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

Systems of fuel supply for ICE

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 discipline "Systems of fuel supply for ICE" is included in the master's degree program "Mechanical Engineering" in the direction of 13.04.03 "Energy Engineering" and is studied in the 1st semester of the 1st year. The discipline is implemented by the Basic Department of Energy Engineering. The discipline consists of 5 sections and 21 topics and is aimed at studying the design features of internal combustion engine fuel supply systems.

The purpose of mastering the discipline is to gain knowledge, skills, skills and experience in the field of design, production and operation of internal combustion engines.

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-1	Ability to carry out a critical analysis of problematic situations based on a systematic approach, develop a strategy for action.	GC-1.1. Analyzes the problematic situation and decomposes it into separate tasks; GC-1.2. Develops a strategy for solving the task; GC-1.3. Forms possible solutions to problems.
PC-1	Ability to analyze, make scientific generalizations and conclusions, put forward new ideas, interpret and present the results of scientific research.	PC-1.1. Knowledge of modern methods of scientific research in the subject area; PC-1.2. The ability to conduct scientific research, analysis and put forward new ideas; PC-1.3. Have the skills to interpret and present the results of scientific research.

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.		Special chapters of the theory of heat engines; Automatic heat engine control; Alternative Energy Sources; Independent Research Work (Practice in Obtaining Primary Skills in Research Work)
PC-1	Ability to analyze, make scientific generalizations and conclusions, put forward new ideas, interpret and present the results of scientific research.	-	Alternative Energy Sources; Independent Research Work (Practice in Obtaining Primary Skills in Research Work)

			Undergraduate practice Research Work; Research Practice;

* - 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 3 *credits, 108 hours.Table 4.1.* Form of study work of EP HE

Type of academic activities		**Total academic hours**	**Semester(s)**			
			1			
Contact academic hours		54	54			
including:						
Lectures (LC)		18	18			
Lab works (LW)		18	18			
Seminars (workshops / tutorials) (S)		18	18			
Self-studies academic hours		54	54			
Evaluation and assessment academic hours		0	0			
Course work / project, credits		0	0			
Course workload	academic hours	108	108			
	credits	3	3			

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 Introduction.	Appointment. Functions of fuel systems. Requirements.	LC, SM, AW
	Classification of fuel systems.	LC, SM, AW
Section 2 Diesel fuel systems. General provisions.	Classification of diesel fuel systems.	LC, SM, AW
	Cylinder filling systems with air. Regulation of the composition of the mixture in diesels.	LC, SM, AW
	Features of the combustion process in diesels. The main methods of mixing.	LC, SM, AW
Section 3 The design of diesel fuel systems.	Split injection systems. Inline fuel injection pumps.	LC, SM, AW

	Fuel injection pump of distribution type with axial and radial movement of the plunger and control solenoid valves	LC, LR SM, AW
	Individual fuel injection pumps	LC, LR SM, AW
	The nozzle pump. Design, operating modes.	LC, LR SM, AW
	The Common Rail system. Features of the work. The main elements. Fuel injection pump. High Pressure Battery (Rail)	LC, SM, AW
	Composition and diagrams of the low pressure line of fuel systems	LC, SM, AW
	Electronic control and regulation of fuel supply systems	LC, SM, AW
	The control unit. Sensors	LC, SM, AW
Section 4 Gasoline engine power systems. General provisions.	The composition of the mixture. Dosing and mixing. The most advantageous characteristic of the carburetor.	LC, SM, AW
	Methods of fuel supply. Injection and mixing. The process of atomization and evaporation of fuel.	LC, SM, AW
	Cylinder filling control systems.	LC, LR SM, AW
	Overview of fuel injection systems.	LC, SM, AW
Section 5 The design of gasoline engine power systems	Central injection. Advantages and disadvantages.	LC, SM, AW
	Gasoline injection systems into the intake pipeline. Advantages and prospects of development	LC, SM, AW
	Gasoline direct injection systems into the cylinder. Advantages and prospects of development. Operating modes of the direct injection system into the cylinder	LC, SM, AW
	Combined injection system	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. 1. Кавтарадзе Р.З. Теория поршневых двигателей. Учебник для вузов.- М.: Изд-во МГТУ им. Н.Э. Баумана, 2016.-720 с. http://ebooks.bmstu.press/catalog/198/book1502.html

2. 2. Грехов Л.В., Габитов И.И., Неговора А.В. Конструкция, расчет и технический сервис топливной аппаратуры современных дизелей: Учебное пособие. - М.: Изд-во Легион-Автодата, 2013. - 292 с. https://autodata.ru/pdf/4673_info.pdf

Additional readings:

1. Комбинированные двигателей внутреннего сгорания: Учебник для студентов вузов./ Н. Д. Чайнов, Н. А. Иващенко, А. Н. Краснокутский, Л. Л. Мягков; Под ред. Н. Д. Чайнова.- М.: Машиностроение, 2008. – 496 с. https://www.twirpx.com/file/346021/3

2. Двигатели автотракторной техники: Учебник./ Шатров М.Г., Морозов К.А., Алексеев И.В. – М.: Кнорус, 2016. – 400 с. https://ozon-st.cdn.ngenix.net/multimedia/1015268414.pdf

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 Systems of fuel supply for ICE

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* 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 Systems of fuel supply for ICE
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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