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**Programme Handbook**  
**Master's Degree Programme in**  
**Buildings of Energy-Efficient Life Cycle**  
***Annexes***

## Master's Programme in Buildings of Energy-Efficient Life Cycle

Year/ Semester	Course Unit	ECTS credits	Lecturer(s)
I/1°	Engineering Pedagogy	4	Rodina-Earthbourne E
I/1°	Scientific Research Methodology	5	Shitikova M.
I/1°	Business and Technical English	4	Rodina-Earthbourne E
I/1°	Mathematical Modelling	5	Drapaliuk A.
I/1°	Eco-Conceptual Architectural and Engineering Projection (Part I)	4	Rodina-Earthbourne E
I/2°	Design, Construction, and Operation of Buildings of Low Energy Consumption	4	Korotkikh D. / Popov I.
I/2°	BIM Technologies for Design Energy Efficient Buildings	5	Drapaliuk A.
I/2°	Eco-Conceptual Architectural and Engineering Projection (Part II)	4	Drapaliuk D.
I/2°	Engineering Systems of Energy-Efficient Buildings	4	Sotnikova O.
II/3°	Principles of Ecological City-Planning	4	Rodina-Earthbourne E
II/3°	Architecture and Design of Energy Efficient Buildings	4	Rodina-Earthbourne E
II/3°	Peculiarity of Design the Life Cycle of Energy Efficient Real Estate	4	Gorbanyova E.
II/3°	Energy and Environmental Monitoring of Construction Projects	5	Drapaliuk D.
II/3°	Integral Assessment Of Biosphere Compatibility of Urban Spaces	4	Sotnikova O.
Elective discipline			
I/2°	Theory of Decision-Making	4	Drapaliuk D.
I/2°	Innovative Construction Materials	4	Korotkikh D.
II/3°	Special Issues of Heat Engineering, Acoustics and Lighting	4	Novikov M.
II/3°	Energy Management of Enterprise	4	Sotnikova O.
Practice			
I/1°	Practice for Obtaining Initial Professional Skills (at the Facilities of Stakeholders)	6	
I/1° - II/4°	Scientific and research work	33	Under supervision of an individual Master thesis Supervisor

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<i>I/2°</i>	<i>Practice for Obtaining Professional Skills and Knowledge's</i>	<i>9</i>	
<i>II/3°</i>	<i>Creative Practice at Facilities</i>	<i>6</i>	
<i>II/4°</i>	<i>Final state examination, Master thesis defence</i>	<i>6</i>	

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### Characteristics of the Course Units

Name	<b>Engineering Pedagogy</b>
Year / Semester	I / 1 <sup>o</sup>
Lecturer	Rodina-Earthbourne E. (Assistant E. Prokshits)
Specific learning outcomes	On successful completion of this module students should be able: 1 – to know and understand the fundamentals of contemporary environmental issues and ecological system theory 2 – to synthesize the received data in correlation with environmental philosophical problems of science and technology, 3 –to understand the main philosophical problems of science and technology in connection with environmental system theory 4 – to reflect philosophically on scientific information and perspectives, in order to broaden their world-view 5 – to participate in class discussions with colleagues and with teachers, in order to develop social communication skills, prepare themselves for the group-projects
Contents	Module offers collected thoughts of some of the most forward-looking Earth science scholars, philosophical concepts and public policy regulations on the topics of: natural limits of resources, ecosystems, and contribution toward the goal of living more gently on our planet, ecological system theory and Green Energy.
Schedule	Lectures - once in two weeks and practice - once a week (14 weeks)
Teaching and learning methods	Face to face, 40 hours: group work, debates, discussions, video footage, idea (mind) mapping, library/information retrieval tasks, lectures, field trips, reading list, seminar
Teaching techniques	Lectures, 12 hours Practical classes, 28 hours
Assessment methods	Credit test. Final-term written test are foreseen. The final-term written test will be devoted to the assessment of the level of achievement of LOs 1- 4 (theoretical comprehension of the subject and the capacity to understand and to express the related concepts).
Assessment criteria	In the written final-term test students should demonstrate their knowledge and understanding of the fundamentals of Ecological System Theory, Green Energy, should be able to name the main contemporary conceptual and practical solutions, contributing toward the goal of living more gently on the planet (in Russia, and around the world). Should be able to demonstrate knowledge of Earth science development throughout the history of mankind. Also the ability of students to illustrate their knowledge and understanding clearly (using appropriate wording), synthetically and correctly will be assessed. Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.
Assessment metrics	Attribution of a final grade
Criteria of attribution of the final grade	The final grade will be determined according to the following rules: - participation in the seminars and debates throughout the duration of the whole unit: 60% - final term written test: 40%
Preparatory	-

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course units	
Educational material of reference	<ol style="list-style-type: none"><li>1. Kabasenche W., O'Rourke., M., Slater Matthew H. The Environment: Philosophy, Science, and Ethics (Topics in Contemporary Philosophy), 2012. - 316 p.</li><li>2. Xianguo Li , Green Energy: Basic Concepts and Fundamentals, Springer, 2011.- 286 p.</li><li>3.Bockris JOM. Will lack of energy lead to the demise of high-technology countries in this century? Int. J.Hydrogen Energy, 2007.- 198 p.</li><li>4. Scott DS. Smelling Land – The Hydrgrogen Defense Against Climate Catastrophe. Canadian Hydrogen Association, 2007.-254 p.</li></ol>

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Name	<b>Scientific Research Methodology</b>
Year / Semester	I / 1 <sup>o</sup>
Lecturer	<i>Shitikova M. (Assistant Popov I.)</i>
Specific learning outcomes	<p>On successful completion of this module students should be able:</p> <p>1 - to acquire knowledge of the contemporary research methods, utilized in construction; practice, and the tendencies of their development, in order to fulfill professional tasks</p> <p>2 – to analyze, interpret, and synthesize the received scientific data;</p> <p>3 – to gain knowledge of the main principles of the use of profound theoretical and practical knowledge in the area of energy saving, eco-design, construction, and building's maintenance;</p> <p>4 - to know modern problems of science and technology in the area of green energy;</p> <p>5 - to describe the world progressive methods in the area of energy efficient building's' design, construction and maintenance;</p> <p>6 – to participate in class discussions with colleagues and with teachers in order to develop social communication skills, prepare themselves for the possible international group-projects</p>
Contents	The main aim of the unit is to acquaint students with current scientific knowledge about contemporary research methods, utilized in construction practice, and the tendencies of their development. It should enable students to carry out scientific research by means of theoretical and experimental methods, when designing and developing new technologies in the field of energy saving and environmental protection both in Russia and abroad.
Schedule	Once two weeks lectures and once a week practice (14 weeks)
Teaching and learning methods	Face to face, 42 hours: group work, debates, discussions, library/information retrieval tasks, reading list, seminar, tutorial, practical exercises
Teaching techniques	Lectures 14 hours Practical classes, 28 hours
Assessment methods	Examination. The final term oral and written examination is foreseen. The exam will be devoted to the assessment of the level of achievement of LOs 1-6).
Assessment criteria	<p>In the final term oral examination students will be required to demonstrate their knowledge of contemporary research methods, utilized in construction practice, and the tendencies of their development.</p> <p>The final term written test will be given in the form of the practical assignment, where students individually will need to solve the problem applying contemporary research methodology.</p> <p>Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.</p>
Assessment metrics	Attribution of a final grade
Criteria of attribution of the final grade	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- participation in group discussions during the term – 40%</li> <li>- final term written examination: 30%</li> <li>- final term oral examination 30%</li> </ul>
Preparatory course units	-
Educational material of	<ol style="list-style-type: none"> <li>1. Ortigueira, Manuel Duarte Fractional Calculus for Scientists and Engineers, 2011. - 154 p.</li> <li>2. Lizárraga-Celaya C. Maple and Mathematica. A Problem Solving Approach for</li> </ol>

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reference	Mathematics, 2nd ed., 2009. – 484 p. 3. O.D. Samarin. Thermo-physical and technical-economic foundations of Thermal Engineering safety and energy efficiency in buildings, 2007. – 134 p. 4. Howlett Robert J. Sustainability in Energy and Buildings/ Results of the Second International Conference in Sustainability in Energy and Buildings (SEB'10), 2011. – 302 p. 5. M'Sirdi N. Sustainability in Energy and Buildings / Proceedings of the 3rd International Conference on Sustainability in Energy and Buildings (SEB'11), 2012. – 650 p.
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## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b>Business and Technical English</b>
Year / Semester	I / 1 <sup>o</sup>
Lecturer	<i>Rodina-Earthbourne E (Assistant E. Prokshits)</i>
Specific learning outcomes	<p>On successful completion of this module students should be able:</p> <p>1 - to communicate in oral and written English, using English vocabulary and grammar to solve the problems of professional activity.</p> <p>2 – to analyze, interpret, and synthesize received English data in correlation with the task given to become a part of the global professional community</p> <p>3 - to communicate in written English with foreign colleagues, editors of scientific research journals, and various foreign partners.</p> <p>4 – to express scientific ideas, analyses, and judgment orally, using proper English terms to present their research work abroad.</p> <p>5 – to research and investigate complex issues in English using Internet sources.</p> <p>6 - to participate in English class discussions with colleagues and with teachers in order to develop social communication skills, prepare themselves for the possible international group-projects</p>
Contents	Module is focused on developing business and technical English language communicational and presentational skills, with the emphasis on practical hands-on experience in writing scientific articles and communicating with scientific journals editors. It allows obtaining English language skills necessary to communicate effectively in a business environment, make presentations, negotiate agreements, explain and defend scientific and research positions. The module is focused on the topics of: natural limits of resources, ecosystems, and contribution toward the goal of living more gently on our planet, ecological system theory and Green Energy.
Schedule	Practice - once a week (14 weeks)
Teaching and learning methods	Face to face, 28 hours: role-play assignments, group work, simulation, debates, discussions, video footage, library/information retrieval tasks, reading list, seminar, tutorial, practical exercises
Teaching techniques	Practical classes, 28 hours
Assessment methods	<p>Credit test. Written and oral.</p> <p>A mid-term written test and a final-term written and oral test are foreseen.</p> <p>The mid-term written test will be devoted to the assessment of the level of achievement of LOs 3 and 5.</p> <p>The final term oral and written test will be devoted to the assessment of the level of achievement of LOs 1, 2, 4, and 6.</p>
Assessment criteria	<p>In the mid-term written test students should demonstrate their ability to to research and investigate complex issues in English using Internet sources and communicate in writing with foreign colleagues, editors of scientific research journals, and various foreign partners. The assessment will regard their capacity to use the proper keywords, English scientific lexicon, grammar, and vocabulary to formulate proper sentences and know the standards of business English communication by email. The students will be given two time-limited tasks:</p> <ul style="list-style-type: none"> <li>- to search Internet for the sources on the specific scientific topic,</li> <li>- to write an e-mail and informative letter about their research work to the imaginable scientific journal editor.</li> </ul> <p>In the final written term test students will be required to translate the short scientific paper on</p>



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	<p>Innovative Technologies in Energy Efficient Buildings from Russian into English, and create an abstract for the paper. The assessment will regard students' capacity to translate text in proper English, in particular, to identify and correctly formulate the main idea of the text into a short abstract.</p> <p>In the oral test students should demonstrate their knowledge and understanding of the English scientific presentation in the field of Energy Efficient construction, Green Energy, and New Technological Innovations in this field. Also their ability to illustrate their knowledge and understanding clearly in English (using appropriate wording), synthetically and correctly will be assessed.</p> <p>Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.</p>
Assessment metrics	Attribution of a final grade
Criteria of attribution of the final grade	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- Mid-term written test: 30%</li> <li>- Final term written test: 30%</li> <li>- Oral examination (including practical classes assessments): 40%</li> </ul>
Preparatory course units	-
Educational material of reference	<ol style="list-style-type: none"> <li>1. Gillett A., Speak Business English Like an American for Native Russian Speakers, 2005. - 201 p.</li> <li>2. Elser A. G. Writing from Scratch: For Business (Writing from Scratch Series), 1990. - 168 p.</li> <li>3. Grant D., McLarty R., Business Basics Student Book: International Edition (Business Basics International Edition), 2006. - 176 p.</li> </ol>

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Name	<b>Mathematical Modelling</b>
Year / Semester	I / 1°
Lecturer	Drapaliuk A.
Specific learning outcomes	<p>On successful completion of this module students should demonstrate:</p> <p>1 - to think abstract, to analyze, to synthesize information of different kinds, in order to improve level of knowledge;</p> <p>2 - to demonstrate knowledge of fundamental and applied disciplines graduate programs;</p> <p>3 - to find with the help of information technology and use in practice new knowledge and skills, including in new areas of knowledge, not related to the scope of activities, to broaden and deepen their scientific Outlook;</p> <p>4 - to recognize the basic problems of their subject area, the solution of which necessitates complex problems requiring the use of quantitative and qualitative methods;</p> <p>5 - to execute, present and report the result of the work performed in a clear and systematic form</p>
Contents	The aim of the course is to prepare for mathematical and information modelling of objects, processes and phenomena occurring in energy-efficient buildings and facilities, to the analysis and control of these models in General and their individual parameters.
Schedule	Once two weeks lectures and once a week practice (14 weeks)
Teaching and learning methods	Face to face, 42 hours: group work, debates, discussions, team project, idea mapping, individual project, concept mapping, lectures, problem-solving sessions, reading list, seminars
Teaching techniques	Lectures, 14 hours Practical classes, 28 hours
Assessment methods	<p>Written test and carrying out of projects.</p> <p>A final-term written test is foreseen.</p> <p>The final term written test will be devoted to the assessment of the level of achievement of LOs 1, 3, 4 and 5.</p> <p>The carrying out of projects will be devoted to the assessment of the level of achievement of LOs 1, 2, and 3 (theoretical comprehension of the project and the capacity to understand and to express the project concepts).</p>
Assessment criteria	<p>In the written final-term test students should demonstrate their ability to think abstract, to analyze, to find new information and use it in practise, to use quantitative and qualitative methods in solving of problems of subject area, to present and report results if their work.</p> <p>The carrying out of projects, finally, should demonstrate their ability to demonstrate knowledge of fundamental and applied disciplines, to find information for solution of subject area problems.</p>
Assessment metrics	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- Course Project is performed – 40%</li> <li>- Practical work is performed - 20 %</li> <li>- Test– 40 %</li> </ul>
Criteria of attribution of the final grade	<p>Assessment of the entire project presented</p> <p>Each member of the group will be evaluated separately – 60%</p> <p>Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%</p> <p>5 Extraordinarily high achievement</p> <p>4 Good level</p>

Добавлено примечание ([VB1]): Please reformulate in a better way. Use only one verb by clear and simple in the words

Добавлено примечание ([VB2]): Please add much more details

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	<p>3 <i>Satisfactory, the level of work expected of students in a graduate-level course</i></p> <p>2 <i>Unacceptable and failing</i></p>
Preparatory course units	-
Educational material of reference	<p>1) Eastman C. et al. BIM Handbook: a guide to building information modeling for owners, managers, designers and contractors, Sybex, 2014. — 1008 p</p> <p>2) Vandezande J., Krygiel E. Mastering Autodesk Revit Architecture 2016, Sybex, 2015. — 1008 p.</p> <p>3) Krygiel Eddy, Vandezande James, Read Phil. Mastering Autodesk Revit Architecture 2014, Sybex, 2013. — 1008 p.</p> <p>4) Nawari N.O., Kuenstle M. Building Information Modeling: Framework for Structural Design, CRC Press, Taylor &amp; Francis Group, 2015. — 257 p.</p> <p>5) Eastman C. et al. BIM Handbook: a guide to building information modeling for owners, managers, designers and contractors, Chuck Estman, Paul Teichols, Rafael Sacks, Kathleen Liston. — 2nd ed. — John Wiley and Sons, Inc., 2011. — 648 p.</p>

## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b>Eco-Conceptual Architectural and Engineering Projection (Part I)</b>
Year / Semester	I / 1 <sup>o</sup>
Lecturer	Rodina-Earthbourne E (+ participation of all the lectures of the Master course in this module is foreseen) (Assistant E. Prokshits)
Specific learning outcomes	On successful completion of this module students should demonstrate the ability:  1 – to apply knowledge and understanding of Information on Global Competitions in EE building constructions, reconstructions, conservation, and maintenance to be aware of the major professional ideas and concepts in the field;  2 – to analyze the content of the competition guidelines to prepare for the participation in an actual Global competition in the 4 <sup>th</sup> semester;  3 – to know the major contemporary trends in energy efficient building construction and renovation, in order to conduct scientific research in the field;  4 – to interpret technical diagrams, plans, drawings, etc. used in Global competition projects, in order to be able to imitate and further utilize ideas and concepts given with the aim of their alternation, modification, and improvement;  5– to participate in class discussions with colleagues and with teachers, in order to develop social communication skills
Contents	This innovative module will acquaint students with the winner-projects of the Global competitions in energy efficient buildings constructions, renovation, and conservation, along with the eco-smart systems planning and design. During this module various components of the successful competition winner project will be analyzed and interpret.
Schedule	Lectures - once in two weeks and practice – once a week (14 weeks)
Teaching and learning methods	Face to face, 42 hours: lectures, discussions, idea analyses mapping, assignments
Teaching techniques	Lectures, 14 hours Practical classes, 28 hours
Assessment methods	Differentiated credit test. Oral test. The final term oral test will be devoted to the assessment of the level of achievement of LOs 1-5. Students should demonstrate their knowledge and understanding of Global competitions in energy efficient buildings constructions, renovation, and conservation, along with the eco-smart systems planning and design (theoretical comprehension of the subject and the capacity to understand and to express the related concepts).
Assessment criteria	In the final term test students will be required to make a presentation of one of the competition winner project in front of the rest of the group. In the oral test students should demonstrate their knowledge and understanding of the main component of the competition procedure, the main parts of the presentation should be devoted to the concept analyses and interpretation.  Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.
Assessment metrics	Attribution of a final grade
Criteria of attribution of the final grade	The final grade will be determined according to the following rules: - participation in group discussions, presentations, and debates during the whole module – 60% - final term oral test: 40%

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Добавлено примечание ([VB4]): Please add more details

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Preparatory course units	-
Educational material of reference	<p>SOURCES:</p> <ul style="list-style-type: none"><li>- Competitions information: ("Competition online"; "Wettbewerbe aktuell", "Bauwelt") <a href="https://www.competitionline.com">https://www.competitionline.com</a> <a href="https://www.wettbewerbe-aktuell.de">https://www.wettbewerbe-aktuell.de</a> <a href="http://www.solardecathlon.gov">http://www.solardecathlon.gov</a> <a href="http://www.bauwelt.de/">http://www.bauwelt.de/</a> <a href="https://www.ashrae.org/membership--conferences/student-zone/design-competition">https://www.ashrae.org/membership--conferences/student-zone/design-competition</a></li></ul> <p>and more, based on year-to year internet sources, etc.</p>

## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b><i>Design, Construction and Operation of Buildings of Low Energy Consumption</i></b>
Year / Semester	I/2°
Lecturer	Korotkikh D. (Assistant Popov I.)
Specific learning outcomes	<p>1 - to develop project documentation of energy-efficient buildings based on the knowledge of requirements of normative documents of the Russian Federation and the EU to reduce energy loss;</p> <p>2 - to apply standard architectural and construction solutions in the development of project documentation of energy-efficient buildings;</p> <p>3 - to establish requirements for materials intended, process ability, mechanical properties, durability, reliability, efficiency and competitiveness in accordance with the consumer properties constructions;</p> <p>4 - to justify the choice of resource-efficient technologies in the construction and operation of buildings.</p>
Contents	The main objective of the module is to acquaint students with knowledge on the design, construction and operation of modern energy efficient buildings. It should give students knowledge of normative documents in the field of design and construction of energy efficient buildings and the ability to set requirements for building materials for its intended purpose, processability, mechanical properties, durability, reliability, efficiency and competitiveness in accordance with the consumer properties of building constructions, the ability to design and operation energy-efficient buildings.
Schedule	Once a week (12 weeks)
Teaching and learning methods	Group work, Discussion, Video Footage, Library\Information Retrieval Tasks, Lecture, Practical Exercises (tasks), Team Project
Teaching techniques	<p>Lectures, 12 hours</p> <p>Laboratory works 12 hours</p> <p>Practical work 12 hours</p>
Assessment methods	<p>Credit test. Written and oral.</p> <p>A mid-term written test and a final-term written and oral test are foreseen.</p> <p>The mid-term written test will be devoted to the assessment of the level of achievement of LOs 1 and 2.</p> <p>The final term oral and written test will be devoted to the assessment of the level of achievement of LOs 2, 3, and 4.</p>
Assessment criteria	<p>Knowledge of normative documents in the field of designing energy efficient buildings.</p> <p>Knowledge of typical architectural solutions of energy efficient buildings.</p> <p>Skill to use typical architectural solutions in the development of project documentation</p> <p>Ability to develop new design solutions in the design of energy efficient buildings.</p> <p>Knowledge of building materials as the elements of the system "material - construction - building construction" for the operation of constructions with the required reliability and safety in these environments.</p> <p>Knowledge of the quality system of indicators of building materials and standard methods for their identification and evaluation using modern equipment research and statistical processing of data.</p>
Assessment metrics	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- performed laboratory work - 20%</li> <li>- performed practical work - 30%</li> <li>- examination Final – 50%</li> </ul>
Criteria of attribution of the final grade	<p>Each member of the group will be evaluated separately – 60%</p> <p>Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%</p>

**Добавлено примечание ([VB5]):** Before the list of Los please add "On successful...."

**Добавлено примечание ([VB6]):** It is not clear. Have a look to the previous modules.

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	<p>5 Extraordinarily high achievement</p> <p>4 Good level</p> <p>3 Satisfactory, the level of work expected of students in a graduate-level course</p> <p>2 Unacceptable and failing</p>
Preparatory course units	Engineering Pedagogy, Eco-Conceptual Architectural and Engineering Projection (Part I).
Educational material of reference	<p>1. Aleksandrova V.F. Technology and organization of reconstruction [electronic resource]: a tutorial / Aleksandrova V.F., Pastukhov Yu., Racine T.A.- Electron. text dannye.- SPb, 2014. – 125 p.</p> <p>2. Nikolenko Y. The technology of construction of buildings and structures. Part 1 [electronic resource]: a tutorial / Nikolenko Yu.V.- Electron. text dannye.- M.: People's Friendship University of Russia, 2013. – 110 p.</p> <p>3. Nikolenko Y. The technology of construction of buildings and structures. Part 2 [electronic resource]: a tutorial / Nikolenko Yu.V.- Electron. text dannye.- M.: People's Friendship University of Russia, 2013. – 134 p.</p> <p>4. Meshcheryakov Yu. Building materials [Text] : a textbook / Center . Inst refresher. - St. Petersburg: 2013. – 366 p.</p> <p>5. Volosuhin V.A. Building structures [Text] : a textbook . - 4 th ed., Revised. and ext. - Rostov- on-Don: Phoenix 2013. Rostov- on-Don: JSC " book" , 2013. - 554 p.</p> <p>6. Tetior A.I. Architectural and construction ecology: Textbook. Allowance for higher education establishment cry rivers UMO / Tetior AI - M.: Academy, 2008. - 360 p.</p> <p>7. Engineering and economic analysis of energy saving measures / R.M. Aloyan, et al. - Tambov: Publisher Pershin RV, 2014. - 170 p.</p> <p>8. Startseva N.A., Yaremenko S.A. Thermal calculation of external walling - Ucheb. method. Benefit to MY. Course work for students enrolled in the direction 270100 "Building". VPO VGASU, Voronezh, 2010. – 75 p.</p> <p>9. Loganina V.I. Application of international standards in the building [electronic resource]: a tutorial / Loganina V.I.- text .- Saratov: Undergraduate education, 2014.- 84 p.</p> <p>10. Green technologies for sustainable development: Textbook / IV. Ageev, O.V. Bednova, S.Y. Vavilov, et al.; ( N.P. Tarasova, Ed) - Tambov: publ Pershin R.V., 2014. - 165 p.</p> <p>11. Practical application of energy-saving technologies; Training Manual/ D.N. Chinas, P. Nowakowski, E.V. Sazonov and et al. (V.N. Semenov and N.S. Popov, Eds) Tambov: publ Pershin R.V., 2014. - 193 p.</p>

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Name	<b><i>BIM Technologies for Design Energy Efficient Buildings</i></b>
Year / Semester	I / 2°
Lecturer	Drapaliuk A.
Specific learning outcomes	<p>On successful completion of this module students should demonstrate:</p> <p>1 –to know methods of civil and structural engineering and theirs structural points including analysis with flexible and specialized program-calculating complexes and computer-aided design;</p> <p>2 - to develop conceptual, technical and working projects of complex objects, including with use of computer-aided design;</p> <p>3 - to develop physical and mathematical (computer) models of phenomena and objects related to the activity profile;</p> <p>4 - to organize collective work of artists, to take executive decisions, to determine the order of performance of works.</p>
Contents	The main aim of the unit is to develop the skills of converting urbanized areas in the implementation of b biosphere compatibility engineering technology. Conceptual bases the formation of a secure and comfortable urban energy infrastructure. Modelling and quantification of constituents humanitarian balance of biotechnosphere, taking into account the impact of objects the energy economy cluster
Schedule	Once two weeks lectures and once a week practice (14 weeks)
Teaching and learning methods	Face to face, 48 hours:group work, debates, discussions, team project, idea mapping, individual project, concept mapping, lectures, problem-solving sessions, reading list, seminars
Teaching techniques	Lectures, 12 hours Practical classes, 36 hours
Assessment methods	<p>Written test and carrying out of projects.</p> <p>A final-term written test is foreseen.</p> <p>The final term written test will be devoted to the assessment of the level of achievement of LOs 1, 3 and 4.</p> <p>The carrying out of projects will be devoted to the assessment of the level of achievement of LOs 2, 3, and 4 (theoretical comprehension of the project and the capacity to understand and to express the project concepts).</p>
Assessment criteria	<p>In the written final-term test students should demonstrate their ability to create information (mathematical) models of energy efficient buildings, selection and analysis of their parameters, creation of design documentation, organization of work of the team of BIM designers, decision-making during project implementation of energy efficient buildings in the group.</p> <p>The carrying out of projects should demonstrate their ability to manage and work in group and to create working models of energy efficient buildings</p>
Assessment metrics	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- Course Project is performed – 40%</li> <li>- Practical work is performed - 20 %</li> <li>- Test– 40 %</li> </ul>
Criteria of attribution of the final grade	<p>Assessment of the entire project presented</p> <p>Each member of the group will be evaluated separately – 60%</p> <p>Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%</p> <p>5 Extraordinarily high achievement</p>



### Master's Programme in Buildings of Energy-Efficient Life Cycle

	<p>4 Good level</p> <p>3 Satisfactory, the level of work expected of students in a graduate-level course</p> <p>2 Unacceptable and failing</p>
Preparatory course units	Mathematical Modelling
Educational material of reference	<p>1) Eastman C. et al. BIM Handbook: a guide to building information modeling for owners, managers, designers and contractors, Sybex, 2014. — 1008 p.</p> <p>2) Vandezande J., Krygiel E. Mastering Autodesk Revit Architecture 2016, Sybex, 2015.-1008 p.</p> <p>3) Krygiel E., Vandezande J., Read Phil. Mastering Autodesk Revit Architecture 2014, Sybex, 2013. — 1008 p.</p> <p>4) Nawari N.O., Kuenstle M. Building Information Modeling: Framework for Structural Design, CRC Press, Taylor &amp; Francis Group, 2015. — 257 p.</p> <p>5) Eastman C. et al. BIM Handbook: a guide to building information modeling for owners, managers, designers and contractors, Chuck Estman, Paul Teichols, Rafael Sacks, Kathleen Liston. — 2nd ed. — Jonh Wiley and Sons, Inc., 2011. — 648 p.</p>

**Master's Programme in Buildings of Energy-Efficient Life Cycle**

Name	<b><i>Eco-Conceptual Architectural and Engineering Projection (Part II ) Project management</i></b>
Year / Semester	I/2°
Lecturer	Drapaliuk D.
Specific learning outcomes	1 - to identify the quality indicators of the building projects and their parts; 2 - to analyze and to adopt quality systems in design projects; 3 - to apply statistical quality control methods; 4 - to develop the concept of quality management for specific projects.
Contents	The main aim of the unit is introduction basic concepts and principles of quality management to give knowledge of modelling process structures management quality system to give knowledge of the quality management and working in command. Students are required to use real/adapted versions of different grant application forms to plan a research project.
Schedule	Once two weeks lectures and once a week practice (12 weeks)
Teaching and learning methods	Practical teaching methods, oral lectures, face to face
Teaching techniques	Lectures, 12 hours Practical classes, 24 hours
Assessment methods	Credit test. Written and oral. A mid-term written test and a final-term written and oral test are foreseen. The mid-term written test will be devoted to the assessment of the level of achievement of LOs 1 and 2. The final term oral and written test will be devoted to the assessment of the level of achievement of LOs 2, 3 and 4.
Assessment criteria	The quality indicators of the building projects and their parts; Analyze of quality systems in design projects; Application statistical quality control methods; The concept of quality management for specific projects.
Assessment metrics	The final grade will be determined according to the following rules: - performed practical work - 50% - examination Final – 50%
Criteria of attribution of the final grade	5 Extraordinarily high achievement 4 Good 3 Satisfactory, the level of work expected of students in a graduate-level course 2 Unacceptable and failing
Preparatory course units	Eco-Conceptual Architectural and Engineering Projection (Part I), Scientific Research Methodology, Engineering Systems of Energy-Efficient Buildings
Educational material of reference	1. Howlett R. J. Sustainability in Energy and Buildings/ Results of the Second International Conference in Sustainability in Energy and Buildings (SEB'10), 2011. – 302 p. 2. M'Sirdi N. Sustainability in Energy and Buildings / Proceedings of the 3rd International Conference on Sustainability in Energy and Buildings (SEB'11), 2012. – 650 p. 3. The methodology of the survey and monitoring of the technical condition of buildings and structures using advanced technology [electronic resource] : a tutorial / Sementsov SV, Orekhov MM, Volkov V.I.- Electron . text dannye.- SPb .: Saint-Petersburg State

**Добавлено примечание ([VB7]):** PLEASE CHECK FOR ALL THE MODULES:  
Add "On successful..."  
Use one verb for LO  
Include 6-7 LOs per module

**Добавлено примечание ([VB8]):** Please expand

**Добавлено примечание ([VB9]):** Not clear. Please refer to the given example

**Добавлено примечание ([VB10]):** Not clear. Please refer to the given example

**Добавлено примечание ([VB11]):** Not clear. Please refer to the given example

#### Master's Programme in Buildings of Energy-Efficient Life Cycle

	<p>University of Architecture and Civil Engineering , EBS DIA , 2013.- 76 c.</p> <p>4. Magrini A. Building Refurbishment for Energy Performance, 2014. - 252 p.</p> <p>5. N. Popov (TSTU), Energy and environmental audit, 2014. – 180 p.</p> <p>6. V. Semenov (VSUAE), Practical application of energy saving technologies, 2014. – 193 p.</p>
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## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b>Theory of Decision-Making</b>
Year / Semester	I/2°
Lecturer	Drapaliuk D.
Specific learning outcomes	1- to apply the basic techniques of tasks solution multi-objective optimization; 2- to know the role and functions of expert systems; 3- to provide skills in expert systems for building industry;
Contents	The main aim of the unit is to have the skill to find organizational and managerial decisions, to design the organizational structure to participate in the development strategies of human resource management in organizations, to have the ability to audit of human resources and to carry out diagnostics organizational culture in research projects.
Schedule	Once two weeks lectures and once a week practice (12 weeks)
Teaching and learning methods	Practical teaching methods, oral lectures
Teaching techniques	Lectures, 12 hours Practical classes, 24 hours
Assessment methods	Credit test. Written and oral. The final term oral and written test will be devoted to the assessment of the level of achievement of LOs 1, 2 and 3.
Assessment criteria	To have the skill to find organizational and managerial decisions, To design the organizational structure to participate in the development strategies of human resource management in organizations, To audit of human resources and to carry out diagnostics organizational culture in research projects.
Assessment metrics	The final grade will be determined according to the following rules: - performed practical work - 50% - examination Final – 50%
Criteria of attribution of the final grade	5 Extraordinarily high achievement 4 Good 3 Satisfactory, the level of work expected of students in a graduate-level course 2 Unacceptable and failing
Preparatory course units	Eco-Conceptual Architectural and Engineering Projection (Part I), Scientific Research Methodology
Educational material of reference	1. Geller G. Sustainable Rural and Urban Ecosystems: Design, Implementation and Operation. Manual for Practice and Study, 2012. – 179 p. 2. Kishimoto A. Advanced Energy Saving and its Applications in Industry, 2013. – 75 p. 3. The methodology of the survey and monitoring of the technical condition of buildings and structures using advanced technology [electronic resource] : a tutorial / Sementsov S.V., Orekhov M.M., Volkov V.I.- Electron . text dannye.- SPb .: Saint-Petersburg State University of Architecture and Civil Engineering , EBS DIA , 2013.- 76 p. 4. Magrini A. Building Refurbishment for Energy Performance, 2014. - 252 p.

Добавлено примечание ([VB12]): Please review according to the other modules and the given example

### Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b><i>Engineering Systems of Energy-Efficient Buildings</i></b>
Year / Semester	I / 2°
Lecturer	Sotnikova O.
Specific learning outcomes	<p>On successful completion of this module students should demonstrate:</p> <p>1 – to know modern problems of development standards the passive house in the global construction practice;</p> <p>2 – to know the principles and approaches for certification of passive houses;</p> <p>3 – to select the research methods of "active" generation of building energy from renewable energy sources;</p> <p>4 – to demonstrate the principles and features of the design, construction and application of systems engineering of passive houses;</p> <p>5 – to analyse the experience of European designers of passive houses;</p> <p>6 – to estimate the accuracy and consistency the combination of the passive house concept with elements of power systems of the "active" house;</p> <p>7 – to participate in class discussion with colleagues and with teachers;</p> <p>8 - to develop social communication skills, prepare themselves for the group-projects.</p>
Contents	The main aim of the unit is to teach students to design energy-efficient "Smart Houses" with the use of innovative technologies; and to present the overview of the modern problems of standards development of the passive house in the global construction practice. This unit is emphasizing the engineering side of the smart house design, with special focus on the innovative technologies. The concept of passive (including energy efficiency) of energy-efficient homes. Technology of creation a comfortable environment in urban spaces
Schedule	Once two weeks lectures and once a week practice (12 weeks)
Teaching and learning methods	Face to face, 36 hours
Teaching techniques	Lectures, 12 hours Practical classes, 24 hours
Assessment methods	Credit test. Final-term written test are foreseen. The final-term written test will be devoted to the assessment of the level of achievement of LOs 1-8 (theoretical comprehension of the subject and the capacity to understand and to express the related concepts)
Assessment criteria	<p>In the written final-term test students should demonstrate their knowledge and understanding of criteria of reference the building to category of power effective, passive and "clever" buildings, the provision of the existing standards of design engineering systems of power effective, passive and "clever" buildings, the basic principles of design passive and power effective houses, and also an order of their certification, positive experience of the European and world designers of the designated objects.</p> <p>Also their ability to illustrate their knowledge and understanding clearly (using appropriate wording), synthetically and correctly will be assessed.</p> <p>Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.</p>
Assessment metrics	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- design Project is performed - 40%</li> <li>- practical work is performed - 20 %</li> <li>- total test – 40%</li> </ul>
Criteria of	5 Extraordinarily high achievement

### Master's Programme in Buildings of Energy-Efficient Life Cycle

attribution of the final grade	4 Goodlevel 3 Satisfactory, the level of work expected of students in a graduate-level course 2 Unacceptable and failing
Preparatory course units	Eco-Conceptual Architectural and Engineering Projection (Part I); Mathematical Modelling of Building Energy Performance; Bachelor Degree in Technical Sciences.
Educational material of reference	1. Polosin I.I., Novoseltsev B. P., V.Yu.Khuzin, M. N. Zherlykina. Engineering systems of buildings and constructions. – M.: Academy, 2012. – 304 p. 2. V. Harke. Smart house. Consolidation in a network of household appliances and system of communications in housing construction. – M.: Technosphere, 2006. – 188 p. 3. Mark E.S. A practical advice and decisions on creation of the smart house. – M, NT-Press, 2007. – 137 p. 4. Practical application of energy-saving technologies: educational benefit / D. N. Kitayev, P. Novakovsky, E.V. Sazonov, V. N. Semenov, E.E. Semenova ; under a general edition by V. N. Semenov and N. S. Popov. - Tambov: Pershin R. V. publishing house, 2014.-193 p.

## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b>Innovative Construction Materials</b>
Year / Semester	I/2°
Lecturer	Korotkikh D.
Specific learning outcomes	1 - to establish requirements for materials intended, process ability, mechanical properties, durability, reliability, efficiency and competitiveness in accordance with the consumer properties constructions.
Contents	The main objective of the module is to acquaint students with the knowledge on construction materials in the system "innovative material - a resource-efficient building construction - energy efficiency of buildings." It should give students the ability to set requirements for building materials for its intended purpose, process ability, mechanical properties, durability, reliability, efficiency and competitiveness in accordance with the consumer properties of building structures.
Schedule	Once a week (12 weeks)
Teaching and learning methods	Group work, Discussion, Video Footage, Library\Information Retrieval Tasks, Lecture, Practical Exercises (tasks), Team Project
Teaching techniques	Lectures, 12 hours Practical work 24 hours
Assessment methods	Credit test. Final-term written and oral test are foreseen. The final-term written test will be devoted to the assessment of the level of achievement of LO 1 (theoretical comprehension of the subject and the capacity to understand and to express the related concepts)
Assessment criteria	Knowledge of building materials as the elements of the system "material - construction - building construction" for the operation of constructions with the required reliability and safety in these environments. Knowledge of the quality system of indicators of building materials and standard methods for their identification and evaluation using modern equipment research and statistical processing of data.
Assessment metrics	Performed practical work - 50% Examination Final – 50%
Criteria of attribution of the final grade	Each member of the group will be evaluated separately – 60% Commission of all the lectures of the Master Degree project will vote (anonymously) – 40% 5 Extraordinarily high achievement 4 Good level 3 Satisfactory, the level of work expected of students in a graduate-level course 2 Unacceptable and failing
Preparatory course units	Engineering Pedagogy, Eco-Conceptual Architectural and Engineering Projection (Part I).
Educational material of reference	1. Meshcheryakov Yu. Building materials: a textbook / Center . Inst refresher. - St. Petersburg: 2013. - . 366 p. 2. Volosuhin V.A. Building structures: a textbook, 4th ed., Revised and ext. - Rostov-on-Don: Phoenix, 2013. - 554 p. 3. Tetior A.I. Architectural and construction ecology: Textbook. Allowance for higher education establishment cry rivers UMO / Tetior A.I. - M.: Academy, 2008. - 360 p. 4. Loganina V.I. Application of international standards in the building: a tutorial/

Добавлено примечание ([VB13]): Please review according to the given examples, previous comments and modules

#### Master's Programme in Buildings of Energy-Efficient Life Cycle

	<p>Loganina V.I. - Electron. text dannye.- Saratov: Undergraduate education, 2014. - 84 p.</p> <p>5. Green technologies for sustainable development: Textbook / IV. Ageev O.V. Bednova, S.Y. Vavilov, etc.; under the total. Ed. N.P. Tarasova. - Tambov: publ Pershin RV, 2014. - 165 p.</p> <p>6. Practical application of energy-saving technologies; Training Manual / D.N. Chinas, P. Nowakowski, E.V. Sazonov et al. (V.N. Semenov and N.S. Popov, Eds). Tambov: publ Pershin R.V., 2014. - 193 p.</p>
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## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b><i>Principles of Ecological City-Planning</i></b>
Year / Semester	II / 3°
Lecturer	<i>Rodina-Earthbourne E (Assistant E. Prokshits)</i>
Specific learning outcomes	<p>On successful completion of this module students should be able:</p> <ol style="list-style-type: none"> <li>1- to apply knowledge and understanding of the principles of ecological city-planning to solve, design, and conduct complex projects;</li> <li>2- to investigate complex issues in the field of energy efficient building;</li> <li>3- to solve complex problems in energy efficient building using the ecological city-planning strategies and methods;</li> <li>4- to use professional software for city-planning to perform complex projects according to the Global standards;</li> <li>5- to read and interpret professional city-planning projects, documentation, and supplement professional information to prepare themselves for the professional industry work and participation in a Global competition in the 4<sup>th</sup> semester;</li> <li>6- to formulate, present, and report the results of the group collective work performed in the field of city-planning using energy-efficient methods to become an equal member of the professional green energy community;</li> <li>7- to participate in class discussions with colleagues and with teachers, in order to develop social communication skills.</li> </ol>
Contents	<p>Module aims at acquainting students with current scientific knowledge of contemporary sustainable rural and urban ecosystems planning, i.e. their design, implementation and operation and contemporary tendencies in ecological cities development around the world and in Russia. It should enable students to carry out urban-planning analyses, theoretical and practical work in the urban-planning fields taking into consideration the most efficient Global energy-saving strategies (which includes (but not limited by) city-planning, rural areas planning, new cities planning, reorganization and reconstruction of the existing territories, revitalization of the abandon areas, and landscape design in various aspects and scales). Along with the main aim, the module is designed to acquaint students with the newest technologies and newest computer software that is used in the field of city-planning and sustainable environmental design both in Russia and abroad. The unit is intended to encourage students to make independent decisions in theoretical and practical urban-planning focusing on the creation of the eco-smart cities of the 21 century. The students will work in team of 3-5 people, combining their knowledge, ideas, enthusiasm, and innovative thinking (individual project work is possible, but requires justification). International collaboration is foreseen.</p>
Schedule	Lectures - once two weeks and practice – once a week (14 weeks)
Teaching and learning methods	Face to face, 28 hours: lectures, role-play assignments, group work, simulation, debates, discussions, video footage, library/information retrieval tasks, reading list, seminar, tutorial, practical exercises, student blog (with already made group projects open for discussions and critique), practical project work
Teaching techniques	Lectures 14 hours Practical classes, 14 hours
Assessment methods	Differentiated credit test and course project. Oral final-term project presentation is foreseen. The final term group- project presentation is to be devoted to the assessment of the level of achievement of LOs 1-7 (to be able to realize an ecological city-planning project and explain its concept and intentions)
Assessment criteria	The final-term test is combined with the practical group project presentation by the whole team (3-5 people), where each member of the team explains and presents his/her part in the project) , here students should demonstrate their knowledge and understanding of main principles of ecological city-planning design, using new technologies and innovations, along with their ability

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	to illustrate their knowledge and understanding clearly in the field of eco-city-planning (using appropriate wording), synthetically and correctly will be assessed.  Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.
Assessment metrics	Attribution of a final grade
Criteria of attribution of the final grade	The final grade will be determined according to the following rules: - Final term group-project presentation: 60% - Oral presentation of the project: 40% Assessment of the entire project presented Each member of the group will be evaluated separately – 60% Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%
Preparatory course units	<u>Bachelor Degree in Civil Engineering or Architecture (fundamentals)</u>
Educational material of reference	1. Rassia Stamatina Th. Cities for Smart Environmental and Energy Futures Impacts on Architecture and Technology, 2014. – 301 p. 2. Geller G., Gluecklich D., Sustainable Rural and Urban Ecosystems: Design, Implementation and Operation, Springer, 2012. - 179 p. 3. Droege P. Beyond sustainability: architecture in the renewable city. In: The stage handbook for architectural theory. Sage. London, 2012. - 601 p. 4. Mumford L. The city in history: its origins, its transformations, and its prospects. Penguin, Harmondsworth, 1961. – 120 p. 5. Simmel G. The metropolis and mental life. In: The Urban sociology redeal. Routledge. London/New York, 2005. – 31 p.

**Добавлено примечание ([VB14]):** This may be a pre-requisite to be admitted to the master course, not a preparatory course for a module

## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b>Special Issues of Heat Engineering, Acoustics and Lighting</b>
Year / Semester	II / 3°
Lecturer	Novikov M.
Specific learning outcomes	<ul style="list-style-type: none"> <li>1- to demonstrate knowledge of fundamental and applied disciplines graduate programs;</li> <li>2 - to conduct scientific experiments using modern research equipment and instruments, assess the results of the research;</li> <li>3 - to know the methods of design and monitoring of buildings and constructions, their structural components, including methods of a settlement substantiation, including with the use of universal and specialized software complexes and systems of the automated designing;</li> <li>4 - to conduct a technical examination of projects of construction objects;</li> </ul>
Contents	The main aim of the unit is this discipline is consideration physical phenomena and processes in structures and buildings associated with heat transfer and dissemination of sound and light. The rationale for the use in construction materials and structures, choice of sizes and shapes of areas that would provide optimal temperature and humidity, acoustic and lighting conditions in the premises according to their functional purpose.
Schedule	Once a two weeks of lecture and once a two weeks of the practice (14 weeks)
Teaching and learning methods	Practical methods of teaching, reading, oral lectures, face to face, 14 hours
Teaching techniques	Lectures, 14 hours Practical classes, 14 hours
Assessment methods	Differentiated credit test and course project. Oral final-term project presentation is foreseen. The final term group- project presentation is to be devoted to the assessment of the level of achievement of LOs 1-4 (to conduct a technical examination of projects of construction objects )
Assessment criteria	Knowledge of the fundamental laws of building physics in the field of thermal protection, natural lighting and insulation, noise protection and acoustics construction; features of modern solutions walling; the ability to conduct calculations in the field of thermal, acoustics and lighting; design skills of walling and confirmation of the correctness of their solution a special calculation.
Assessment metrics	The final grade will be determined according to the following rules: the Course Project is performed – 40%; practical work is performed - 20 %; Total Credit Test– 40 %.
Criteria of attribution of the final grade	Assessment of the entire project presented Each member of the group will be evaluated separately – 60% Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%  5 Extraordinarily high achievement 4 Good 3 Satisfactory, the level of work expected of students in a graduate-level course 2 Unacceptable and failing
Preparatory course units	Design, Construction and Operation of Buildings of Low Energy Consumption; Innovative Construction Materials

Добавлено примечание ([VB15]): Please review according to the given examples, previous comments and modules

### Master's Programme in Buildings of Energy-Efficient Life Cycle

Educational material of reference	<ol style="list-style-type: none"><li>1. Architectural acoustics: Workshop /Melnikov D. E., Ageenko, M. V.: VSUACE, Voronezh, 2015 – 54 p.</li><li>2. Laboratory of building physics: a tutorial /Bogatova T. V., Melnikov E. D.: VSUACE, Voronezh, 2015. – 56 p.</li><li>3. Kupriyanov V. N. Physics of the environment and enclosing structures:a Textbook. – M.: ASV, 2015. – 308 p.</li><li>4. Protasevich A. M. Building Thermophysics enclosing structures of buildings and structures: a tutorial/ Protasevich A. M.— Electron. text data.— Minsk: Vysheishaya SHKOLA, 2015.— 240 p.</li><li>5. Malyavina E. G. Building Thermophysics [Electronic resource]: a tutorial/ Malyavina E. G.— Electron. text data.— M.: Moscow state construction University, EBS ASV, 2011.— 151 p.</li><li>6. Ivanov N. And. Engineering acoustics. Theory and practice of noise control. – M.: Logos, 2013. – 432 p.</li><li>7. V. O. Knudsen, Architectural acoustics. – 3rd ed. erased. – M: URSS, 2011. – 523 p.</li></ol>
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## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b>Architecture and Design of Energy Efficient Buildings</b>
Year / Semester	II / 3°
Lecturer	<i>Rodina-Earthbourne E (Assistant E. Prokshits)</i>
Specific learning outcomes	<p>On successful completion of this module students should be able:</p> <ol style="list-style-type: none"> <li>1- to apply knowledge and understanding of the basic principles of architecture and design of energy efficient buildings to analyze, design, and conduct complex projects;</li> <li>2- to develop design tasks, specifications, standards of enterprises, instructions and guidance on the use of funds, technology and equipment in architecture and design of energy efficient buildings;</li> <li>3- to read professional architectural and design documentation, along with supplement professional information to prepare themselves for the professional industry work and participation in an actual Global competition in the 4<sup>th</sup> semester;</li> <li>4- to formulate, present and report the results of the group collective work performed in the field of architecture and design of energy efficient buildings to become an equal member of the professional green energy community;</li> <li>5- to participate in class discussions with colleagues and with teachers, in order to develop social communication skills.</li> </ol>
Contents	Module aims at acquainting students with current scientific trends in sustainable architecture and design and their implementation and operation around the world and in Russia. It should enable students to carry out architectural and design projects focusing on the analyses, theoretical and practical work in the field of EE building design. The unit is intended to encourage students to make independent decisions in theoretical and practical architectural design. The main practical project in this module will be conducted by a group of students (3-5 people) (individual project work is possible, but requires justification). Most current information on energy conservation code requirements, refer to the 2015 INTERNATIONAL ENERGY CONSERVATION CODE will be introduced, along with the Russian energy efficient standards.
Schedule	Lectures - once in two weeks and practice - once a week (14 weeks)
Teaching and learning methods	Face to face, 42 hours: lectures, role-play assignments, group work, simulation, debates, discussions, video footage, library/information retrieval tasks, reading list, seminar, tutorial, practical exercises, student blog (with already made group projects open for discussions and critique), practical project work
Teaching techniques	Lectures 14 hours Practical classes, 28 hours
Assessment methods	Differentiated credit test and course project. Oral final-term project presentation is foreseen. The final term group- project presentation is to be devoted to the assessment of the level of achievement of LOs 1-5 (to be able to realize a architectural design project of energy efficient building and explain its concept), along with the project presentation, students should be able to demonstrate their knowledge of International Energy Conservation Code and compare it to the Russian contemporary standards.
Assessment criteria	<p>The final-term test is combined with the practical group project presentation by the whole team (each member of the team explains and presents his/her part in the project) , here students should demonstrate their knowledge and understanding of main principles of architecture and design of energy-efficient buildings, using new technologies and innovations, along with the international energy conservation code and Russian standards in the field. Also the ability to illustrate the knowledge and understanding in the field of architecture and design of EE building (using appropriate wording), synthetically and correctly will be assessed.</p> <p>Finally, students' ability to participate in class discussions with teachers and colleagues will be</p>

Добавлено примечание ([VB16]): You may express in simpler terms.

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	assessed in practical classes.
Assessment metrics	Attribution of a final grade
Criteria of attribution of the final grade	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- final term group-project presentation: 60%</li> <li>- oral presentation of the project: 40%</li> </ul> <p>Assessment of the entire project presented</p> <p>Each member of the group will be evaluated separately – 60%</p> <p>Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%</p>
Preparatory course units	Eco-Conceptual Architectural and Engineering Projection (Part I&II)
Educational material of reference	<ol style="list-style-type: none"> <li>1. Rassia Stamatina Th. Sustainable Environmental Design in Architecture. Impacts on Health, 2012. – 338 p.</li> <li>2. Braham W.W., Architecture and Systems Ecology: Thermodynamic Principles of Environmental Building Design, in three parts, 2016, 276 p.</li> <li>3. International Energy Conservation Code by International Code Council, 2015. – 105 p.</li> </ol>

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Name	<b><i>Peculiarity of Design the Life Cycle of Energy Efficient Real Estate</i></b>
Year / Semester	II /3°
Lecturer	Gorbanyova E.
Specific learning outcomes	On successful completion of this module students should demonstrate: 1 - to demonstrate a theoretical knowledge of the life cycles of energy and real estate; 2 – to know stages of energy and real estate life cycle make a choice energy-efficient option resource and energy saving given life and chronological age of the property; 3 – to apply methods of assessing the implementation of energy saving measures and their effects on the ecological situation at all stages of the life cycle of objects; 4 – to acquire the skills of calculations of economic and social efficiency, as well as the determination of the periodic costs of operation and maintenance during the operational phase of energy and facilities; 5 - to demonstrate the results of the analytical work in visual presentation.
Contents	The main aim of the unit is to acquaint students with modern methods of evaluating the effectiveness of energy performance and properties throughout the life cycle from the time of the feasibility study until the physical or obsolescence , as well as the use of ways to improve energy efficiency by using different types of energy
Schedule	Once two weeks lectures and once a week practice (14 weeks)
Teaching and learning methods	Face to face, 42 hours:group work, debates, discussions, idea mapping, library\information retrieval tasks, concept mapping, lectures, problem-solving sessions, reading list, seminars
Teaching techniques	Lectures, 14 hours Practical classes, 28 hours
Assessment methods	Credit test. Final-term written test are foreseen. The final-term written test will be devoted to the assessment of the level of achievement of LOs 1-5 (theoretical comprehension of the subject and the capacity to understand and to express the related concepts)
Assessment criteria	In the final written test students must demonstrate their knowledge and understanding of design life cycle energy efficiency of real estate objects taking into account lifespan and chronological age of real estate, using methods of evaluation of energy saving measures and their results on the environmental situation at all stages of the life cycle of objects, and calculations of economic and social efficiency and recurring costs during the operation of real estate. Also their ability to illustrate their knowledge and understanding clearly (using appropriate wording), synthetically and correctly will be assessed. Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.
Assessment metrics	The final grade will be determined according to the following rules: - practical work is performed - 60 % - total Credit Test– 40 %
Criteria of attribution of the final grade	5 Extraordinarily high achievement 4 Good level 3 Satisfactory, the level of work expected of students in a graduate-level course 2 Unacceptable and failing
Preparatory course units	Eco-Conceptual Architectural and Engineering Projection (Part I&II); The Design, Construction and Operation of Buildings of Low Energy Consumption; Mathematical Modelling of Building Energy Performance; BIM Technologies for Energy Efficient Buildings; Engineering Systems of

Добавлено примечание ([VB17]): Not clear. Please re-formulate

Добавлено примечание ([VB18]): Please add more details

Добавлено примечание ([VB19]): Please review according to the given examples, previous comments and modules

## Master's Programme in Buildings of Energy-Efficient Life Cycle

	Energy-Efficient Buildings; Innovative Construction Materials
Educational material of reference	<ol style="list-style-type: none"> <li>1. N. Shiryayeva (UrSU), Lifecycle of energy, energy management and optimum decision making, 2014. – 190 p.</li> <li>2. A.N. Dmitriev, Y.A. Tabunshikov etc. Manual on estimation of economical efficiency of investment in energy-efficiency, 2010. – 103 p.</li> <li>3. Economy and management : textbook : recommended by Training and methodology Association / under the General editorship of G. P. Grabovoy ; Mosk. GOS. stroit. UN-vol - 2-e lzd., Rev. and DOP. - Moscow : Prospekt, 2013. - 569 p.</li> <li>4. Economy and real estate management. Examples, tasks, exercises: studies. allowance: 2 h H 2 / ed. by Grabovoi G. P. - Smolensk, Moscow, Smolin Plus : ASV, 2001. - 435 p.</li> <li>5. Reconstruction and upgrade of the existing development of the city: proc. allowance : rivers. Of Association of the Russian Federation / under the General editorship of G. P. Grabovoy, V. A. Kharitonov. - M. : ASV : Realproekt, 2006. - 624 p.</li> </ol>



### Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b>Energy and Environmental Monitoring of Construction Projects</b>
Year / Semester	II / 3°
Lecturer	Drapaliuk D.
Specific learning outcomes	1 - to determine the strength characteristics of building materials; 2 - to obtain knowledge about the methods of examination of structures and buildings; 3 - to know how to determine the energy efficiency of the building envelopes; 4 - to acquire the ability to conduct a technical examination of construction objects; 5 - to acquire skills of inspection of building structures
Contents	The main aim of the unit is to present the overview of technical and practical methods and tools for carrying out energy and environmental monitoring of building constructions, structures, and facilities, to enhance the efficiency of reparation and construction works during the building reconstruction, overall and construction of buildings using energy saving technologies.
Schedule	Once two weeks lectures and once a week practice (14 weeks)
Teaching and learning methods	Practical teaching methods, oral lectures, face to face, 14 hours
Teaching techniques	Lectures, 14 hours Practical classes, 28 hours
Assessment methods	Credit test. Final-term written and oral test are foreseen. The final-term written test will be devoted to the assessment of the level of achievement of LOs 1-5 (theoretical comprehension of the subject and the capacity to understand and to apply the received knowledge in practice)
Assessment criteria	Determination of the strength characteristics of building materials, knowledge about the methods of examination of structures and buildings; knowledge of determination the energy efficiency of the building envelopes, ability to conduct a technical examination of construction objects, skills of inspection of building structures.
Assessment metrics	The final grade will be determined according to the following rules: - performed laboratory work - 20% - performed practical work - 30% - examination Final – 50%
Criteria of attribution of the final grade	5 Extraordinarily high achievement 4 Good 3 Satisfactory, the level of work expected of students in a graduate-level course 2 Unacceptable and failing
Preparatory course units	Design, Construction, and Operation of Buildings of Low Energy Consumption, Eco-Conceptual Architectural and Engineering Projection.
Educational material of reference	1. Monitoring of housing and physical wear and tear, conducting surveys of building materials and constructions / Educational - methodical manual / Drapaliuk D.A. / From - to : VGASU , Voronezh , 2013 . - 82 p. 2. Diagnostics of technical state of reinforced concrete structures by the nature of fracture and other injuries: guidance / Kondratieva N.V. / Samara: Samara State Architectural University , FBS DIA , 2013.- 32 p. 3. The methodology of the survey and monitoring of the technical condition of buildings and structures using advanced technology: a tutorial / Sementsov S.V. Orekhov MM, Volkov V.I.- Electron . text dannye.- SPb .: Saint-Petersburg State University of Architecture and Civil Engineering , EBS DIA , 2013.- 76 p.

Добавлено примечание ([VB20]): Please review according to the given examples, previous comments and modules

#### Master's Programme in Buildings of Energy-Efficient Life Cycle

	<p>4. Magrini A. Building Refurbishment for Energy Performance, 2014. - 252 p.</p> <p>5. N. Popov (TSTU), Energy and environmental audit, 2014. – 180 p.</p> <p>6. V. Semenov (VSUAE), Practical application of energy saving technologies, 2014. – 193 p.</p>
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**Master's Programme in Buildings of Energy-Efficient Life Cycle**

Name	<b><i>Integral Assessment of Biosphere Compatibility of Urban Spaces</i></b>
Year / Semester	II / 3°
Lecturer	Sotnikova O.
Specific learning outcomes	<p>On successful completion of this module students should demonstrate:</p> <p>1 – to realize the main functions of the city, which meet the rational needs of man</p> <p>2 – to demonstrate the principles of transform urban energy infrastructure in order to create biosphere compatibility cities, developing human;</p> <p>3 – to select research algorithm for calculating the criteria of compatibility of biosphere energy infrastructure urbanized territory;</p> <p>4 – to figure out the methodology of forecasting parameters of the human potential in urban areas;</p> <p>5 – to know the trends of the assessment methodology of planning solutions building and reconstruction in system urbanized territories from the perspective of biosphere compatibility with objects of energy infrastructure ;</p> <p>6 – to know the modern principles and methods of numerical and experimental studies of the state of the production environment of urbanized areas of life support systems;</p> <p>7 – to participate in class discussion with colleagues and with teachers;</p> <p>8 – to develop social communication skills, prepare themselves for the group-projects.</p>
Contents	The main aim of the unit is to develop the skills of converting urbanized areas in the implementation of biosphere compatibility engineering technology. Conceptual bases the formation of a secure and comfortable urban energy infrastructure. Modelling and quantification of constituents humanitarian balance of biotechnosphere, taking into account the impact of objects the energy economy cluster
Schedule	Once two weeks lectures and once a week practice (14 weeks)
Teaching and learning methods	Face to face, 42 hours:group work, debates, discussions, team project, idea mapping, individual project, library/information retrieval tasks, concept mapping, lectures, problem-solving sessions, reading list, seminars
Teaching techniques	Lectures, 14 hours Practical classes, 28 hours
Assessment methods	Credit test. Final-term written test are foreseen. The final-term written test will be devoted to the assessment of the level of achievement of LOs 1-8 (theoretical comprehension of the subject and the capacity to understand and to express the related concepts)
Assessment criteria	<p>In the written final-term test students should demonstrate their knowledge and understanding of the main functions of the city satisfying to rational needs of the person and algorithm of their calculation, criteria of biosphere compatibility of an urban environment (including power infrastructure of the urbanized territory), estimated indicators and parameters of monitoring of a condition of an urban environment, classes of ecological safety of objects (including power infrastructure). Also their ability to illustrate their knowledge and understanding clearly (using appropriate wording), synthetically and correctly will be assessed.</p> <p>Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.</p>
Assessment metrics	<p>The final grade will be determined according to the following rules:</p> <ul style="list-style-type: none"> <li>- Course Project is performed – 40%</li> <li>- Practical work is performed - 20 %</li> <li>- total Credit Test– 40 %</li> </ul>
Criteria of attribution of the final	<p>Assessment of the entire project presented</p> <p>Each member of the group will be evaluated separately – 60%</p> <p>Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%</p>

### Master's Programme in Buildings of Energy-Efficient Life Cycle

grade	<p>5 Extraordinarily high achievement</p> <p>4 Good level</p> <p>3 Satisfactory, the level of work expected of students in a graduate-level course</p> <p>2 Unacceptable and failing</p>
Preparatory course units	Eco-Conceptual Architectural and Engineering Projection (Part I&II); The Design, construction and operation of buildings of low energy consumption; Mathematical Modelling of Building Energy Performance; BIM Technologies for Energy Efficient Buildings; Engineering Systems of Energy-Efficient Buildings; Innovative Construction Materials
Educational material of reference	<p>1. Ilyichev V.A., Yemelyanov S.G., Kolchunov V. I., Gordon V.A., Bakayeva N. V. The principles of transformation of the city to biosphere compatibility and developing the person. - M, DIA, 2015. – 184 p.</p> <p>2. Ilyichev V.A. Transformation of the cities in biosphere compatibility and developing the person: rate of lectures / V.A.Ilyichev, S.G. Yemelyanov. – M.: YuZGU publishing house, 2013. – 99 p.</p> <p>3. Novikov.A. I. Econometrics: Educational benefit / A.I. Novikov. – M.: INFRA-M, 2007. – 144 p.</p> <p>4. Methodology of functional modeling of IDEFO. Regulating document. – GOSSTANDART of RUSSIA. - M.: Publishing house of standards, 2000. – 62 p.</p> <p>5. Maslov N. V. Town-planning ecology (M. S. Shumilov, Ed) – M.: The higher school. 2003. – 284 p.</p> <p>6. Vladimirov V. V. Urban ecology: abstract of lectures. – M.: MNEPU publishing house, 1999. - 204 p.</p> <p>7. Azarov V. N. City ecology / V.N. Azarov, V. A. Grachev, V. I. Telichenko and other: textbook for higher educational institutions / Under the editorship of V. V. Gutenev. – M. - Volgograd: Printerra-Dizayn, 2010. – 816 p.</p> <p>8. Golovinsky P. A., Surovtsev I.S. System analysis: (education guidance). - Voronezh: SUE VO "Voronezh regional typography", 2013 - 171 p.</p>

## Master's Programme in Buildings of Energy-Efficient Life Cycle

Name	<b><i>Energy Management of Enterprise</i></b>
Year / Semester	II / 3 <sup>o</sup>
Lecturer	Sotnikova O.
Specific learning outcomes	On successful completion of this module students should demonstrate: 1 - to use the knowledge of the fundamental areas of natural science and professional cycles in explaining the physical essence of the processes occurring in the objects of heat and mass transfer energy saving equipment; 2 - to participate in the testing of heat exchangers and energy-saving auxiliary equipment according to set programs to perform numerical and experimental investigations; 3 - to support optimal cost-effective modes for the equipment of the power generation facilities of civil construction and industrial enterprises; 4 - to apply conservation technologies in industrial and civil engineering projects; 5 - to carry out installation and commissioning and repair work on the primary and auxiliary energy saving equipment provided professional adaptation.
Contents	The main aim of the unit is to develop the skills of the foundations of the economic mechanism of energy conservation; the rules of regulation of heat consumption; the cost structure of utilities; rules of formation of tariffs on electric and thermal energy; the algorithm for determining the cost of electric and thermal energy; the main functions of the inspection services; the algorithm of calculation of indicators of efficiency of the energy saving project
Schedule	Once two weeks lectures and once a week practice (14 weeks)
Teaching and learning methods	Face to face, 42 hours: group work, debates, discussions, team project, idea mapping, individual project, library/information retrieval tasks, concept mapping, lectures, problem-solving sessions, reading list, seminar
Teaching techniques	Lectures, 14 hours Practical classes, 28 hours
Assessment methods	Credit test. Final-term written test are foreseen. The final-term written test will be devoted to the assessment of the level of achievement of LOs 1-5 (theoretical comprehension of the subject and the capacity to understand and to express the related concepts)
Assessment criteria	In the written final-term test students should demonstrate their knowledge and understanding of the main functions of the city satisfying to rational needs of the person and algorithm of their calculation, criteria of biosphere compatibility of an urban environment (including power infrastructure of the urbanized territory), estimated indicators and parameters of monitoring of a condition of an urban environment, classes of ecological safety of objects (including power infrastructure). Also their ability to illustrate their knowledge and understanding clearly (using appropriate wording), synthetically and correctly will be assessed.  Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.
Assessment metrics	The final grade will be determined according to the following rules: - Course Project is performed – 40% - practical work is performed - 20 % - total Credit Test– 40 %
Criteria of attribution of the final grade	Assessment of the entire project presented Each member of the group will be evaluated separately – 60% Commission of all the lectures of the Master Degree project will vote (anonymously) – 40%

### Master's Programme in Buildings of Energy-Efficient Life Cycle

	<p>5 Extraordinarily high achievement</p> <p>4 Good level</p> <p>3 Satisfactory, the level of work expected of students in a graduate-level course</p> <p>2 Unacceptable and failing</p>
Preparatory course units	Eco-Conceptual Architectural and Engineering Projection (Part I&II); The Design, construction and operation of buildings of low energy consumption; Mathematical Modelling of Building Energy Performance; BIM Technologies for Energy Efficient Buildings; Engineering Systems of Energy-Efficient Buildings; Innovative Construction Materials
Educational material of reference	<p>1. Organization of energy saving (power management). Solutions of ZSMK-NKMK-EVRAZ. – M.: INFRA-M, 2016. – 108 p.</p> <p>2. Andrizhiyevsky A. A. Energy saving and energy management: studies / A.A. Andrizhiyevsky, V. I. Volodin. - the 2nd Ed: The higher school, 2005. – 233 p.</p> <p>3. Gitelman L.D., Ratnikov B. E. Risk-free power management. Industrial enterprise in the market of the electric power. – M.: Case, 2004. – 600 p.</p> <p>4. T.Kh.Gulbrandsen, L.P.Padalko, V. L. Chervinsky. Energoeffektivnost and energy management: educational and methodical benefit. – Minsk, BGATU publishing house, 2010. – 240 p.</p>

## Master's Programme in Buildings of Energy-Efficient Life Cycle

### Characteristics of the Differentiated Credit

Workload	<i>Written Test, Oral examination</i>	
Requirements to be fulfilled by the final work	<i>To pass the test, which consists of 40 questions</i>	
Criteria for the attribution of the graduation grade	<i>Individual work</i>	<i>60 %</i>
	<i>Oral examination</i>	<i>40 % here we need to mention criterias for 4 credit test and for 5 credit test separatly</i>

## Master's Programme in Buildings of Energy-Efficient Life Cycle

### Teaching Staff - Academic Year 2017-18

Lecturer	Qualification *	Course units of the SP	Course units of other SP
Sotnikova Olga	FP	Engineering Systems of Energy-Efficient Buildings, Legal and Legislative Issues in the Field of Energy Saving, Energy Management of Enterprise, Integral Assessment of Biosphere Compatibility of Urban Spaces	1. The energy audit. 2. Heat and gas supply settlements and enterprises. 3. Energy-efficient buildings. 4. Green design standards. 5. Feasibility study of energy efficiency investment projects. 6. Ecology of Energy.
Shitikova Marina	FP	Scientific Research Methodology	Scientific Research Methodology
Drapaliuk Alexander	AP	Mathematical Modelling of Building Energy Performance, BIM Technologies for Design Energy Efficient Buildings	BIM Technologies
Drapaliuk Dmitrii	AP	Energy and Environmental Monitoring of Construction Projects 1 The theory of decision-making	Modern graphic complexes in the construction process Monitoring the state of housing and physical deterioration A survey of building materials and structures Analysis of projects of manufacture of works Technical and author's supervision Analysis of test methods for construction materials The compliance of products with project requirements, standards and certificates Theory of combustion and explosion Physico-chemical bases of development and suppression of fires
Gorbanyova Elena	AP	Peculiarity of Design the Life Cycle of Energy Efficient Real Estate	1. Project management frameworks. 2. Bases of the organization and management in construction 3. The organization, planning and management in construction 4. A special course on



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			<i>designing of building constructions of high and wide-span rise buildings and constructions</i> <i>5. Production organization and enterprise management in construction</i> <i>6. Project management</i> <i>7. Real estate administration bases</i>
Korotkikh Dmitrii	AP	<i>Design, Construction, and Operation of Buildings of Low Energy Consumption; Innovative Construction Materials</i>	<i>1. Designing construction industry enterprises</i> <i>2. Design of industrial technology and the basics of CAD</i> <i>3. Appliances and construction technology</i> <i>Information technology in the construction</i>
Novikov Michail	AP	<i>Special Issues of Heat Engineering, Acoustics and Lighting</i>	<i>Building Physics</i>
Rodina Elena	AP	<i>Engineering Pedagogy, Business and Technical English, Eco-Conceptual Architectural and Engineering Projection (Part I), Principles of Ecological City-Planning, Architecture and Design of Energy Efficient Buildings, Principles of Ecological City-Planning</i>	<i>1. Urban-planning,</i> <i>2. Development of urban transport communications,</i> <i>3. Structural planning of city engineering infrastructure</i>

\* FP: Full Professor; AP: Associate professor; ...; PR: Professional.

**Master's Programme in Buildings of Energy-Efficient Life Cycle**

**VORONEZH STATE UNIVERSITY OF ARCHITECTURE AND CIVIL ENGINEERING**

**Laboratories**

<b>Laboratory</b>	<b>Equipment</b>	<b>Work places / N. students per work place</b>	<b>Technical Staff</b>
An independent testing laboratory of construction materials	<i>Equipment for laboratory work</i>	10 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory air conditioning;	<i>Equipment for laboratory work</i>	10 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory gas supply	<i>Equipment for laboratory work</i>	15 / 4	1 technician (8.30-13.35 14.20-17.45)
Laboratory of heat supply and heat generating installations	<i>Equipment for laboratory work</i>	10 / 2	1 technician (8.30-13.35 14.20-17.45)
Testing laboratory of Chair of Structural Mechanics	<i>Equipment for laboratory work</i>	20 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory of construction materials	<i>Equipment for laboratory work</i>	18 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory modelling of building technologies and designs	<i>Equipment for laboratory work</i>	19 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory of pumps, fans and compressors	<i>Equipment for laboratory work</i>	10 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory of heating and ventilation	<i>Equipment for laboratory work</i>	10 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory of thermodynamics, heat transfer and heat exchange	<i>Equipment for laboratory work</i>	15 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory of construction physics	<i>Equipment for laboratory work</i>	12 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory of Chair of Fire and Industrial Safety	<i>Equipment for laboratory work</i>	10 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory of testing building structures	<i>Equipment for laboratory work</i>	15 / 2	1 technician (8.30-13.35 14.20-17.45)
Laboratory vibroacoustic	<i>Equipment for laboratory work</i>	5 / 3	1 technician (8.30-13.35 14.20-17.45)

**Master's Programme in Buildings of Energy-Efficient Life Cycle**

**VORONEZH STATE UNIVERSITY OF ARCHITECTURE AND CIVIL ENGINEERING**

**Libraries**

<b>Library</b>	
Web Connection	<a href="http://catalog2.vgasu.vrn.ru/MarcWeb2">http://catalog2.vgasu.vrn.ru/MarcWeb2</a> <a href="http://www.lib.vsu.ru">www.lib.vsu.ru</a> <a href="http://www.iprbookshop.ru/">http://www.iprbookshop.ru/</a>
Services offered	consultation of books and journals, drafting and editing of the bibliography of literature on individual request, book rent, bibliographical researches, access to data bases, etc.
Librarian staff available	Shulzhenko Natalia – Director, Makhotina Marina - Deputy Director, Konstantinova Marina - Deputy Director, Efremova Galina - Head of Reading Room Sector

**Opening time and access rules**

<b>Structure Department</b>	<b>Placement</b>	<b>On session</b>
Directorate	5213	Mon.-Thu. 9.00-17.00 Friday. 9.00-16.00 Break: 12.30-13.00
Student's subscription	5104	Mon.-Thu. 10.00-18.00 Friday. 10.00-17.00 Saturday. 10.00-15.00
Teacher's subscription	5104	Mon.-Thu. 10.00-18.00 Friday. 10.00-17.00 Saturday. 10.00-15.00
1st – 2nd year Student's subscription	5108	Mon.-Thu. 10.00-18.00 Friday. 10.00-17.00 Saturday. 10.00-15.00
Art subscription	5209	Mon.-Fri. 10.00-18.00 Saturday. 10.00-15.00
Reading room of humanitarian literature	5410	Mon.-Fri. 9.00-19.00 Saturday. 9.00-17.00
Reading room of the specifications and technical documentation	5407	Mon.-Fri. 9.00-19.00 Saturday. 9.00-17.00
Reading room of technical literature	5408	Mon.-Fri. 9.00-19.00 Saturday. 9.00-17.00
Department of scientific and bibliographic service	5404	Mon.-Thu. 9.00-17.00 Friday. 9.00-16.00
Department of completing	5208	Mon.-Thu. 9.00-17.00 Friday. 9.00-16.00

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Department of scientific and technical processing	5208	Mon.-Thu. 9.00-17.00 Friday. 9.00-16.00
Department of book storage	5104	Mon.-Thu. 9.00-17.00 Friday. 9.00-16.00
Fund of rare books	5406	Mon.-Thu. 9.00-17.00 Friday. 9.00-16.00
Hall of electronic information	5409	Mon.-Thu. 9.00-17.00 Friday. 9.00-16.00

### Bibliographical material of interest for the didactic activities of the Master Programme

1. Rassia Stamatina Th. Cities for Smart Environmental and Energy Futures Impacts on Architecture and Technology, 2014. – 301 p.
2. Geller G., Gluecklich D., Sustainable Rural and Urban Ecosystems: Design, Implementation and Operation, Springer, 2012.- 179 p.
3. Droege P. Beyond sustainability: architecture in the renewable city. In: The stage handbook for architectural theory. Sage. London, 2012. - 601
4. Mumford L. The city in history: its origins, its transformations, and its prospects. Penguin, Harmondsworth, 1961. – 120 p.
5. Simmel G. The metropolis and mental life. In: The Urban sociology redeal. Routledge. London/New York, 2005. - 31 p.
6. Ortigueira, Manuel Duarte Fractional Calculus for Scientists and Engineers, 2011. - 154 p.
7. Lizárraga-Celaya C. Maple and Mathematica. A Problem Solving Approach for Mathematics, 2nd ed., 2009. – 484 p.
8. O.D. Samarin. Thermo-physical and technical- economic foundations of Thermal Engineering safety and energy efficiency in buildings, 2007. – 134 p.
9. Howlett Robert J. Sustainability in Energy and Buildings/ Results of the Second International Conference in Sustainability in Energy and Buildings (SEB'10), 2011. – 302 p.
10. M'Sirdi N. Sustainability in Energy and Buildings / Proceedings of the 3rd International Conference on Sustainability in Energy and Buildings (SEB'11), 2012. – 650 p.
11. Gillett A., Speak Business English Like an American for Native Russian Speakers, 2005. - 201 p.  
Elser A. G. Writing from Scratch: For Business (Writing from Scratch Series), 1990. - 168 p.
12. Grant D., McLarty R., Business Basics Student Book: International Edition (Business Basics International Edition), 2006. - 176 p.
13. Eastman C. et al. BIM Handbook: a guide to building information modeling for owners, managers, designers and contractors, Sybex, 2014. — 1008 p
14. Vandezande J., Krygiel E. Mastering Autodesk Revit Architecture 2016, Sybex, 2015. — 1008 p.
15. Krygiel Eddy, Vandezande James, Read Phil. Mastering Autodesk Revit Architecture 2014, Sybex, 2013. — 1008 p.
16. Nawari N.O., Kuenstle M. Building Information Modeling: Framework for Structural Design, CRC Press, Taylor & Francis Group, 2015. — 257 p.
17. Eastman C. et al. BIM Handbook: a guide to building information modeling for owners, managers, designers and contractors, Chuck Estman, Paul Teichols, Rafael Sacks, Kathleen Liston. — 2nd ed. — John Wiley and Sons, Inc., 2011. — 648 p.
18. Aleksandrova V.F. Technology and organization of reconstruction [electronic resource] : a tutorial / Aleksandrova V.F., Pastukhov Yu., Racine T.A.- Electron. text dannye.- SPb, 2014. – 125 p.

## Master's Programme in Buildings of Energy-Efficient Life Cycle

19. Nikolenko Y. The technology of construction of buildings and structures. Part 1 [electronic resource]: a tutorial / Nikolenko Yu.V.- Electron. text dannye.- M.: People's Friendship University of Russia, 2013. – 110 p.
20. Nikolenko Y. The technology of construction of buildings and structures. Part 2 [electronic resource]: a tutorial / Nikolenko Yu.V.- Electron. text dannye.- M.: People's Friendship University of Russia, 2013. – 134 p.
21. Meshcheryakov Yu. Building materials [Text] : a textbook / Center . Inst refresher . - St. Petersburg: [b . and ], 2013. – 366 p.
22. Volosuhin , V.A. Building structures [Text] : a textbook . - 4th ed., Revised. and ext. - Rostov- on-Don : Phoenix 2013. Rostov- on-Don: JSC " book" , 2013. - 554 p.
23. Tetior A.I. Architectural and construction ecology: Textbook. Allowance for higher education establishment cry rivers UMO / Tetior AI - M.: Academy, 2008. - 360 p.
24. Engineering and economic analysis of energy saving measures / R.M. Aloyan , etc. - Tambov : . Publisher Pershin RV, 2014. - 170 p.
25. O.N. Startseva, S.A. Yaremenko, Thermal calculation of external walling - Ucheb. method. Benefit to MY course work for students enrolled in the direction 270100 "Building". VPO VGASU, Voronezh, 2010. – 75 p.
26. Loganina V.I. Application of international standards in the building [electronic resource]: a tutorial / Loganina V.I.- text .- Saratov: Undergraduate education, 2014.- 84 p.
27. Green technologies for sustainable development: Textbook / I.V. Ageev, O.V. Bednova, S.Y. Vavilov , et al. (N.P. Tarasova, Ed) - Tambov: publ Pershin R.V., 2014. - 165 p.
28. M'Sirdi N. Sustainability in Energy and Buildings / Proceedings of the 3rd International Conference on Sustainability in Energy and Buildings (SEB'11), 2012. – 650 p.
29. The methodology of the survey and monitoring of the technical condition of buildings and structures using advanced technology [electronic resource]: a tutorial / Sementsov SV, Orekhov MM, Volkov V.I.- Electron . text dannye.- SPb .: Saint-Petersburg State University of Architecture and Civil Engineering , EBS DIA , 2013.- 76 c.
30. Magrini A. Building Refurbishment for Energy Performance, 2014. - 252 p.
31. N. Popov, Energy and environmental audit, 2014. – 180 p.
32. V. Semenov, Practical application of energy saving technologies, 2014. – 193 p.
33. Geller G. Sustainable Rural and Urban Ecosystems: Design, Implementation and Operation. Manual for Practice and Study, 2012. – 179 p.
34. Kishimoto A. Advanced Energy Saving and its Applications in Industry, 2013. – 75 p.
35. The methodology of the survey and monitoring of the technical condition of buildings and structures using advanced technology [electronic resource] : a tutorial / Sementsov S.V., Orekhov M.M., Volkov V.I.- Electron . text dannye.- SPb .: Saint-Petersburg State University of Architecture and Civil Engineering , EBS DIA , 2013.- 76 p.
36. Magrini A. Building Refurbishment for Energy Performance, 2014. - 252 p.
37. Polosin I.I., Novoseltsev B. P., V.Yu.Khuzin, M. N. Zherlykina. Engineering systems of buildings and constructions. – M.: Academy, 2012. – 304 p.
38. V. Harke. Smart house. Consolidation in a network of household appliances and system of communications in housing construction. – M.: Technosphere, 2006. – 188 p.
39. Mark E.S. A practical advice and decisions on creation of the smart house. – M, NT-Press, 2007. – 137 p.
40. Practical application of energy-saving technologies: educational benefit / D. N. Kitayev, P. Novakovsky, E.V. Sazonov, V. N. Semenov, E.E. Semenova ( V. N. Semenov and N. S. Popov, Eds) - Tambov: Pershin R. V. publishing house, 2014.-193 p.
41. Meshcheryakov Yu. Building materials: a textbook / Center . Inst refresher. - St. Petersburg: 2013. - . 366 p.
42. Volosuhin V.A. Building structures [Text] : a textbook . - 4 th ed., Revised and ext. - Rostov- on-Don : Phoenix, 2013. - 554 p.

## Master's Programme in Buildings of Energy-Efficient Life Cycle

43. Tetior A.I. Architectural and construction ecology: Textbook. Allowance for higher education establishment cry rivers UMO / Tetior A.I. - M.: Academy, 2008. - 360 p.
44. Loganina V.I. Application of international standards in the building: a tutorial/ Loganina V.I. - Electron. text dannye.- Saratov: Undergraduate education, 2014. - 84 p.
45. Green technologies for sustainable development: Textbook / IV. Ageev, O.V. Bednova , S.Y. Vavilov , et al.( N.P. Tarasova, Ed) - Tambov: publ Pershin RV, 2014. - 165 p.
46. Practical application of energy-saving technologies ; Therefore training Training Manual / D.N. Chinas ,P. Nowakowski E.V. Sazonov et al..(V.N. Semenov and N.S. Popov, Eds). Tambov: publ Pershin R.V., 2014. - 193 p.
47. Architectural acoustics: Workshop /Melnikov D. E., Ageenko, M. V.: VSUACE , Voronezh , 2015 – 54 p.
48. Laboratory of building physics: a tutorial /Bogatova T. V., Melnikov E. D.: VSUACE , Voronezh , 2015. – 56 p.
49. Kupriyanov V. N. Physics of the environment and enclosing structures: a Textbook. – M.: ASV, 2015. – 308 p.
50. Protasevich A. M. Building Thermophysics enclosing structures of buildings and structures [Electronic resource]: a tutorial/ Protasevich A. M.— Electron. text data.— Minsk: Vysheishaya SHKOLA, 2015.— 240 p.
51. Malyavina E. G. Building Thermophysics: a tutorial/ Malyavina E. G.— Electron. text data.— M.: Moscow state construction University, EBS ASV, 2011.— 151 p.
52. Ivanov N. And. Engineering acoustics. Theory and practice of noise control. – M.: Logos, 2013. – 432 p.
53. V. O. Knudsen, Architectural acoustics. – 3rd ed. erased. – M: URSS, 2011. – 523 p.
54. N. Shiryayeva, Lifecycle of energy, energy management and optimum decision making, 2014. – 190p.
55. A.N. Dmitriev, Y.A. Tabunshikov etc. Manual on estimation of economical efficiency of investment in energy-efficiency, 2010. – 103 p.
56. Economy and management: textbook : recommended by Training and methodology Association / under the General editorship of G. P. Grabovoy ; Mosk. GOS. stroit. UN-vol - 2-e Izd., Rev. and DOP. - Moscow: Prospekt, 2013. - 569 p.
57. Economy and real estate management. Examples, tasks, exercises : studies. allowance : 2 h H 2 / ed. by Grabovoi G. P. - Smolensk, Moscow, Smolin Plus : ASV, 2001. - 435 p.
58. Ilyichev V.A., Yemelyanov S.G., Kolchunov V. I., Gordon V.A., Bakayeva N. V. The principles of transformation of the city to biosphere compatibility and developing the person. - M, DIA, 2015. – 184 p.
59. Ilyichev V.A. Transformation of the cities in biosphere compatibility and developing the person: rate of lectures / V.A.Ilyichev, S.G. Yemelyanov. – M.: YuZGU publishing house, 2013. – 99 p.
60. Novikov.A. I. Econometrics: Educational benefit / A.I. Novikov. – M.: INFRA-M, 2007. – 144 p.
61. Methodology of functional modeling of IDEF0. Regulating document. – GOSSTANDART of RUSSIA. - M.: Publishing house of standards, 2000. – 62 p.
62. Maslov N. V. Town-planning ecology (M.S. Shumilov, Ed) – M.: The higher school. 2003. – 284 p.
63. Vladimirov V. V. Urban ecology: abstract of lectures. – M.: MNEPU publishing house, 1999. - 204 p.
64. Azarov V. N. City ecology / V.N. Azarov, V. A. Grachev, V. I. Telichenko and other: textbook for higher educational institutions / Under the editorship of V. V. Gutenev. – M. - Volgograd: Printerra-Dizayn, 2010. – 816 p.
65. Reconstruction and upgrade of the existing development of the city: proc. allowance : rivers. Of Association of the Russian Federation / under the General editorship of G. P. Grabovoy, V. A. Kharitonov. - M. : ASV : Realproekt, 2006. - 624 p.
66. Golovinsky P. A., Surovtsev I.S. System analysis: (education guidance). - Voronezh: SUE VO "Voronezh regional typography", 2013 - 171 p.
67. Organization of energy saving (power management). Solutions of ZSMK-NKMK-EVRAZ. – M.: INFRA-M, 2016. – 108 p.

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68. Andrizhiyevsky A. A. Energy saving and energy management: studies. benefit / A.A. Andrizhiyevsky V. I. Volodin. - the 2nd prod...: The higher school, 2005. – 233 p.
69. Gitelman L.D., Ratnikov B. E. Risk-free power management. Industrial enterprise in the market of the electric power. – M.: Case, 2004. – 600 p.
70. T.Kh.Gulbrandsen, L.P.Padalko, V. L. Chervinsky. Energoeffektivnost and energy management: educational and methodical benefit. – Minsk, BGATU publishing house, 2010. – 240 p.

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Organization / Institution
<ul style="list-style-type: none"> <li>Limited Liability Company "Voronezh project company"</li> <li>Limited Liability Company Arhgruppa "Cube 3", Voronezh</li> <li>Limited Liability Company "Strojproekt", Voronezh</li> <li>Limited Liability Company Stroygradservis, Rossosh</li> <li>Closed Joint-Stock Company "Sozidatel", Voronezh</li> <li>Limited Liability Company Management Company "Zhilproekt", Voronezh</li> <li>Open Joint Stock Company SMY-42, Voronezh</li> <li>Department chief architect of the district administration Bobrowski, Bobrow</li> <li>Open Joint Stock Company "Agropromproekt", Voronezh</li> <li>Russian Railways Stroy, Voronezh</li> <li>Open Joint Stock Company "Giproprom", Voronezh</li> <li>Limited Liability Company "Genproektstroy", Voronezh</li> <li>Limited Liability Company "Spetsproekt", Rossosh</li> <li>Open Joint Stock Company "Grazhdanproekt", Voronezh</li> <li>VMU-1 Yu-V Techmontazh, Voronezh</li> <li>Limited Liability Company "Voronezhoblstroyremproekt", Voronezh</li> <li>DOAO "Gazproektengineering", Voronezh</li> <li>Limited Liability Company "Stroykomgrupp", Moscow</li> <li>Limited Liability Company "Russian construction company", Voronezh</li> <li>Closed Joint-Stock Company "Giprokommundortrans", Voronezh</li> <li>Limited Liability Company "Geozemstroy", Voronezh</li> <li>MUP "Architectural and Industrial Group", Zadonsk, Lipetsk region</li> <li>Limited Liability Company "Stroyengineering", Voronezh</li> <li>Judicial construction expertise on the definition of the Leninsky district court of Voronezh</li> </ul>

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### Partnerships for carrying out mobility periods

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<ul style="list-style-type: none"> <li>GENOA UNIVERSITY</li> <li>URAL FEDERAL UNIVERSITY n.a. BORIS ELTSIN</li> <li>ST. PETERSBURG POLYTECHNIC UNIVERSITY</li> <li>TAMBOV STATE TECHNICAL UNIVERSITY</li> <li>SOUTH URAL STATE UNIVERSITY</li> <li>NATIONAL POLYTECHNIC UNIVERSITY OF ARMENIA</li> <li>AMERICAN UNIVERSITY OF ARMENIA</li> <li>TECHNICAL UNIVERSITY OF IASI</li> <li>SLOVAK UNIVERSITY OF BRATISLAVA</li> <li>SECONDA UNIVERSITÀ DEGLI STUDI DI NAPOLI</li> <li>KAUNAS UNIVERSITY OF TECHNOLOGY</li> </ul>

Добавлено примечание ([VB21]): It must be checked. It depends on specific agreements. To be checked with Angelo