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Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE
LUMUMBA
RUDN University

Academy of Engineering

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

COURSE SYLLABUS

Modern energy technology

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

1. The COURSE GOAL

The purpose of teaching the discipline "Modern energy technologies" is to form students' knowledge in the field of modern energy technologies, understanding the importance of the direction of human activity, called energy conservation, i.e. a set of measures aimed at the efficient use of energy and thermal energy resources (TER).

Objectives of the discipline: mastering students' knowledge on the basics of resource- and energy-saving technologies of hydrocarbon raw materials, understanding the basic principles of reducing hydrocarbon losses during collection, preparation, transportation and processing, mastering knowledge about the efficiency of using hydrocarbon raw materials in internal combustion engines, studying the operational and environmental properties of alternative and promising energy sources and their impact on the technical and economic characteristics of machines.

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 of the 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-3	Ability to carry out a critical analysis of problematic situations based on a systematic approach, develop a strategy for action.		Modern issues of power engineering science and manufacture.
GPC-2	Ability determine and implement the priorities of his own activities and ways to improve them based on self-assessment	-	Modern issues of power engineering science and manufacture.

* - 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)			
			1			
<i>Contact academic hours</i>		78	78			
including:						
Lectures (LC)		17	17			
Lab works (LW)		17	17			
Seminars (workshops / tutorials) (S)		17	17			
<i>Self-studies academic hours</i>		66	66			
<i>Evaluation and assessment academic hours</i>		27	27			
<i>Course work / project, credits</i>		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 educational work*
Section 1 Introduction.	Basic concepts and definitions. Ensuring energy security. The main provisions of the law of the Russian Federation. Modern problems of ecology and resource conservation in relation to internal combustion engines.	LC, SM, AW
Section 2 Secondary energy resources (SER).	An overview of ways to improve the efficiency of using fuel and energy resources. Secondary energy resources (SER). Energy saving in buildings and structures. Accounting and regulation of energy consumption. Heat pump installations.	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 Renewable energy.	Energy production based on renewable sources. Hydropower engineering. Wind energy. Solar energy. Bioresources. Geothermal energy.	LC, SM, AW
Section 5 Heat pump installations (TNI)	Classification of heat pump installations (TNI). Characteristics of low-potential heat sources.	LC, SM, AW
Section 6 Secondary resources of a heat engine.	Thermal balance. Characteristics of the secondary resources of the heat engine. The use of TNIs to increase the use of SER heat engines.	LC, SM, AW
Section 7 Modern internal combustion engines.	Internal combustion engines with adaptive workflow. Engines with controlled valve timing phases. Modern methods of joint management of fuel supply and air supply. Modern fuel systems.	LC, SM, AW
Section 8 Ecology and energy conservation.	Environmental problems of power engineering. Energy saving by industry.	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 projector, 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 энергосбережения. Учебное пособие. Изд-во БГЭУ, 2002. – 200 с.
2. Вальехо Мальдонадо Пабло Рамон. Энергосберегающие технологии и альтернативная энергия: Учеб. пособие. – М.: РУДН, 2008. – 204 с.
3. Гусаков С.В. Перспективы применения в дизелях альтернативных топлив из возобновляемых источников: Учеб. пособие. – М.: РУДН, 2008. – 318 с.

Additional readings:

1. Гусаков С.В. Гибридные силовые установки на основе ДВС: Учеб. пособие. – М.: РУДН, 2008. – 207 с.
2. Шкаликова В.П. Современные традиционные и альтернативные топлива для ДВС и перспективы их развития: Учеб. пособие. – М.: РУДН, 2008. – 128 с.
3. Патрахальцев Н.Н. Повышение экономических и экологических качеств двигателей внутреннего сгорания на основе применения альтернативных топлив: Учеб. пособие. – М.: РУДН, 2008. – 267 с.
4. Сибикин М.Ю., Сибикин Ю.Д. Технология энергосбережения: Учебник. – 3-е изд., перераб. и доп. – М.: ФОРУМ: ИНФРА-М, 2013. – 352 с.

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/](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 energy technology.

* 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 energy technology results are specified in the Appendix to the internship syllabus.

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

DEVELOPERS:

Associate Professor in the Department
of Energy Engineering

position, educational department

signature

Oshchepkov P.P.

name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

Head of the Department of
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HEAD OF HIGHER EDUCATION PROGRAMME:

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