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 higher education programme developer

COURSE SYLLABUS

Engineering Systems of Buildings
course title

Recommended by the Didactic Council for the Education Field of:

08.04.01 Civil Engineering
field of studies / speciality code and title

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

Civil Engineering and Built Environment
higher education programme profile/specialisation title

2026

1. COURSE GOAL(s)

The goal of the course Engineering Systems of Buildings is to study by students the issues of design and technology of construction of structures and equipment of engineering systems of a building in a complex, for example: electricity, heating, water supply, sanitation, ventilation and air conditioning of a building.

The main objectives of the course are:

- analysis of power supply, heating, water supply, sanitation, ventilation and air conditioning systems of buildings in the complex;
- study of fundamental technical solutions and operation of engineering systems of buildings;
- analysis of the structure, principle of operation and operation of engineering systems of buildings;
- analysis of schemes and systems of power supply, heating, water supply, sanitation, ventilation and air conditioning of buildings in the complex, principles of design and construction.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The course Engineering Systems of Buildings implementation is aimed at the development of the following competences (competences in part):

Table 2.1. List of competences that students acquire during the course «Engineering Systems of Buildings»

Competence code	**Competence descriptor**	**Competence formation indicators** (within this course)
PC-2	Development of project products based on the results of engineering and technical design for urban development activities	PC-2.2 Able to perform engineering and technical design and develop design products for engineering systems and engineering structures

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course Engineering Systems of Buildings refers to the *elective component* of (B1) block of the higher educational programme curriculum.

Within the higher education programme students also master other disciplines (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the course Engineering Systems of Buildings.

Table 3.1. The list of the higher education programme components that contribute to the achievement of the expected learning outcomes as the internship results.

Competence code	**Competence descriptor**	**Previous courses / modules, internships**	**Subsequent courses / modules, internships**
PC-2	Development of project products based on the results of engineering and technical design for urban development activities	Digital technologies in construction; Structural Design in Steel; Nanotechnology in Civil Engineering; Structural Design in Reinforced Concrete: Special Topics; Structural Dynamics; Structural Design in Reinforced Concrete; Building materials: Special Topics;	Desin Practice; Technological Practice; Pre-Graduation Practice

		Structural Design in Steel: Special Topics; Modelling of Construction Processes	

4. COURSE WORKLOAD

The total workload of the course Engineering Systems of Buildings is 2 credits.

Table 4.1. Academic activities types by periods of the higher education programme

Type of academic activities		**Total academic hours**	**Semester(s)**			
			3			
Contact academic hours		36	36			
including:						
Lectures (LC)		18	18			
Lab works (LW)		0	0			
Seminars (workshops / tutorials) (S)		18	18			
Self-studies academic hours		27	27			
Evaluation and assessment academic hours		9	9			
Course work / project, credits						
Course workload	academic hours	72	72			
	credits	2	2			

5. COURSE CONTENTS

Modules	**Contents (topics)**	**Academic activities types ***
Section 1. Introduction	Topic 1.1 General characteristics of building engineering systems. Electricity, heating, water supply, drainage, ventilation and air conditioning of buildings as a part of the building and life support of people	LC, S
Section 2. Building power supply	Topic 2.1 Equipment for power supply. Calculation of power supply of the building. Tracing of electrical wires in the building	LC, S
Section 3. Building heat supply	Topic 3.1 Design of buildings' heating systems. Heat pipelines and their placement. Routing and installation of heat networks in the building. Specific thermal characteristics of the building for heating, taking into account the construction volume of the heated part of the building, The average calculated internal temperature of the heated rooms and the correction factor for the change of the specific thermal characteristics depending on the local climatic conditions. Selection of the optimum heating system in the	LC, S

Modules	Contents (topics)	Academic activities types *
	building and parameters of heat carriers. Topic 3.2 Calculation of the heating system of the building. Installation of devices of heating systems. Calculation of pipelines of the heating system for the longest and most loaded circulating ring of the system, through which at the present pressure difference in the system, the specified costs of the heat carrier are passed. Calculation of single and two-pipe heating system. Hydraulic mode and thermal stability of water heating systems. Dimensions of openings for heating pipelines in the building. Materials and equipment for installation of devices of heating systems. Installation work on the installation of heating systems	
Section 4. Building water supply	Topic 4.1 Classification of water supply systems. Materials and equipment of the water supply system. Schematics of water supply networks of the building. Tracing of water supply networks in the building. Operation of water supply systems and their separate structures. Method of calculation of water supply of the building. Mathematical model of calculation of water pipes of the building. Hydraulic calculation of water networks in the building.	LC, S
Section 5. Water disposal of the building	Topic 5.1 Water disposal systems and their characteristics. The device and principle of operation of systems of water disposal of the building. The basics of design of systems of water disposal of the building. Calculation of the capacity of water drainage networks of the building	LC, S
Раздел 6. Building ventilation	Topic 6.1 Design of ventilation systems of the building. Air receiving and venting devices for exhaust and supply ventilation. Intake and exhaust chambers. Determination of the required air exchange in the building. General provisions for the design of the ventilation system. Exhaust and intake ventilation. Dimensions of holes for laying ventilation channels in the building. Materials and equipment for installation of ventilation system devices. Installation work on installation of ventilation systems. Topic 6.2 Calculation of the building ventilation system. Determination of the required area of cross sections of the main branch sections. Determination of pressure loss in the ventilation network. Determination of the design gravity pressure. Determination of the coefficient of resistance on friction	LC, S
Section 7.	Topic 7.1 Air conditioning of buildings. Air-	LC, S

Modules	Contents (topics)	Academic activities types *
Air conditioning	conditioning devices. Routing and installation of air-conditioning networks. Dimensions of openings for laying air-conditioning channels in the building. Materials and equipment for the installation of air-conditioning devices. Installation work on the installation of air-conditioning systems	

* - to be filled in only for full -time training: LC - lectures; LW - lab work; S - seminars.

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	Classroom equipment	Specialized educational / laboratory equipment, software and materials for course study (if necessary)
Lectures	An auditorium for conducting lectures, equipped with a set of specialized furniture; a blackboard (screen) and technical means for multi-media presentations.	
Seminars	A classroom for conducting seminars, group and individual consultations, current and midterm assessment; equipped with a set of specialised furniture and technical means for multimedia presentations.	
Computer Labs	Not required.	
Self-studies	A classroom for independent work of students (can be used for seminars and consultations), equipped with a set of specialised furniture and computers with access to the electronic information and educational environment	

7. RESOURCES RECOMMENDED FOR INTERNSHIP

Main readings:

1. Kabyshev A.V., Obukhov S.G. Calculation and design of power supply systems for facilities and installations Textbook / Vol. polytechnic. un-T. – Tomsk, 2023. – 248 p. http://portal.tpu.ru:7777/SHARED/i/IOM/liter/Tab/M_Kabishev_Obuhov_Raschet.pdf
2. Svintsov A.P. Heating, ventilation and air conditioning: textbook. – M.: "Orgservice-2000". 2016. – 177 p. Available in the library of the RUDN.
3. Prozorov I.V., Nikoladze G.I., Minaev A.V. Hydraulics, water supply and sewerage. – M.: Higher School. 1990. – 448 p. Available in the RUDN Library.

Additional readings:

1. Vasiliev V. F., Ivanova Yu. V., Sukhanov I. I. Heating and ventilation of a residential building. Study guide. – St. Petersburg: Publishing House of SPBGASU. 2020. – 72 p.
2. Svintsov A. P., Harun M. Methodological recommendations for the implementation of course projects on the course "Water supply and sanitation". Educational and methodical manual. - M.: Publishing House of RUDN. 2012. – 52 p.

Internet sources:

1. Electronic libraries (EL) of RUDN University and other institutions, to which university students have access on the basis of concluded agreements:
   - RUDN Electronic Library System (RUDN ELS) http://lib.rudn.ru/MegaPro/Web
   - EL "University Library Online" http://www.biblioclub.ru
   - EL "Yurayt" http://www.biblio-online.ru
   - EL "Student Consultant" www.studentlibrary.ru
   - EL "Lan" http://e.lanbook.com/
   - EL "Trinity Bridge"
2. Databases and search engines:
   - electronic foundation of legal and normative-technical documentation http://docs.cntd.ru/
   - Yandex search engine https:// www .yandex.ru/
   - Google search engine https://www.google.ru/
   - Scopus abstract database http://www.elsevierscience.ru/products/scopus/

The training toolkit and guidelines for a student:

1. Collection of lectures on the course Engineering Systems of Buildings.

* The training toolkit and guidelines for the course are placed on the internship page in the university telecommunication training and information system under the set procedure..

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL AS INTERNSHIP RESULTS

The assessment toolkit and the grading system* to evaluate the level of competences (competences in part) formation as the course Engineering Systems of Buildings results are specified in the Appendix to the internship syllabus.

* The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

DEVELOPERS:

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