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**Federal State Autonomous Educational Institution of Higher Education  
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA  
NAMED AFTER PATRICE LUMUMBA  
RUDN University**

**Academy of Engineering**

(educational division (faculty/institute/academy) as programme developer)

**Department of Construction Technology and Structural Materials**

(department realizing the PhD program)

**COURSE SYLLABUS**

**Building designs, buildings and constructions**

(course title)

Scientific specialty:

**2.1.1. Building designs, buildings and constructions**

(scientific speciality code and title)

The course instruction is implemented within the PhD programmes:

**Building designs, buildings and constructions**

(PhD program title)

### 1. DISCIPLINE (MODULE) GOAL

The purpose of mastering the discipline «Building designs, buildings and constructions» is to gain knowledge, skills, and experience in the field of calculation of structures and structures that characterize the stages of competence formation and ensure the achievement of the planned results of the development of the educational program and also preparation for the candidate's examinations and obtaining knowledge, skills and experience in the field of construction.

### 2. REQUIREMENTS TO PHD-STUDENTS ON FINISHING THE COURSE

Mastering the discipline «Building designs, buildings and constructions» is aimed at preparing for passing candidate exams, as well as mastering the competencies:

Proficiency in the methodology of theoretical and experimental research in the field of construction;

Proficiency in the culture of scientific research in the field of construction, including using the latest information and communication technologies;

Proficiency in methods for developing scientific and methodological foundations for research, improvement, theoretical, experimental and technical and economic justification for the use of various technical solutions and technologies in construction;

Proficiency in innovative scientifically based methods for designing structures and devices for obtaining water from natural sources, its preparation for various needs, transportation to places of consumption, subsequent processing with rational use in technological cycles, taking into account the requirements for ensuring environmental safety, increasing the cost-effectiveness and reliability of the functioning of water management systems in populated areas, industrial enterprises and territorial-industrial complexes.

### 3. WORKLOAD OF THE DISCIPLINE AND TYPES OF ACTIVITIES

The overall workload of the discipline «Building designs, buildings and constructions» is 3 credit units (108 academic hours).

Types of activities	Total ac. hrs.	Semesters
		3
<i>Classroom activities (total), including:</i>	60	60
В том числе:		
Lectures (LC)	30	30
Laboratory activities (LA)	–	–
Practical lessons/Seminars (PC)	30	30
<i>Independent work</i>	48	48
<i>Intermediate certification (test with assessment/exam)</i>	–	–
Overall workload	ac. hrs.	108
	credits	3

### 4. CONTENT OF THE DISCIPLINE

Name of the discipline section	Contents of the section (topic)	Type of study work
Section 1. Calculation of the transverse frame of an agricultural building	<p>Topic 1.1. Determination of loads and impacts acting on the transverse frame of an agricultural building</p> <p>Topic 1.2. General calculation of the transverse frame based on a flat FE model. Analysis of calculation results</p> <p>Topic 1.3. General calculation of the transverse frame based on a spatial FE model. Analysis of calculation results</p>	LC, PC

	Topic 1.4. Selection of sections and strength testing of the main wooden elements that make up the frame (posts, beams, ties)	
Section 2. Calculation of a glued metal-wood rafter truss and a beam on plate dowels	Topic 2.1. General FE calculation of a glued metal-wood rafter truss. Analysis of calculation results Topic 2.2. Selection of sections and strength testing of the elements of a glued metal-wood rafter truss Topic 2.3. Study of the stress-strain state (SSS) of the support node of a glued metal-wood rafter truss based on flat (two-dimensional) and spatial (volumetric) FE models	LC, PC
Section 3. Calculation of the transverse frame of a steel frame of a multi-story building	Topic 3.1. Determination of loads and impacts acting on the transverse frame of a multi-story building steel frame Topic 3.2. General calculation of the transverse frame of a multi-story building steel frame based on a flat FE model. Analysis of calculation results Topic 3.3. General calculation of the transverse frame of a multi-story building steel frame based on a spatial FE model. Analysis of calculation results Topic 3.4. Selection of sections and strength testing of the main load-bearing elements of a multi-story building steel frame	LC, PC
Section 4. Calculation of a metal rafter truss	Topic 4.1. General FE calculation of a metal rafter truss. Analysis of calculation results Topic 4.2. Selection of sections and strength testing of metal rafter truss elements Topic 4.3. Study of the stress-strain state (SSS) of metal rafter truss nodes based on flat (two-dimensional) and spatial (volumetric) FE models Topic 4.4. Design and drawing of a metal rafter truss	

### 5. EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Room Type	Room Equipment	Specialized educational / laboratory equipment, software and materials for mastering the discipline
Class for Seminars	Room for seminar-type classes, equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets	Not necessary
Self-Work Class	Room for self-working (can be used for lecture and seminars activities), equipped with a set of specialized furniture, board (screen) and technical / multimedia gadgets and computers with an access to EIPES	Not necessary

## 6. METHODOLOGICAL SUPPORT AND LEARNING MATERIALS

### *Main readings:*

1. Advanced Finite Element Method in Structural Engineering. 2009. Publisher: Springer Berlin Heidelberg. ISBN: 978-3-642-00316-5

2. Yudina, AF Metallicheskie i zhelezobetonnye konstruktsiy [Metal and reinforced concrete structures]. Editing: textbook for universities / A.F. Yudin. - 2nd ed., Rev. and add. - Moscow: Yurayt Publishing House, 2019 .-- 302 p. - (Series: Specialist). - ISBN 978-5-534-06927-3. - Text: electronic // EBS Yurayt [site]. - URL: <https://biblio-online.ru/bcode/434494> (date of access: 01.04.2019).

3. KrivoshaPCo, SN Architectural and building structures: a textbook for academic bachelor's degree / SN KrivoshaPCo, VV Galishnikova. - Moscow: Yurayt Publishing House, 2019 .-- 460 p. - (Series: Bachelor. Academic course). - ISBN 978-5-534-03143-0. - Access mode: HYPERLINK <https://biblio-online.ru/bcode/432798>

4. Tukhfatullin, BA Numerical methods of calculation of building structures. Finite element method: textbook. manual for academic bachelor's degree / BA Tukhfatullin. - 2nd ed., Rev. and add. - Moscow: Yurayt Publishing House, 2019 .-- 157 p. - (Series: Bachelor. Academic course). - ISBN 978-5-534-08899-1. - Access mode: HYPERLINK <https://biblio-online.ru/bcode/442338>

### *Additional readings:*

1. Algorithms for Solving the Parametric Self-Adjoint 2D Elliptic Boundary-Value Problem Using High-Accuracy Finite Element Method [Text] = Algorithms for solving the Parametric Self-Adjoint elliptic boundary value problem in a two-dimensional domain by the high-order finite element method

// Bulletin of the Peoples ' Friendship University of Russia: Mathematics. Computer science. Physics. - 2017. - no. T. 25 (1). - C. 36-55. <http://dx.doi.org/10.22363/2312-9735-2017-25-1>

2. Gusev Alexander Alexandrovich. Finite Element Method of High-Order Accuracy for solving Two-Dimensional Elliptic Boundary-Value Problems of Two and Three Identical Atoms in a Line : article in English / A. A. Gusev // Bulletin of the Peoples ' Friendship University of Russia: Mathematics. Computer science. Physics. - 2018. - no. t. 26 (3). - p. 226-243. <http://journals.rudn.ru/miph/article/view/18988/16003>

3. Solution of the Boundary-Value Problem for a Systems of ODEs of Large Dimension: Benchmark Calculations in the Framework of Kantorovich Method [Text] = Solution of boundary-value problems for systems of ODES of large dimension: reference calculations within the framework of the Kantorovich method. Computer science. Physics. - 2016. - No. 3. - p. 31-37.

<http://journals.rudn.ru/miph/article/view/13387/12817>

4. KrivoshaPCo, SN Construction of buildings and structures: textbook for SPO / SN KrivoshaPCo, VV Galishnikova. - Moscow: Yurayt Publishing House, 2019 .-- 476 p. - (Series: Professional Education). - ISBN 978-5-534-02348-0. - Access mode: HYPERLINK <https://biblio-online.ru/bcode/433396>

5. Dedyukh, RI Materials science and technology of structural materials. Fusion welding technology: textbook. manual for applied baccalaureate / RI Dedyukh. - Moscow: Yurayt Publishing House, 2019 .-- 169 p. - (Series: Universities of Russia). - ISBN 978-5-534-01539-3. - Text: electronic // EBS Yurayt [site]. - URL: <https://biblio-online.ru/bcode/433979> (date of access: 01.04.2019).

6. Yudina, AF Building structures. Editing: textbook for SPO / A.F. Yudin. - 2nd ed., Rev. and add. - Moscow: Yurayt Publishing House, 2019 .-- 302 p. - (Series: Professional Education). - ISBN 978-5-534-07027-9. - Access mode: HYPERLINK <https://biblio-online.ru/bcode/442133>

### *Internet sources:*

ELS RUDN University and third party EBS, to which university students have access based signed contracts:

- RUDN Electronic Library System, <http://lib.rudn.ru/MegaPro/Web> ;
- ELS University Library Online, <http://www.biblioclub.ru> ;
- EBS Urayt, <http://www.biblio-online.ru> ;
- ELS Student Consultant, <http://www.studentlibrary.ru> ;
- EBS Lan, <http://e.lanbook.com> ;
- EBS Trinity Bridge <http://www.trmost.ru>

Databases and search engines:

- Electronic fund of legal and normative-technical documentation, <http://docs.cntd.ru> ;
- Yandex search system [https:// www .yandex.ru](https://www.yandex.ru) ;
- Google search system <https://www.google.com> ;
- Reference database Scopus , <http://www.elsevierscience.ru/products/scopus>

*Educational and methodological materials for students' self-work studying the discipline / module:*

A course of lectures on the discipline «Building designs, buildings and constructions».

### **7. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR MIDTERM ATTESTATION OF STUDENTS IN THE DISCIPLINE (MODULE)**

Assessment toolkit and a grading system to evaluate the level of competences (competences in part) formation as the course results are specified on the TUIS platform.

#### **DEVELOPERS:**

Associate Professor

A.S. Markovich

#### **HEAD OF THE DEPARTMENT**

Head of Department

S.B. Yazyev