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ФИО: Ястребов Олег Александрович
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**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
RUDN University**

Academy of Engineering

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

FINAL STATE EXAMINATION SYLLABUS

Recommended by the Didactic Council for the Education Field of:

13.04.03 «Power Engineering»

field of studies / speciality code and title

The final state examination is implemented within the professional education program of higher education:

Mechanical Engineering

higher education programme profile/specialisation title

1. FINAL STATE EXAMINATION GOAL AND TASKS

The goal of the final state examination within the framework of the higher education programme implementation is to check the conformity of the students' training outcomes as the programme results with the relevant requirements of the Federal State Educational Standard of the Higher Education or the RUDN University Educational Standards.

The tasks of the final state examination include the following:

- checking the quality of teaching a person basic humanitarian knowledge, natural science laws and phenomena necessary for professional activities of a graduate;
- identifying the level of theoretical and practical readiness of a graduate to perform professional tasks in compliance with the qualification obtained;
- establishing the degree of a person's desire for self-development, improving his or her qualifications and skills;
- exploring the formation of a graduate's sustainable motivation for professional activities in compliance with the types of tasks of professional activities provided for by the Federal State Educational Standard of the Higher Education or the RUDN University Educational Standards;
- assessing the level of graduates' ability to find organizational and managerial solutions in non-standard situations and evaluating graduates' readiness to bear responsibility for them;
- ensuring the integration of education and scientific and technical activities, increasing the efficiency of scientific and technological achievements use, reforming the scientific sphere and stimulating innovation;
- ensuring the quality of specialists' training in compliance with the requirements of the Federal State Educational Standards of the Higher Education or the RUDN University Educational Standards.

2. REQUIREMENTS FOR HIGHER EDUCATION PROGRAMME COMPLETION AND LEARNING OUTCOMES

A student who does not have failed tests or exams and who has fully completed the curriculum or the individual curriculum of the higher education programme is allowed to the final state examination.

On the higher education programme completion the graduate is expected to master the following **generic competences (GC)**:

| Code and descriptor of the generic competences |
|---|
| GC-1 Ability to carry out a critical analysis of problematic situations based on a systematic approach, develop a strategy for action |
| GC-2 Ability to manage a project at all stages of its life cycle |
| GC-3 Ability to organize and manage the work of the team, developing a team strategy to achieve the set goal |
| GC-4 Ability apply modern communication technologies in the official language of the Russian Federation and a foreign language(s) for academic and professional interaction |
| GC-5 Ability to analyze and take into account the diversity of cultures in the process of intercultural interaction |
| GC-6 Ability determine and implement the priorities of his own activities and ways to improve them based on self-assessment |

| Code and descriptor of the generic competences |
|--|
| GC-7 Ability to search for the necessary sources of information and data, perceive, analyze, memorize and transmit information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information received to solve problems; evaluate information, its reliability, build logical conclusions based on incoming information and data |

- general professional competences (GPC):

| Code and descriptor of the general professional competences |
|--|
| GPC-1 Ability to formulate research goals and objectives, identify priorities for solving problems, and select evaluation criteria |
| GPC-2 Ability to apply modern research methods, evaluate and present the results of the work performed |

- professional competences (PC):

| Code and descriptor of the professional competences |
|---|
| PC-1 Ability to analyze, make scientific generalizations and conclusions, put forward new ideas, interpret and present the results of scientific research |
| PC -2 Ability to carry out research and development in the field of professional activity |

3. FINAL STATE EXAMINATION PROCEDURE

The final state examination can be conducted both in in-person format (students and the state examination committee are at RUDN University during the examination), and through the use of distance learning technologies (DLT) available in the RUDN Electronic Information and Educational Environment.

The procedure for in-person or DLT-facilitated final state examination is regulated by the relevant local normative act of the RUDN University.

The final state examination within the framework of the higher education programme includes:

- state exam
- defence of the graduation qualifying paper (degree thesis).

4. STATE EXAM PROCEDURE

The total workload of the State Exam is 3 credits.

The state exam is held in one or more disciplines and (modules) of the higher education programme, whose mastery bears a decisive importance for graduates' occupational performance.

The state exam is held in two stages:

The first stage includes the assessment of the level of a graduate's theoretical training in the form of **computer testing** through the tools available in the RUDN Electronic Information and Educational Environment (EIEE).

The second stage focuses on the assessment of the graduate's practical preparation for future occupational activities in the form of **solving work-related situational problems (cases)**.

In order to prepare students for taking the state exam, the head of the educational programme (no later than one calendar month before the start of the final state examination) shall familiarise the graduate students with the final state examination syllabus, the

comprehensive list of theoretical issues included in the state exam, examples of work-related (occupational) situational tasks (cases) that the students will have to solve in the process of taking the state exam, as well as with the procedure for each stage of the state exam and the grading system for evaluating its results (with assessment materials).

Before the state exam, students are offered consultations on issues and tasks included in the state exam (mandatory pre-exam consultation).

The procedure for conducting the computer testing within the final state examination is as follows:

The purpose of the test part of the state exam is to assess the level of theoretical training of a graduate based on the material of disciplines / modules of the educational program. The test item contains 10 questions. The student is given 20 minutes to complete the test task.

The procedure for conducting the second stage of the state exam is as follows:

The bulk of the state exam is conducted in writing using exam tickets. Each exam ticket contains five questions.

The questions included in the examination card are interdisciplinary in nature and are aimed at determining the level of theoretical and practical preparedness of the graduate to solve professional problems defined by the educational standard of the RUDN University in accordance with the type / types of professional activity that / which the educational program is focused on.

The total number of exam tickets is determined by the number of students admitted to the state exam. The student is given 90 minutes to prepare and defend a written answer to the ticket.

At the state exam by the members of the State Examination Commission, the student may be asked additional questions in the field of the graduate's professional activities, provided for by the educational standard.

The list of questions for preparing for the state exam, as well as the criteria for evaluating the results of this stage of the state final exam are given in the fund of evaluation tools.

The state exam results evaluation is carried out in accordance with the methodology set forth in the assessment toolkit that is specified in the Appendix to this syllabus.

(The state exam procedure is not included in the final state examination).

5. REQUIREMENTS FOR GRADUATION QUALIFYING PAPER (DEGREE THESIS) AND PROCEDURE FOR ITS DEFENCE

The degree thesis is a graduation qualifying paper that the student (several students in a team) prepare to demonstrate his/her/their level of competence and work readiness.

The list of degree theses themes offered to students for further work is approved by the order of the head of the educational division (faculty/institute/academy) that runs the higher education programme, the respective information is delivered to the students by the programme head no later than six months before the date of the final state examination start.

The students are allowed to suggest their own themes for the theses, under the set procedure.

The student who has passed the state exam is admitted to defend the graduation degree thesis *(if there is a state exam in the final state examination procedure).*

The student (students) is/are allowed to defend his/ her/their thesis only if this fully completed degree paper is signed by the respective graduate (s), the supervisor, the consultant (if any), the heads of the educational department and educational division; the thesis is also subject to the external review procedure (mandatory for master's and specialist's programmes) and the plagiarism check (in the "Anti-plagiarism" system). The review of the graduation qualifying paper supervisor shall be attached as well, with a specific emphasis laid on the graduate's activities in the course of the degree thesis drafting.

No later than 14 days before the date of the thesis defence, a rehearsal of the procedure is held at the presence of the degree thesis supervisor and other academic staff of the educational department, in order to timely identify and eliminate shortcomings in the structure, content and design of the degree thesis.

The degree theses are introduced to the State Examination Board members at the public defence procedure. It includes the students' oral reports with mandatory multimedia (graphic) presentations that introduce the thesis main content.

At the end of the reports, the students reply orally to the State Examination Board members' questions regarding the subject, structure, content of the paper and the profile/specialisation of the higher education programme. The reports and / or answers to the Board members' questions may be delivered in a foreign language.

The stages of the graduation qualifying paper preparation, the requirements for its structure, volume, contents and design, as well as the list of mandatory and recommended documents submitted for defence are specified in the relevant guidelines.

The evaluation of the degree thesis defense results is carried out in accordance with the methodology set forth in the assessment toolkit that is specified in the Appendix to the syllabus.

[\(The procedure of the graduation qualifying paper \(degree thesis\) defence is not included in the final state examination\).](#)

6. REQUIREMENTS FOR EQUIPMENT AND TECHNOLOGY SUPPORT FOR FINAL STATE EXAMINATION

The infrastructure and technical support necessary for the examination implementation include: classrooms equipped with... (computers, specialised software, other devices, if any, etc.).

7. RESOURCES RECOMMENDED FOR FINAL STATE EXAMINATION

Main readings to prepare for the state exam and/or degree thesis defence:

1. Шаталов И.К., Антипов Ю.А. Расчет характеристик одновальных ГТУ. Для студентов III-IV курсов, обучающихся по направлению "Энергомашиностроение". - М.: Изд-во УДН, 2016. - 26 с.
2. Трухний А.Д., Ломакин Б.В. Теплофикационные паровые турбины и турбоустановки. Учебное пособие. М. Изд-во МЭИ, 2002, 540 с.
3. Шаталов И.К. Теплонасосные установки с приводом от тепловых двигателей: Уч. пособие. М.: РУДН, 2009г.
4. Шаталов И.К., Барский И.А. Регулировочные характеристики газотурбинных установок, схемы и определение основных параметров ПГУ. М. Изд-во РУДН, 2003, 124 с.

5. Сафронова, Т.Н. Основы научных исследований: учебное пособие / Т.Н. Сафронова, А.М. Тимофеева; Министерство образования и науки Российской Федерации, Сибирский Федеральный университет. - Красноярск: Сибирский федеральный университет, 2015. - 131 с.: табл., ил. - ISBN 978-5-7638-3170-2; Режим доступа: <http://biblioclub.ru/index.php?page=book&id=435828>
6. Шкляр, М.Ф. Основы научных исследований: учебное пособие / М.Ф. Шкляр. - 6-е изд. - Москва: Издательско-торговая корпорация «Дашков и К°», 2017. - 208 с. - (Учебные издания для бакалавров). - Библиогр.: с. 195-196. - ISBN 978-5-394-02518-1; То же [Электронный ресурс]. (04.12.2017). Режим доступа: <http://biblioclub.ru/index.php?page=book&id=450782>
7. Горелов, С.В. Основы научных исследований: учебное пособие / С.В. Горелов, В.П. Горелов, Е.А. Григорьев; под ред. В.П. Горелова. - 2-е изд., стер. - Москва; Берлин: Директ-Медиа, 2016. - 534 с.: ил., табл. - Библиогр. в кн. - ISBN 978-5-4475-8350-7; То же [Электронный ресурс]. (04.12.2017). Режим доступа: <http://biblioclub.ru/index.php?page=book&id=443846>
8. Кузнецов, И.Н. Основы научных исследований: учебное пособие / И.Н. Кузнецов. - 3-е изд. - Москва: Издательско-торговая корпорация «Дашков и К°», 2017. - 283 с. - (Учебные издания для бакалавров). - Библиогр. в кн. - ISBN 978-5-394-02783-3; Режим доступа: <http://biblioclub.ru/index.php?page=book&id=450759>

Additional readings to prepare for the state exam and/or degree thesis defence:

1. Основы научных исследований и патентоведение: учебно-методическое пособие / сост. В.А. Вальков, В.А. Головатюк, В.И. Кочергин, С.Г. Щукин. - Новосибирск: Новосибирский государственный аграрный университет, 2013. - 228 с. Режим доступа: <http://biblioclub.ru/index.php?page=book&id=230540>
2. Ерофеев, В. Л. Теплотехника в 2 т. Том 1. Термодинамика и теория теплообмена: учебник для бакалавриата и магистратуры / В. Л. Ерофеев, А. С. Пряхин, П. Д. Семенов; под редакцией В. Л. Ерофеева, А. С. Пряхина. — Москва: Издательство Юрайт, 2019. — 308 с. — (Бакалавр и магистр. Академический курс). — ISBN 978-5-534-01738-0. — Текст: электронный // ЭБС Юрайт [сайт].
3. URL: <https://www.biblio-online.ru/bcode/433336>
4. Ерофеев, В. Л. Теплотехника в 2 т. Том 2. Энергетическое использование теплоты: учебник для бакалавриата и магистратуры / В. Л. Ерофеев, А. С. Пряхин, П. Д. Семенов; под редакцией В. Л. Ерофеева, А. С. Пряхина. — Москва: Издательство Юрайт, 2019. — 199 с. — (Бакалавр и магистр. Академический курс). — ISBN 978-5-534-01850-9. — Текст: электронный // ЭБС Юрайт [сайт].
5. URL: <https://www.biblio-online.ru/bcode/434256>
6. Энергосбережение в теплоэнергетике и теплотехнологиях: уч. для вузов. Под ред. А.В. Клименко.—М.: МЭИ, 2010.—424 с.
7. Андрижневский А.А., Володин В.И. Энергосбережение и энергетический менеджмент. Мн.: Высшая школа, 2005 г.
8. Аметистов Е.В.(ред.). Основы современной энергетики. М. Изд-во МЭИ, 2004, в 2-х частях.
9. Цанев С.В. и др. Газотурбинные и парогазовые установки тепловых электростанций. М. Изд-во МЭИ, 2009, 584с.
10. Антипов Ю.А. и др. «Методическое руководство к выполнению лабораторной работы «Испытание центробежного компрессора». М. РУДН, 2019

11. Трубицын, В.А. Основы научных исследований: учебное пособие / В.А. Трубицын, А.А. Порожня, В.В. Мелешин; Министерство образования и науки Российской Федерации, Федеральное государственное автономное образовательное учреждение высшего профессионального образования «Северо-Кавказский федеральный университет». - Ставрополь: СКФУ, 2016. - 149 с.: ил. - Библиогр. в кн.; Режим доступа: <http://biblioclub.ru/index.php?page=book&id=459296>
12. Дрещинский, В. А. Методология научных исследований: учебник для бакалавриата и магистратуры / В. А. Дрещинский. — 2-е изд., перераб. и доп. — М. : Издательство Юрайт, 2017. — 324 с. — (Серия : Бакалавр и магистр. Академический курс). — ISBN 978-5-534-02965-9. Режим доступа: <https://biblio-online.ru/book/8600D715-1FEB-4159-A50C-F939A48BE9C1>
13. Основы научных исследований: учебное пособие / Министерство образования и науки Российской Федерации, Волгоградский государственный архитектурно-строительный университет; сост. О.А. Ганжа, Т.В. Соловьева. - Волгоград: Волгоградский государственный архитектурно-строительный университет, 2013. - 97 с. : ил., табл., схем. - Библиогр. в кн.. - ISBN 978-5-98276-566-6 ; Режим доступа: <http://biblioclub.ru/index.php?page=book&id=434797>
14. Леонова, О.В. Надёжность механических систем : учебное пособие / О.В. Леонова ; Министерство транспорта Российской Федерации, Московская государственная академия водного транспорта. - Москва: Альтаир-МГАВТ, 2014. - 179 с. : ил., табл., схем. - Библиогр. В кн. ; То же [Электронный ресурс]. URL:<http://biblioclub.ru/index.php?page=book&id=429858>
15. Обеспечение надежности сложных технических систем [Электронный ресурс] : учеб. / А.Н. Дорохов [и др.]. — Электрон. дан. — Санкт-Петербург: Лань, 2017.— 352 с. <https://e.lanbook.com/book/93594>
16. Основы технического творчества и научных исследований: учебное пособие / Ю.В. Пахомова, Н.В. Орлова, А.Ю. Орлов, А.Н. Пахомов; Министерство образования и науки Российской Федерации, Федеральное государственное бюджетное образовательное учреждение высшего профессионального образования «Тамбовский государственный технический университет». - Тамбов: Издательство ФГБОУ ВПО «ТГТУ», 2015.-81с.: ил. <http://biblioclub.ru/index.php?page=book&id=444964>

Other basic and additional literature is also used, indicated in the work programs of the disciplines of the educational program.

Internet sources

1. Electronic libraries (EL) of RUDN University and other institutions, to which university students have access on the basis of concluded agreements:

- RUDN Electronic Library System (RUDN ELS) <http://lib.rudn.ru/MegaPro/Web>
- EL "University Library Online" <http://www.biblioclub.ru>
- EL "Yurayt" <http://www.biblio-online.ru>
- EL "Student Consultant" www.studentlibrary.ru
- EL "Lan" <http://e.lanbook.com/>
- EL "Trinity Bridge"

2. Databases and search engines:

- electronic foundation of legal and normative-technical documentation
<http://docs.cntd.ru/>

- Yandex search engine [https:// www .yandex.ru/](https://www.yandex.ru/)

- Google search engine <https://www.google.ru/>

- Scopus abstract database

<http://www.elsevierscience.ru/products/scopus/>

The training toolkit and guidelines for student's self-studies to prepare for the state exam and /or to draft the degree thesis and defend it:*

1. The guidelines for drafting and formatting the degree thesis within the higher education programme Rector's Order No. 878 dated 11/30/2016.

2. The procedure for the degree thesis check in the "Anti- plagiarism" system.

3. The procedure for conducting the final state examination under the higher education programme Rector's Order No. 790 dated 13.10.2016. through the use of DLT and proctoring system.

*The training toolkit and guidelines for the student's self-studies are placed on the final state examination page in the university telecommunication training and information system under the set procedure.

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF GRADUATES' COMPETENCES LEVEL

The assessment materials and the grading system* to evaluate the graduate's level of competences (competences in part) formation as the results of the higher education programme completion are specified in the Appendix to this syllabus.

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

HEAD OF EDUCATIONAL DEPARTMENT:

Base of departments a Power

engineering

Yu A Radin

educational department

signature

name and surname

HEAD OF HIGHER EDUCATION PROGRAMME:

Base of departments a Power

engineering

Yu A Radin

position, department

signature

name and surname