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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 higher education programme developer

COURSE SYLLABUS

Structural Design in Steel

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

2024

1. COURSE GOAL(s)

The goal of the course Structural Design in Steel is to gain knowledge, skills, skills and experience in the field of theory and design of buildings and structures that characterize the stages of competence formation and ensure the achievement of the planned results of the development of the educational program. Produce graduates who are committed to a career in structural engineering with a range of employers. Produce graduates equipped to take up professional employment in the construction industry and become lifelong learners with an appreciation of the value to society of an education in structural engineering. Produce graduates who have knowhow and understanding of the key aspects of structural engineering. Allow graduates to acquire and develop problem-solving skills, and subject-specific skills. Develop graduates who bring practical solutions to design problems and who have the technical skills to see their ideas through to realization.

The main objectives of the course Structural Design in Steel are:

- training of specialists of a wide profile in industrial and civil construction with an in-depth study of the basics of design, manufacture, installation, reinforcement of metal structures of buildings and structures;
- formation of skills of calculations and design of metal structures from the point of view of specific engineering tasks using design norms, standards, reference books;
- obtaining skills in the use of automation tools for the design of metal building structures.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The course Structural Design in Steel 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 «Structural Design in Steel»

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-2.1 Capable of performing engineering and technical design and developing design products for building structures, grounds and foundations

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course Structural Design in Steel 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 Structural Design in Steel.

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		Life Cycle Economics of Buildings; Structural Design in Reinforced Concrete: Special Topics; Structural Dynamics; Structural Design in Steel: Special Topics;

			Modelling of Construction Processes; Applications of Finite Element Method for Civil Engineering problems; Sustainability in Civil Engineering; Optimization Methods in Civil Engineering; Structural Stability; Geometric Shaping and Analysis of Shells; Engineering Systems of Buildings; Desin Practice; Technological Practice; Pre-Graduation Practice
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4. COURSE WORKLOAD

The total workload of the course Structural Design in Steel is 4 credits.

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

Type of academic activities	Total academic hours	Semester(s)			
		1			
<i>Contact academic hours</i>	36	36			
including:					
Lectures (LC)	18	18			
Lab works (LW)	0	0			
Seminars (workshops / tutorials) (S)	18	18			
<i>Self-studies academic hours</i>	81	81			
<i>Evaluation and assessment academic hours</i>	27	27			
<i>Course work / project, credits</i>					
Course workload	academic hours	144	144		
	credits	4	4		

5. COURSE CONTENTS

Modules	Contents (topics)	Academic activities types *
Section 1. Introduction to steel structures	Introduction: Building codes, Seismic forces, Analysis, and design of complex structures. Loads, philosophy of design, steel and properties	LC, S
Section 2. Members of steel structures	Review of tension members, Review of compression members, Review of flexural members , Review of flexural members, Pure	LC, S

Modules	Contents (topics)	Academic activities types *
	torsion of homogeneous sections; shear stresses due to bending of thin-wall open x-section , Torsional stresses in I-shaped steel sections	
Section 3. Steel structures analysis	Analogy between torsional and plane bending; load and resistance factor design for torsion , Allowable strength design for torsion, torsional buckling , Lateral support of beams; elastic and inelastic lateral torsional buckling of beams	LC, S
Section 4. Steel structures design	Load and resistance factor design-I shaped beams; allowable strength design – I shaped beams Allowable strength design – I shaped beams, effective lateral unbraced length, Lateral bracing design	LC, S

* - 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.	Computers, Multimedia projector, Screen for projector, Whiteboard, WiFi
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. Handbook of structural steel connection design and details. Akbar R. Tamboli.
<https://drive.google.com/file/d/1F2qQ2Ae8VOOyP-p2K4JxByBWjcaFtBvl/view>

Additional readings:

1. Filippo Berto (Ed.), Ricardo Branco (Ed.). Mechanical Behavior of High-Strength Low-Alloy Steels [Электронный ресурс] 2023. 1 с. ISBN 9783038972044 URL: <https://www.mdpi.com/books/pdfview/book/767>
2. Smart Lesley, Gagan Michael. Structures of metals // The Molecular World: The Third Dimension. 2002. ISBN 0-85404-660-7 DOI: <http://dx.doi.org/10.1039/9781847557902-00015>

3. Al-Samman T. Material and Process Design for Lightweight Structures, 2019. 1 c. ISBN 9783038979586 URL: <https://mdpi.com/books/pdfview/book/1319>

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.elsevier.com/locate/scopus/>

The training toolkit and guidelines for a student:

1. Collection of lectures on the course Structural Design in Steel.

* 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 Structural Design in Steel 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:

Associate Professor in the Department
of Construction Technology and
Structural Materials

position, educational department

signature

M.I. Rynkovskaya

name and surname

position, educational department

signature

name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

Head of the Department of
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A.V. Solovyeva

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**HEAD OF
HIGHER EDUCATION PROGRAMME:**

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