Federal State Autonomous Educational Institution of Higher Education

PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA

RUDN University

Institute of Medicine

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

COURSE SYLLABUS

Pharmacology

course title

Recommended by the Didactic Council for the Education Field of:

31.05.03 Dentistry

field of studies / speciality code and title

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

Dentistry

higher education programme profile/specialisation title

2023-2024

1. COURSE GOAL(s)

The goal of the course “Pharmacology” is to develop in students the system of knowledge about the principles of drugs classification, their mechanisms of action, pharmacological effects, indications, and contraindications for use; the principles of combining drugs, the risk of adverse side effects and their prevention, rules of drugs prescription and drug rational administration.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the course (module) "Pharmacology" is aimed at developing the following competencies among students: GPC-6.3, 6.4, 6.9, GPC-13.1, 13.2, PC-6.1, 6.2, 6.3.

Table 2.1. List of competences that students acquire through the course study

Competence code	**Competence descriptor**	**Competence formation indicators** (within this course)
GPC -6.	Being able to prescribe non-drug and drug treatment, monitor its efficacy and safety when solving professional tasks	GPC-6.3. Assessing the possible side effects of taking medicinal drugs.
		GPC-6.4. Providing medical care to a dental patient in emergency or urgent forms.
		GPC-6.9. Evaluating the efficacy and safety of using medicinal drugs, medical devices and other methods of treatment at a dental appointment.
GPC -13.	Being able to understand the operation principles of modern IT and use them to solve the professional tasks	GPC-13.1. Using information technology in professional activity and observing the information security rules. Information and communication media and technology in professional activity.
		GPC-13.2. Observing the information security rules in professional activity.
PC-6.	Being able to analyze and present in public medical information based on evidence-based medicine, participate in scientific research, introduce new methods and techniques aimed at protecting public health	PC-6.1. Searching for medical information based on evidence-based medicine, interpreting data from scientific publications and/or preparing a presentation to make medical information, the results of scientific research public.
		PC-6.2. Developing algorithms for the examination and treatment of adults and children with dental diseases in accordance with the principles of evidence-based medicine, as well as searching and interpreting medical information based on evidence-based medicine.

		PC-6.3. Conducting public presentation of medical information based on evidence-based medicine/ partial participation in scientific research.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the core/variable/elective* component of (B1) block of the higher educational programme curriculum.

* - Underline whatever applicable.

Within the higher education programme students also master other (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the course study.

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

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
GPC-6	Being able to prescribe non-drug and drug treatment, monitor its efficacy and safety when solving professional tasks	-	Internal illnesses Clinical pharmacology general surgery Surgical diseases Infectious diseases, phthisiology Dermatovenereology Neurology Psychiatry and narcology Otorhinolaryngology Ophthalmology Obstetrics
GPC-13	Being able to understand the operation principles of modern IT and use them to solve the professional tasks	Latin language Medical informatics	Dentist assistant (general practice), incl. research work
PC-6	Being able to analyze and present in public medical information based on evidence-based medicine, participate in scientific research, introduce new methods and techniques aimed at protecting public health	-	Dentist assistant (general practice), incl. research work

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course is 5 credits (108 academic hours).

*Table 4.1. Types of academic activities during the periods of higher education programme mastering (**full-time training**)**

Type of academic activities		Total academic hours	Semesters/training modules			
			5	**6**		
Contact academic hours		105	45	60		
including:						
Lectures (LC)		18	9	9		
Lab work (LW)		87	36	51		
Seminars (workshops/tutorials) (S)						
Self-studies		39	9	28		
Evaluation and assessment (exam/passing/failing grade)		36	18	20		
Course workload	academic hours_	180	72	108		
	credits	5	2	3		

* To be filled in regarding the higher education programme correspondence training mode.

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title	Course module contents (topics)	Academic activities types
Module 1. General Pharmacology	1. **Recipe. Introduction to Pharmacology.** Types of prescriptions. Formulation rules in the Russian Federation. Types of dosage forms. ATC classification.	LC
	2. Basic principles of pharmacodynamics Mechanisms of drug action. Antagonists, agonists, partial agonists. Target molecules of drugs (receptors, enzymes, ion channels). Types of pharmacological response: expected pharmacological response, hyperreactivity, tachyphylaxis, idiosyncrasy. The relationship between pharmacokinetics and pharmacodynamics. The concept of a therapeutic index, a therapeutic range. Therapeutic drug monitoring (indications, significance, interpretation of results). Pharmacodynamic interaction of drugs.	LC
	3**. Basic principles of pharmacokinetics.** Basic pharmacokinetic parameters and their significance. Drug bioavailability, drug absorption pathways, drug distribution volume, degree of binding to blood plasma proteins, drug metabolism,	LC, LW

	drug elimination, half-life, drug excretion routes, clearance. Factors affecting the value of pharmacokinetic parameters. Pharmacokinetic curve. Pharmacokinetic interaction of drugs.	
Module 2. Pharmacology of drugs groups **2.1. Drugs affecting afferent and efferent innervation**	1. **Drugs affecting afferent innervation. Local anesthetics.** Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC, LW
	2. Cholinergic agents. **Anticholinergics. Cholinomimetics.** Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC, LW
	3. Adrenomimetics and sympathomimetics Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC, LW
	4. Adrenolythics and sympatholytics. Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC
2.2. **Drugs affecting the cardiovascular system**	**1. Diuretics** Carbonic anhydrase inhibitors (acetazolamide). Osmodiuretics (mannitol). Loop diuretics (bumetamide, furosemide, ethacrynic acid, torasemide). Diuretics acting on the cortical segment of Henle's loop (hydrochlorothiazide, clopamide, chlorthalidone, metolazone, indapamide). Potassium-sparing diuretics (spironolactone, eplerenone, amiloride, triamterene). Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC
	2. Lipid-lowering agents Statins (fluvastatin, simvastatin, pravastatin, atorvastatin, rosuvastatin); fibrates (clofibrate, bezafibrate, gemfibrozil); derivatives of nicotinic acid (niacin, enduracin); bile acid sequestrants (cholestyramine, colestipol, colesevelam); an inhibitor of intestinal cholesterol absorption (ezetimibe); PCSK9 inhibitors. Classification. Pharmacodynamics, mechanism of action.	LC, LW

	Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	
	3. Antihypertensive agents Ways to affect the renin-angiotensin system (RAS): pharmacology of ACE inhibitors (captopril, enalapril, perindopril, quinapril, moexipril, ramipril, fosinopril, trandolapril, spirapril, lisinopril) and angiotensin receptor blockers (valsartan, candesartan, losartan). Tactics of prescribing ACE inhibitors and angiotensin receptor blockers in hypertension and CHF. Dihydropyridine calcium antagonists: nifedipine, nimodipine, felodipine, amlodipine: pharmacology and place in the treatment of angina pectoris and hypertension. Centrally acting drugs: alpha2-adrenergic agonists (methyldopa, guanfacine, clonidine) and agonists of I1 - imidazoline receptors. Ganglion blockers: azamethonium bromide (penamine), benzohexonium. Features of use in hypertensive crisis. Nitrates (nitroglycerin, isosorbide dinitrate, isosorbide-5-mononitrate, molsidomine): pharmacology, place in the treatment of coronary artery disease. The main challenges of nitrate therapy (tolerance).	LC, LW
	4. Antianginal drugs 1) reducing myocardial oxygen demand (b-blockers); 2) increasing the delivery of oxygen to the heart (coronary dilators of the myotropic antispasmodic and adenosine type of action); 3) reducing myocardial oxygen demand and increasing oxygen delivery to the heart (nitrates, calcium antagonists). Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC, LW
	5. Antiarrhythmic drugs. Class I antiarrhythmics (sodium channel blockers). Subclasses Ia (quinidine, novocainamide, disopyramide, aymaline), Ib (lidocaine, mexiletine, trimecaine, diphenin), Ic (etmozine, etacizin, propafenone, flecainide, alapenin) - clinical pharmacology, indications, contraindications, side effects. ECG changes while prescribing these drugs. Class II antiarrhythmics: Beta-blockers: nonselective (propranolol, nadolol, sotalol), selective (oxprenolol, metoprolol, atenolol, betaxolol, bisoprolol, nebivolol), drugs with their own sympathomimetic activity (oxprenolol, pindolokirol-1), drugs with alpha-1-blocking activity (labetalol, carvedilol).	LC, LW

	Beta-blockers as myocardial unloading instruments in the treatment of CHF. Clinical pharmacology, indications, contraindications, side effects. ECG changes while prescribing these drugs. Class III antiarrhythmics (potassium channel blockers - amiodarone, sotalol, dofetilide, ibutilide): clinical pharmacology, indications for prescription, ECG changes while prescribing these drugs. Class IV antiarrhythmics (calcium antagonists - verapamil, diltiazem): clinical pharmacology, indications, contraindications, side effects. ECG changes while prescribing these drugs. Additional antiarrhythmic drugs: adenosine, potassium salts.	
	6. Drugs to manage heart failure Drugs with a positive inotropic effect: cardiac glycosides (digoxin, strophanthin), non-glycoside cardiotonics (dopamine, dobutamine, amrinone, milrinone, enoximone, levosimendan). Classification of inotropic agents. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients. The dosage regimen of cardiac glycosides, depending on the state of the gastrointestinal tract, metabolic and excretion organs in the patient, the number and rhythm of heart contractions, the state of contractility and conductivity of the myocardium, the rate of development of the effect, drug interactions and factors contributing to a change in sensitivity to drugs. Diagnostics, correction and prevention of adverse reactions. Possible interactions with their combined administration and with drugs from other groups.	LC, LW
2.3. Drugs affecting hemostasis and hematopoiesis	**1. Drugs affecting the blood coagulation system.** Antiplatelet agents: acetylsalicylic acid, clopidogrel, ticlopidine, abciximab, anagrelide, alprostadil, lysine acetylsalicylate. Direct anticoagulants: sodium heparin, low molecular weight heparins (sodium enoxaparin, nadroparin, fraxiparin). Indirect anticoagulants: warfarin, coumarins. Fibrinolytics: streptokinase, tissue plasminogen activator (alteplase, prourokinase). Synthetic selective inhibitor of activated factor X (Xa) fondaparinux sodium, rivaroxaban, direct thrombin inhibitor dabigatran. Drugs that increase blood clotting (vitamin K and its analogs, thrombin, hemostatic sponge, fibrinogen). Fibrinolysis inhibitors (aminocaproic acid). Drugs to stop bleeding in patients with hemophilia (factor VIII cryoprecipitate, antihemophilic plasma, coagulation	LC, LW

	factor VII, coagulation factor IX). Etamsilat. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	
	2. Drugs affecting the hematopoietic system. Iron preparations. Erythropoietin. Preparations containing folic acid, cyanocobalamin. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC
2.4. Drugs affecting the functions of the respiratory system, digestion and metabolic processes	**1. Drugs affecting the functions of the respiratory system** Beta-2 adreno-agonists: salbutamol, fenoterol, salmeterol, formoterol. M-anticholinergics: ipratropium bromide, tiotropium bromide. Methylxanthines: theophylline, aminophylline. Mast cell membrane stabilizers (cromoglycic acid), antileukotriene drugs (zafirlukast, montelukast, zileuton). Inhalation GCS. Systemic GCS. Antitussive drugs. Mucolytics, mucoregulators, mucokinetics. Antitussive drugs of central action. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients. The concept of the stepwise therapy for bronchial asthma, therapy of chronic obstructive pulmonary disease. Diagnostics, correction and prevention of adverse reactions. Receptor desensitization syndrome (tachyphylaxis, internalization and decreased regulation - the development of resistance to beta-adreno-agonists), methods of its correction and prevention.	LC, LW
	2. Drugs affecting the functions of the digestive system. Pharmacology of antacids (sodium bicarbonate, calcium carbonate, aluminum hydroxide, aluminum phosphate, magnesium oxide, magnesium hydroxide). Pharmacology of H2-histamine receptor blockers (cimetidine, ranitidine, famotidine, nizatidine, roxatidine). Pharmacology of M-anticholinergics: pirenzipine. Pharmacology of proton pump inhibitors (omeprazole, esomeprazole, lansoprazole, pantoprazole, rabeprazole). Prescribing antisecretory agents for the treatment and prevention of gastric	LW

	ulcer and duodenal ulcer. Pharmacology of prokinetics (metoclopromide, domperidone, trimebutin). Pharmacology of gastrocytoprotectors (bismuth tripotassium citrate, bismuth colloidal subcitrate, misoprostol, sucralfate). Prescribing antisecretory agents and prokinetics for the treatment and prevention of GERD, functional dyspepsia, NSAID gastropathy. Antibacterial (anti-Helicobacter) drugs in the treatment of peptic ulcer: amoxicillin, clarithromycin, tetracycline, metronidazole. Consensus principles "Maastricht-5" in the treatment of H. pylori infection: indications for eradication, basic therapy regimens, methods of monitoring the effectiveness of treatment.	
	3. Hormones of the pituitary gland, hypothalamus, pineal gland, thyroid and pancreas, hypoglycemic drugs. Antidiabetic drugs: insulins (ultrashort, short, intermediate, long acting), sulfonylurea derivatives (glibenclamide, gliquidone), methiglinides (repaglinide), biguanides (metformin), α-glycosidase inhibitors (acarbose), thiazolidinediones (rosiglitazone), depiptidyl peptidase inhibitors -4 (DPP-4) (vildagliptin), GLP-1 analogues and agonists (liraglutide), amylin analogues (pramlintide acetate), gliflozins (daptogliflozin). Preparations of thyroid hormones and antithyroid drugs (L-thyroxine, mercazolil, thiamazole, potassium iodide). Preparations of pituitary and hypothalamic hormones. Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications. Adverse drug reactions. Drug interactions. Use in special categories of patients. Principles of replacement therapy.	LW
	4. Steroid hormones Sex steroids. Contraceptives. Anabolic steroids. Glucocorticoids. Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients. Types of glucocorticoid therapy. Negative outcomes and their prophylaxis	LC, LW
	5. Drugs affecting immune processes. I. Cytostatics: a) alkylating agents: cyclophosphamide	LC, LW

	b) antimetabolites: azathioprine methotrexate Glucocorticoids: prednisone, etc. Drugs that inhibit the formation or action of IL-2: a) antibiotics: cyclosporine tacrolimus, rapamycin b) MAT preparations for IL-2 receptors: basiliximab, daclizumab. Antibody preparations: a) Polyclonal antibodies - anti-thymocyte immunoglobulin b) MAT to TNF-alpha - infliximabi etc. 4-aminoquinoline derivatives (chloroquine, hydroxychloroquine), D-penicillamine, Gold preparations (sodium aurothiomalate, auranofin, etc.). Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients. II. Immunostimulants. Preparations of bacterial and fungal origin, their synthetic and semi-synthetic analogs. Preparations of animal origin. Cytokines (interferons, interleukins) and stimulators of their formation in the body. Herbal preparations. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients.	
	6. Antiallergic drugs Types of allergic reactions. Pathogenesis of allergic and pseudo-allergic reactions. Points of application of drugs. Drugs for the treatment of immediate-type hypersensitivity reactions (HNT): 1) agents that prevent the release of histamine and other mediators of allergy - glucocorticoids, cromoglycic acid (cromolyn sodium, intal); 2) antihistamines - H1-histamine blockers; 3) symptomatic agents - adrenergic agonists (adrenaline, ephedrine), myotropic bronchodilators (aminophylline). Drugs for the treatment of delayed-type hypersensitivity reactions (HRT): GCS, cytostatics, NSAIDs. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications.	LC, LW

	Contraindications Adverse reactions. Drug interaction. Use in special categories of patients.	
2.5. Drugs affecting the central nervous system. Medicines affecting the nociceptive system and the synthesis of pain and inflammation mediators	**1. Drugs for anesthesia. Analgesics.** Preparations for inhalational and intravenous anesthesia. Opioid analgesics. Non-steroidal anti-inflammatory drugs (NSAIDs). Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications. Adverse drug reactions. Drug-drug interactions. Use in special categories of patients.	LC, LW
	2. Sedative drugs. Hypnotic agents. Anxiolytics. Antiepileptic drugs. Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications. Adverse drug reactions. Drug-drug interactions. Use in special categories of patients.	LC, LW
	3. Antipsychotics. Antidepressants. Remedies for the treatment of mania. Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications. Adverse drug reactions. Drug-drug interactions. Use in special categories of patients.	LC, LW
	4. Psychostimulants. Nootropics. Drugs for neurodegenerative diseases. Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications. Adverse drug reactions. Drug-drug interactions. Use in special categories of patients.	LC, LW
2.6. Antibacterial, antiviral and antifungal agents	**1. Antibiotics (part I)** The main clinically significant pathogens and infectious diseases. Mechanisms of bacterial resistance. General characteristics of antimicrobial drugs. Types of antimicrobial pharmacotherapy. Principles of rational antibiotic therapy. Classification of antibiotics and their mechanisms of action. Beta-lactam antibiotics. Pharmacology of penicillins (benzylpenicillin, amoxicillin, ampicillin, oxacillin, piperacillin). Pharmacology of cephalosporins (1st generation: cefazolin, cephalexin, cefaclor; 2nd generation: cefamandol, cefuroxime; 3rd generation: cefoperazone, cefotaxime, ceftriaxone; 4th generation: cefepime, 5th generation: ceftobiprol). Pharmacology of carbapenems (imipenem, meropenem) and monobactams (aztreonam). Non-beta-lactam antibiotics. Pharmacology of	LC, LW

	aminoglycosides (gentamicin, amikacin, tobramycin, netilmicin). Pharmacology of macrolides (erythromycin, roxithromycin, azithromycin, clarithromycin). Pharmacology of tetracyclines (tetracycline, doxycycline) and glycopeptides (vancomycin, teicoplanin). New groups of antibiotics: oxazolidinediones (linezolid), lipopeptides (daptomycin), glycillcyclins (tigecycline), pleuromutilins (retapamulin).	
	2. Non-beta lactam antibiotics and synthetic antimicrobials: Not beta-lactam antibiotics. Pharmacology of aminoglycosides (gentamicin, amikacin, tobramycin, netilmicin). Pharmacology of macrolides (erythromycin, roxithromycin, azithromycin, clarithromycin). Pharmacology of tetracyclines (tetracycline, doxycycline) and glycopeptides (vancomycin, teicoplanin). New groups of antibiotics: oxazolidinediones (linezolid), lipopeptides (daptomycin), gycilcyclines (tigecycline), pleuromutilins (retapamulin). Sulfonamides, quinolone and fluoroquinolone derivatives, 5-nitrofuran, imidazole derivatives. Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications. Unwanted reactions. LS interaction. Use in special categories of patients.	LC, LW
	3.Antiviral, antifungal agents. Antifungals: amphotericin B, itraconazole, ketoconazole, clotrimazole, nystatin, polygynax, sertaconazole, fluconazole. Antivirals: anti-herpetic, anti-cytomegalovirus, anti-influenza (M2 channel blockers, neuroaminidase inhibitors), antiretroviral drugs.	LW
	4. Anti-tuberculosis drugs. 1st line drugs, 2nd line drugs. Tuberculosis chemotherapy regimens. Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications. Adverse drug reactions. Drug-drug interactions. Use in special categories of patients.	LW
	5. Antiprotozoal, antisyphilitic, antihelminthic drugs Antiprotozoal: quinine, chloroquine, primaquine Antiparasitic: levamisole, mebendazole, albendazole, pyrantel, diethylcarbazine, praziquantel	LW

	Classification. Pharmacodynamics of the group of drugs, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications. Adverse drug reactions. Drug-drug interactions. Use in special categories of patients.	

* - to be filled in only for **full** -time training: *LC - lectures; LW - lab work; S - seminars.*

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	**Classroom equipment**	**Specialised educational / laboratory equipment, software, and materials for course study** (if necessary)
Lecture	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless Internet connection. Software: Microsoft Windows, MS Office /Office 365, MS Teams, Chrome (latest stable release), Skype	Classroom for lectures and lab works, group and individual consultations, current control and intermediate certification. A set of specialized furniture; technical devices: Optoma HD36 multimedia projector, Lenovo IdealPad330-5ikb laptop, Internet access. Wall projection screen, floorboard information marker magnetic, interactive complex for testing students.
Lab works	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless Internet connection. Software: Microsoft Windows, MS Office /Office 365, MS Teams, Chrome (latest stable release), Skype	Classroom for lectures and lab works, group and individual consultations, current control and intermediate certification. A set of specialized furniture; technical devices: Optoma HD36 multimedia projector, HP250G7 laptop, Internet access. Wall projection screen, floorboard information marker magnetic, interactive complex for testing students.
Lab work	Classroom, equipped with a set	Wall projection screen, magnetic floor information marker board, Optoma

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
	of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless Internet connection. Software: Microsoft Windows, MS Office /Office 365, MS Teams, Chrome (latest stable release), Skype	HD36 multimedia projector, Lenovo 15.6 laptop, centrifuge 5804, analytical scale AF225DPCT, Vortekx shaker, CryoCubeF101h freezer

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. Illustrated textbook / editor R.N. Alyautdin. - Электронные текстовые данные. - Moscow : GEOTAR-Media, 2020. - 312 p. - Книга на английском языке. - ISBN 978-5-9704-5665-1.
2. Pharmacology : textbook / D.A. Kharkevitch; Translation of Russian textbook, 12th edition, revised and improved. - 2nd edition. - M. : ГЭОТАР-Медиа, 2017. - 680 pages with illustrations. - Книга на английском языке. - ISBN 978-5-9704-3883-1.

Additional readings:

1. Basic and Clinical Pharmacology / B. Katzung, S. Masters. - 11th ed. ; Книга на английском языке. - New York : McGraw-Hill, 2009. - 1218 p. : il. - (LANGE Basic Science). - ISBN 978-007-127118-9 : 4318.03.
2. Clinical Pharmacology / P.N. Bennett, M.J. Brown. - 10th ed. ; Книга на английском языке. - Edinburgh : Churchill Livingstone, 2008. - 694 p. : il. - ISBN 978-0-443-10245-5 : 2048.65.
3. Tutorial Guide to Pharmacokinetics: учебное пособие / С.К. Зырянов, О.И. Бутранова, М.Б. Кубаева. – Москва: РУДН, 2022. – 134 с.: ил. ISBN 978-5-209-10837-5
4. Tutorial Guide to Pharmacodynamics [Текст] = Пособие по фармакологии : Учебное пособие / S.K. Zyryanov, O.I. Butranova. - Книга на английском языке. - M. : PFUR, 2019. - 56 с. : ил.

Internet sources

Electronic libraries with access for RUDN students:

1. Electronic libraries with access for RUDN students – ЭБС РУДН: http://lib.rudn.ru:8080/MegaPro/Web
2. Online University library: http://www.biblioclub.ru

3. IQlib: http://www.iqlib.ru
4. НЭБ Elibrary: http://elibrary.ru
5. Science Direct: http://www.sciencedirect.com
6. EBSCO: http://search.ebscohost.com
7. Oxford University Press: http://www3.oup.co.uk/jnls
8. Sage Publications: http://online.sagepub.com
9. Springer/Kluwer: http://www.springerlink.com
10. Tailor & Francis: http://www.informaworld.com
11. Web of Science: http://www.isiknowledge.com
12. Консультант студента http://www.studmedlib.ru
13. Университетская информационная система РОССИЯ: http://www.cir.ru/index.jsp
14. Учебный портал РУДН: http://web-local.rudn.ru/

Data bases

1. U.S. National Library of Medicine National Institutes of Health: http://www.ncbi.nlm.nih.gov/pubmed/
2. ACS Publications: Data base / American Chemical Society. - База данных на английском языке. - Washington : ACS Publications, 2013. - Режим доступа: http://pubs.acs.org/
3. RSC Journals : Data base / Royal Society of Chemistry. - База данных на английском языке. - London : RSC Publishing, 2013. - Режим доступа: http://pubs.rsc.org/
4. Springer Link: Data base / Springer Science+Business Media. - База данных на английском языке. - Berlin : Springer Science+Business Media, 2013. - Режим доступа: http://link.springer.com/.

*Training toolkit for self- studies to master the course *:*

1. The set of lectures on the course ”Pharmacology”

2. The laboratory workshop (if any).on the course ”Pharmacology”

3. The guidelines for writing a course paper / project (if any) on the course ”Pharmacology”.

4. ……

* The training toolkit for self- studies to master the course is placed on the course 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 UPON COURSE COMPLETION

The assessment toolkit and the grading system* to evaluate the competences formation level (GPC-6.3, 6.4, 6.9, GPC-13.1, 13.2, PC-6.1, 6.2, 6.3.) upon the course study completion are specified in the Appendix to the course 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:

Assoc. prof. of Department of General and Clinical Pharmacology		Butranova O.I.
position, department	signature	name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

of General and Clinical Pharmacology		Zyryanov S K.
name of department	signature	name and surname

HEAD

OF HIGHER EDUCATION PROGRAMME:

First Deputy Director of Medical Institute		Razumova S.N.
position, department	signature	name and surname