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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 computer communication services

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 discipline "Modern computer communication services" 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 4 sections and 18 topics and is aimed at studying a complex of modern software products for solving design and research applied problems of power engineering.

The discipline "Modern computer communication services" 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 4 sections and 18 topics and is aimed at studying a complex of modern software products for solving design and research applied problems of power engineering.

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-2	Ability to manage a project at all stages of its life cycle.	GC-2.1. Formulates a project task based on the problem posed and a way to solve it through the implementation of project management; GC-2.2. Develops the concept of the project within the framework of the designated problem: formulates the purpose, objectives, justifies the relevance, significance, expected results and possible areas of their application; GC-2.3. Plans the necessary resources, including taking into account the possibility of their replacement.
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.	GC-7.1. To know the methods of collecting and processing information using digital means, as well as current Russian and foreign sources of information in the field of professional activity, principles, methods and means of solving standard tasks of professional activity using digital means and taking into account the basic requirements of information security; GC-7.2. Be able to apply methods of searching, collecting and processing information; using digital means, carry out critical analysis and synthesis of information obtained from various sources, and solve standard tasks of professional activity using digital means and taking into account the basic requirements of information security; GC-7.3. Possess methods of searching, collecting and processing, critical analysis and synthesis of information using digital tools to solve tasks, skills in preparing reviews, annotations, abstracts, scientific reports, publications and bibliographies on research work using digital tools and taking into account information security requirements.
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

Com- petence code	Competence descriptor	Previous courses/modules, internships*	Subsequent courses/modules, internships*
GC-2	Ability to manage a project at all stages of its life cycle.		Geoinformation Systems and Applications. Reduction of internal combustion engine pollution issues/
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.		Special chapters of the theory of heat engines/ Improving of economical and ecological ICE characteristics.
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 *6 credits, 216 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>	90	90			
including:					
Lectures (LC)	36	36			
Lab works (LW)	54	54			
Seminars (workshops / tutorials) (S)	0	0			
<i>Self-studies academic hours</i>	99	99			
<i>Evaluation and assessment academic hours</i>	27	27			
<i>Course work / project, credits</i>	0	0			
Course workload	academic hours	216	216		
	credits	6	6		

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 Organization of modern machine design technology.	Introduction. The concept of CALS technologies. CALS Technology standards are the product development process. CALS technology software.	LC, LR.
	New information technologies as a global phenomenon. The interaction of participants in the life cycle in a single information space. The structure of interaction between members of CALS technologies.	LC, AW.
	The concept of PDM systems. The product development process. CALS technology software.	LC, LR.
	Integrated logical support for the product. New information technologies as a global phenomenon	LC, AW.
Section 2 The main provisions of the theory of the finite element method (FEM).	Classification of tasks solved by the FEM. The basic concept of the FEM. Matrix relations of the plane theory of elasticity. The variational origin of the FEM.	LC, LR.
	The total stiffness matrix and the total load vector of the system. A flat problem in the FEM. The algorithm for solving the problem of statics according to FEM.	LC, AW.
	An axisymmetric problem. A modal task in the FEM.	LC, LR.
	Solving the FEM problem of thermal conductivity. The thermal conductivity matrix of a one-dimensional FEM.	LC, AW.
Section 3 Strength calculation of parts.	Calculation of the strength of parts under variable loads in Solid Works and ANSYS environments.	LC, LR.
	The main stages of the calculation. The choice of material. Boundary conditions	LC, AW.
Section 4 Torsional vibrations of the crankshaft.	General information about torsional vibrations of the crankshaft. Determination of the calculated equivalent torsion system of the crankshaft as part of the power plant. Determination of the elastic properties of the shaft.	LC, LR.
	Determination of the torsional stiffness of the crankshaft and drive. Experimental determination of the torsional stiffness of the crankshaft. Determination of torsional stiffness of a crank using its finite element model.	LC, AW.
	Determination of the reduced moments of inertia of the masses of the torsional system. Determination of the moment of inertia of the disc, equivalent to the engine mass, including the masses of the crank and the masses of the piston and connecting rod groups.	LC, LR.
	Determination of natural frequencies and vibration patterns of the torsional system. Differential equations of natural oscillations. Solving differential equations.	LC, AW.
	Harmonic torque analysis. Critical engine operating modes.	LC, LR.
	Phase (vector) diagrams of the harmonics of the engine	LC, AW.
	Energy losses due to fluctuations. Calculation of the amplitude of the twisting angle j and the torque in the area with the stiffness of the crankshaft. Determination of additional torsional stress in the crankshaft root necks in critical modes	LC, LR.
	Ways to reduce the amplitude of torsional vibrations	LC, 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 multimedia 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. Конструирование и расчет коленчатых валов на выносливость: учебное пособие / П.Р. Вальехо Мальдонадо, А.Н. Краснокутский, Н.Д. Чайнов. — Москва : ИНФРА-М, 2024. — 254 с., [4 с.] ил. — (Высшее образование). — DOI 10.12737/1995197.
2. Конструирование и расчет коленчатого вала поршневого двигателя: учебное пособие / П.Р. Вальехо Мальдонадо, А.Н. Краснокутский, Н.Д. Чайнов. — Москва: ИНФРА-М, 2023. — 130 с. : [3] ил. — (Высшее образование: Бакалавриат). — DOI 10.12737/1863129.
3. Кинематика и динамика автомобильных поршневых двигателей: учеб. пособие / П.Р. Вальехо Мальдонадо, Н.Д. Чайнов. — М. :ИНФРА-М, 2020. — 283 с. + Доп. материалы [Электронный ресурс; URL:http://www.znaniium.com]. — (Высшее образование: Бакалавриат). — DOI/10.12737/989072.
4. Алямовский А. А. SolidWorks Simulation. Как решать практические задачи. — СПб.: БХВ-Петербург, 2012. — 448 с.: ил
5. Дударева, Н. Ю. SolidWorks 2011 на примерах / Н. Ю. Дударева, С. А. Загайко. — СПб.: БХВ-Петербург, 2011. — 46 с.: ил
6. В.А. Пронин, Д.В. Жигновская, В.А. Цветков, Введение в расчетную платформу Ansys Workbench: Лабораторные работы. Часть 1 – СПб: Университет ИТМО, 2019. – 46 с.
7. А. А. Черепашков, Н. В. Носов. Компьютерные технологии, моделирование и автоматизированные системы в машиностроении: учебное пособие для ВПО. – Волгоград: ИД Ин-Фолио, 2009 г., 640 с.
8. Яманин А.И., Голубев Ю.В., Жаров А.В. и др. Компьютерно-информационные технологии в двигателестроении: учебное пособие.- М.: Машиностроение, 2005. 480 с.
9. Яманин А. И. Динамика поршневых двигателей внутреннего сгорания: учебник для вузов/ Я.А. И.манин, А.В. Жаров, С.О. Барышкинов. – 2-е изд., стер. — Санкт Петербург: Лань, 2021. —592 с.
10. Кинематический и динамический расчеты кривошипно-шатунного механизма с прицепным шатуном V-образного двигателя внутреннего сгорания с применением программы mathcad: Учебно-методическое пособие для выполнения практических и лабораторных работ, курсовых и дипломных проектов./ П. Р. Вальехо Мальдонадо, Д. К. Гришин, Н. Д. Чайнов. – М. : МГМУ «МАМИ», 2012. 120 стр.

11. П.Р. Вальехо Мальдонадо, Д.К. Гришин. Кинематика и динамика кривошипно-шатунного механизма поршневого двигателя внутреннего сгорания: учебно-методическое пособие для выполнения практических и лабораторных работ. – М. : МГТУ «МАМИ», 2011. 122 стр.

Additional readings:

Баумана, 2002 г., 336 с.

2. Mathcad. Математический практикум для инженеров и экономистов / Н.А. Сливина, А.И. Плис .— учеб. пособие; 2-е изд., перераб. и доп. — М. : Издательство "Финансы и статистика", 2003 .— 657 с.

3. Гоц, А. Н. Расчеты на прочность деталей ДВС при напряжениях, переменных во времени: учебное пособие: -М.: ФОРУМ, 2015.-208 с.

4. Оценка выносливости базовых деталей поршневых двигателей: учеб. пособие/ А. Н. Краснокутский, Л. Л. Мягков, Н. Д. чайнов.- М.: Изд-во МГТУ им. Н. Э. Баумана, 2013.- 102 с., ил.

5. Черняк, А. А. Математические расчеты в среде Mathcad : учебное пособие для вузов / А. А. Черняк, Ж. А. Черняк ; под общей редакцией А. А. Черняк. — 3-е изд., испр. и доп. — Москва : Издательство Юрайт, 2024. — 163 с. — (Высшее образование). — ISBN 978-5-534-14675-2. — Текст : электронный // Образовательная платформа Юрайт [сайт]. — URL: <https://urait.ru/bcode/539482>

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 computer communication services.

* 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 computer communication services 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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of Energy Engineering

position, educational department

signature

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name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

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