC -2.2 Able to select and adapt mathematical methods and software to solve practical problems; GPC -2.3 Has the skills to develop and implement algorithms for solving applied problems in the field of professional activity;
GPC -3	Able to use fundamental knowledge to solve basic control problems in technical systems in order to improve in professional activities	GPC-3.1 Knows the theoretical foundations and principles of mathematical modeling; GPC -3.2 Able to develop and use methods of mathematical modeling, information technologies to solve problems of applied mathematics; GPC-3.3 Possesses practical skills in solving problems of applied mathematics, methods of mathematical modeling, information technologies and the basics of their use in professional activities, professional thinking skills and an arsenal of methods and approaches necessary for the adequate use of methods of modern mathematics in theoretical and applied problems;

3. PLACE OF DISCIPLINE IN THE STRUCTURE OF HE EP

Discipline "Equations of Mathematical Physics" refers to the mandatory part of block 1 “Disciplines (modules)” of the educational program of higher education.

As part of the educational program of higher education, students also master other disciplines and/or practices that contribute to achieving the planned results of mastering the discipline “Equations of Mathematical Physics”.

Table 3.1. List of components of EP HE that contribute to achieving the planned results of mastering the discipline

Cipher	Name of competency	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
GPC -2	Able to formulate tasks of professional activity based on knowledge, specialized sections of mathematical and natural science disciplines (modules)	Research work / Scientific research work; Technological Training; Mathematical analysis; Space Flight Mechanics; Numerical Methods; Automatic Control Theory; Algebra and Geometry; Analysis of Geoinformation Data;	Technological Training; Undergraduate practice / Pre-graduate practice;
GPC -3	Able to use fundamental knowledge to solve basic control problems in technical systems in order to improve in professional activities	Mathematical analysis; Space Flight Mechanics; Theoretical Mechanics; Numerical Methods; Automatic Control Theory; Algebra and Geometry; Theory of Probability and Mathematical Statistics; Differential equations; complex analysis; Optimal Control Methods; Analysis of Geoinformation Data; Research work / Scientific research work; Technological Training;	Technological Training; Undergraduate practice / Pre-graduate practice;

* - to be filled out in accordance with the competency matrix and SUP EP VO

** - elective disciplines/practices

4. SCOPE OF DISCIPLINE AND TYPES OF STUDY WORK

The total complexity of the discipline “Equations of mathematical physics” is “8” credit units.

Table 4.1. Types of educational work by periods of mastering the educational program of higher education for full-time study.

Type of educational work	TOTAL,ac.ch.		Semester(s)
			7
<i>Contact work, ac.ch.</i>	108		108
Lectures (LC)	54		54
Laboratory work (LR)	0		0
Practical/seminar sessions (SZ)	54		54
<i>Independent work of students, ac.ch.</i>	153		153
<i>Control (exam/test with assessment), academic degree.</i>	27		27
Total labor intensity of the discipline	ac.ch.	288	288
	credit units	8	8

5. CONTENT OF DISCIPLINE

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

Section number	Name of the discipline section	Contents of the section (topic)		Type of educational work*
Section 1	Equations of mathematical physics	1.1	Basic equations of mathematical physics	LC, NW
		1.2	Cauchy problem for the equation of string vibrations	LC, NW
		1.3	d'Alembert's formula	LC, NW
		1.4	Vibrations of a semi-bounded string	LC, NW
		1.5	Fourier series	LC, NW
		1.6	Solution of the Cauchy problem for the vibration equation of a string with fixed ends	LC, NW
		1.7	Forced string vibrations	LC, NW
		1.8	Equation of heat propagation in a rod	LC, NW
		1.9	Thermal conductivity in the final rod	LC, NW
		1.10	Laplace's equation	LC, NW
		1.11	Recording in polar coordinates	LC, NW
		1.12	Fourier method for Laplace's equation	LC, NW
Section 2	Methods for solving equations of mathematical physics	2.1	Potential theory methods	LC, NW
		2.2	Numerical methods	LC, NW
		2.3	Variational methods	LC, NW
		2.4	Projection methods	LC, NW
		2.5	Asymptotic methods	LC, NW

* - to be filled out only for full-time education: LC – lectures; LR – laboratory work; SZ – practical/seminar classes.

6. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

Table 6.1. Material and technical support of the discipline

Audience type	Auditorium equipment	Specialized educational/laboratory equipment, software and materials for mastering the discipline (if necessary)
Lecture	An auditorium for conducting 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, ongoing monitoring and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations.	
For independent work	An auditorium for independent work by 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!

7. EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT OF DISCIPLINE

Main literature:

1. Tikhonov A.N. Samarsky A.A. Equations of mathematical physics
2. Aramanovich I.G., Levin V.I. Equations of mathematical physics. M. Science. 1976.
3. Savin A.Yu. Sternin B.Yu. Equations of mathematical physics. Presentation. RUDN University 2012
4. Kirillov A.I. (ed.) - Reshebnik. Higher mathematics. Special sections, 2nd ed., FML, 2006
5. Korshunov Yu.S., Rynovskaya M.V., Savin A.Yu. Equations of mathematical physics. M. RUDN. 2016.

Additional literature:

1. Farlow C.. Partial differential equations for scientists and engineers. M. Mir. 1985
2. E. Zauderer Partial differential equations and applied mathematics. 2006
3. Agoshkov V.I., Dubovsky P.B., Shutyaev V.P. Methods for solving problems of mathematical physics / Ed. G. I. Marchuk. - M.: FIZMATLIT, 2002. - 320 p. - ISBN 5-9221-02457-5

Resources of the information and telecommunications network "Internet":

1. EBS of RUDN University and third-party EBS, to which university students have access based on concluded agreements

- Electronic library system of RUDN University - EBS RUDN University <http://lib.rudn.ru/MegaPro/Web>
- EBS "University Library Online" <http://www.biblioclub.ru>
- EBS Law <http://www.biblio-online.ru>
- EBS "Student Consultant" www.studentlibrary.ru
- EBS "Trinity Bridge"

2. Databases and search engines

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

Educational and methodological materials for students' independent work when mastering a discipline/module:*

1. A course of lectures on the discipline "Equations of Mathematical Physics".

* - all educational and methodological materials for students' independent work are posted in accordance with the current procedure on the discipline page in TUIS!

8. ASSESSMENT MATERIALS AND POINT-RATING SYSTEM FOR ASSESSING THE LEVEL OF COMPETENCIES FOR A DISCIPLINE

Evaluation materials and point-rating system* for assessing the level of development of competencies (parts of competencies) based on the results of mastering the discipline "Equations of mathematical physics" are presented in the Appendix to this Work Program of the discipline.

* - OM and BRS are formed on the basis of the requirements of the relevant local regulatory act of RUDN University.

DEVELOPER:

Assistant professor

Position,

Signature

Saltykova Olga

Alexandrovna

Last name I.O.

HEAD OF DEPARTMENT:

Head of the department

Position

Signature

Razumny Yuri Nikolaevich

Last name I.O.

HEAD OF EP HE:

Professor

Position,

Signature

Razumny Yuri Nikolaevich

Last name I.O.