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

«Introduction to low-dimensional topology»
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 "Introduction to low-dimensional topology" is to master the concepts and methods of the theory of classical and virtual knots

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the discipline " Introduction to low-dimensional topology " 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-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

3.COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The discipline "Introduction to low-dimensional topology" 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 " Introduction to low-dimensional topology".

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-1	Able to conduct scientific research and obtain new scientific and applied results independently and as part of a scientific team	Research work, Computer technologies in science and education	Research work, Undergraduate practice, State exam

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total labor intensity of the discipline " Introduction to low-dimensional topology " 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	*36*		*36*		
Lectures (LC)	36		36		
Lab work (LW)					
Seminars (workshops/tutorials) (S)					
Self-studies	*45*		*45*		
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. Fundamentals of classical differential geometry	Topic 1.1. Fundamentals of the theory of curves and regular surfaces.	Lecture
Section 2. Fundamentals of the topology of smooth manifolds	Topic 2.1. Smooth manifold. Definition and examples. Embeddings and immersions of manifolds	Lecture
Section 3. Fundamentals of the theory of knots and links	Topic 3.1. Concepts of knot and link. Knot and link diagrams. Polynomial invariants of knots and links Topic 3.2. Virtual knots and links. Knot and link invariants with values on graphs.	Lecture

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	-

Classroom type	Classroom equipment	Specialized educational/laboratory equipment, software and materials for mastering the discipline
	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. Kosniewski Ch. "Initial course of algebraic topology". M., Mir, 1983.
2. Milnor J., Wallace A. "Differential topology. Beginning course. M., Mir, 1972.
3. Postnikov M.M. "Lectures on geometry, semester III. Smooth manifolds. M., "Nauka", 1987.
4. Prasolov V.V. "Elements of combinatorial and differential topology". M., MTSNMO, 2005.
5. Fuks D.B., Fomenko A.T., Gutenmakher V.L. "Homotopy topology". M. Publishing House of Moscow State University, 1969.

Additional literature:

1. Boltyansky V.G., Efremovich V.A. "Initial topology". M., "Science", 1982.
2. Dubrovin B.A., Novikov S.P., Fomenko A.T. "Modern Geometry". M., "Science", 1979.
3. Massey W., Stolings J. "Algebraic topology. Introduction". M., Mir, 1977.
4. Hirsch M. "Differential topology". M., Mir, 1979.
5. Hu Si-chiang. "Homotopy Theory". M., Mir, 1964.

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 " Introduction to low-dimensional topology " are presented in the Appendix to this Work Program of the discipline

Developer:

	V.A. Krasnov
signature	name and surname

**HEAD
OF HIGHER EDUCATION PROGRAMME:**

	V.I. Burenkov
signature	name and surname

HEAD
OF EDUCATIONAL DEPARTMENT

	A.B. Muravnik
signature	name and surname