Federal State Autonomous Educational Institution of Higher Education

PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA

RUDN University

Academy of Engineering

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

COURSE SYLLABUS

Modern issues of power engineering science and manufacture

course title

Recommended by the Didactic Council for the Education Field of:

13.04.03. POWER ENGINEERING

field of studies / speciality code and title

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

Mechanical Engineering

higher education programme profile/specialisation title

2024г.

1. The COURSE GOAL

The purpose of teaching the discipline "Modern problems of science and production in energy engineering" is to study the current state and problems of improving energy technology, its design and operation features.

Objectives of the discipline:

• to introduce students to the main types of modern electric power generation plants;

• give an idea of the physical processes in the main generating facilities;

• to teach how to make and justify specific technical decisions in the subsequent design of generating facilities.

2. REQUIREMENTS FOR LEARNING OUTCOMES:

The following competences are formed in the study process.

Table 2.1. List of competences that students acquire during the course

Competence code	Competence descriptor	Competence formation indicators
GC-3	Ability to organize and manage the work of the team, developing a team strategy to achieve the set goal.	GC-3.1. Demonstrates an understanding of the principles of teamwork; GC-3.2. Plans and adjusts the work of the team taking into account the interests, behaviors and opinions of its members; GC-3.3 Resolves conflicts and contradictions in business communication based on consideration of the interests of all parties.
GPC-2	Ability to apply modern research methods, evaluate and present the results of the work performed.	GPC-2.1. Selects the necessary research method to solve the task; GPC-2.2. Analyzes the results obtained; GPC-2.3. Represents the results of the work performed.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The subject refers to the variable component of (B1) block of the higher educational programme curriculum.

Within the higher education programme students also master other disciplines and internships that contribute to the achievement of the expected learning outcomes as results ofthe subject mastery

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

Competence code	**Competence descriptor**	**Previous courses/modules, internships***	**Subsequent courses/modules, internships***
GC-1	Ability to carry out a critical analysis of problematic situations based on a systematic approach, develop a strategy for action.	Modern energy technology Modern computer communication services Special chapters of the theory of heat engines	Undergraduate Training Final State Examination
GPC-2	Ability determine and implement the priorities of his own activities and ways to improve them based on self-assessment	Modern energy technology Modern computer communication services	Undergraduate Training Final State Examination

		Special chapters of the theory of heat engines	

* - in accordance with the matrix of competencies and the SUP EP VO

4. WORKLOAD OF THE COURSE AND FORMS OF STUDY WORK

General workload of the course *4 credits, 144*

hours.Table 4.1. Form of study work of EP HE

Type of academic activities		**Total academic hours**	**Semester(s)**			
			3			
Contact academic hours		78	78			
including:						
Lectures (LC)		17	17			
Lab works (LW)		17	17			
Seminars (workshops / tutorials) (S)		17	17			
Self-studies academic hours		66	66			
Evaluation and assessment academic hours		27	27			
Course work / project, credits		0	0			
Course workload	academic hours	144	144			
	credits	4	4			

5.CONTENT OF THE COURSE

Table 5.1. Content of the course

The title of the section of the discipline	**Content of the section (topic)**	**Types of educa-tional work***
Section 1 The current state of the global and Russian thermal power industry and its prospects.	The main generating capacities of Russia and their technical level. The distribution of generating capacities, their age, and the ability to provide guaranteed power supply. Graphs of the load of power systems and problems of their coverage. Prospects for the development of global and Russian energy. Prospects for the development of gas turbine and combined cycle gas technologies.	LC, SM, AW
Section 2 Problems of increasing the efficiency and reliability of internal combustion engines and combined installations.	Modern internal combustion engines: their design, parameters, and applications. Examples of the best foreign ICE. The main problems of creating competitive internal combustion engines in Russia. Scientific problems of engine system development, gorenje process improvement, reduction of toxic emissions. Maintenance problems. Scientific and practical problems of reliability of internal combustion engines.	LC, SM, AW
Section 3 Energy saving.	Organization and promotion of energy saving. Economic incentives. Energy saving in Russia and abroad. Energy planning, energy audit.	LC, SM, AW
Section 4 Prospects for the development of	General information about the current problems of science and technology of power engineering in the field of training. The achieved level of perfection and unsolved problems of the power equipment of the hydroelectric power plant and the working process	LC, SM, AW

hydropower.	of the hydro turbine. Energy pumps – problems and ways to solve them. Modern scientific and applied problems in the field of volumetric hydraulic machines, hydro-, pneumatic systems and aggregates.	
Section 5 Promising materials in heat and hydropower and engine building.	Structural materials in heat and hydropower. Structural materials used in the engine industry. Requirements for structural materials in the heat and hydropower industry. Promising materials in the engine industry.	LC, SM, AW
Section 6 Modern liquid fuels for internal combustion engines.	Liquid hydrocarbon fuels. Analysis of the quality indicators of liquid hydrocarbon fuels in order to influence the working process of internal combustion engines. Advantages of light fuel injection.	LC, SM, AW
Section 7 Alternative fuels.	Types of alternative fuels and their physico-chemical properties. Promising fuels for internal combustion engines. Analysis of the use of alternative fuels in the internal combustion engine.	LC, SM, AW
Section 8 The quality of alternative fuels.	Physico-chemical properties of alternative fuels. Changing the parameters of the internal combustion engine workflow when using alternative fuels. Mixed fuels, their characteristics and application prospects.	LC, SM, AW

* - LC – lecture, LR – laboratory work, SM – seminars; AW – Autonomous work

6. INTERNSHIP EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Technical Support Requirements

A type of aclassroom	Technical Support Requirements	Special equipment, software
For lectures	An auditorium for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multi-media presentations	Technical means: projector Epson EH- TW5300 (LCD, 1080p 1920 x 1080, 2200Lm, 35000:1, 2 x HDMI, MHL, экран Draper Bar-onet NTSC (3:4) 244/96(8) 152*203 MW
For seminars	Auditorium for seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and technical means of multimedia presentations	Computer class; technical equipment: personal computers, projection screen, multimedia projector, NEC NP-V302XG, Internet access. Software: Microsoft products (OS, office suite, incl. MS Office/Office 365, Teams, Skype),
For autonomous work	Auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to the EIOS	Computer class; technical equipment: personal computers, projection screen, multimedia pro-jector, NEC NP-V302XG, Internet access. Software: Microsoft products (OS, office suite, including. MS Office/Office 365, Teams, Skype)

7.RESOURCES RECOMMENDED FOR THE COURSE:

Main literature:

1. Основы современной энергетики, т.2, Современная теплоэнергетика, под ред. Трухния А.Д., 2008.
2. Паровые и газовые турбины для электростанций: учебник для ВУЗов. Под ред. А.Г. Костюка. М.: Издательский дом МЭИ, 2008.
3. Лойцянский Л.Г. Механика жидкости и газа. –М.: Наука, 1978.
4. Алексеев А.А. и др. Теория управления. –СПб.: Изд-во СПбГЭТУ «ЛЭТИ», 1999.
5. Ковалев Н.Н., Квятковский В.С. Гидротурбиностроение в СССР. –М.-Л.:

Госэнергоиздат, 1957.
6. Ломакин А.А. Центробежные и осевые насосы. –М.-Л.: Машиностроение, 1966.
7. Башта Т.М. Объемные насосы и гидравлические двигатели гидросистем. –М.: Машиностроение, 1974.
8. Фомичев В.М. Проектирование электрогидравлических усилителей следящих приводов: Изд-во МГТУ, 2009.
9. Доверман Г.И., Шелыгин Б.Л., Мошкарин А.В. и др. Расчёт котельных агрегатов с использованием современных программных продуктов / ГОУ ВПО «Ивановский государственный энергетический университет имени В.И. Ленина». – Иваново, 2007.
10. Тепловой расчёт котлов (Нормативный метод) 2-е изд. С.-Пб.: НПО ЦКТИ, 1998.
11. Тепловой расчёт котельных агрегатов (Нормативный метод) / Под ред. Н.В. Кузнецова. М.: Энергия, 1973.

Additional readings:

1. Теплотехнический справочник /под ред. В.А. Григорьева. Т.3. «Тепловые и атомные электростанции», раздел 5. Насосы и газодувные машины. М., 2002.
2. Тепловые и атомные электрические станции (справочник), т. 3 / Под. ред. А.В.Клименко и В.М.Зорина. М.: Энергоатомиздат, 2001; гл. 1.
3. Физический энциклопедический словарь. –М.: Советская Энциклопедия, т.I, II, 1960-1966.
4. Попов Е.П. Теория линейных систем автоматического регулирования и управления. –Учебн. пособие для вузов. –М.: Наука, 1989. – 304 с.
5. Попов Е.П. Теория нелинейных систем автоматического регулирования и управления. –Учебн. пособие для вузов. –М.: Наука, 1988.
6. Климонтович Ю.Л. Турбулентное движение и структура хаоса. –М.: Наука, 1990.

Фишер И.З. Статическая теория жидкостей. –М.: Гос. изд-во физ-мат.лит., 1961.

Electronic library systems:

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

The training toolkit and guidelines for a student:

1. Collection of lectures on the course Modern issues of power engineering science and manufacture.

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

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

The assessment toolkit and the grading system* to evaluate the level of competences (competences in part) formation as the course Modern issues of power engineering science and manufacture results are specified in the Appendix to the internship syllabus.

* The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local

normative act of RUDN University (regulations / order).

DEVELOPERS:

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