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:

31.05.01 General Medicine

field of studies / speciality code and title

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

General Medicine

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The goal of the course «Pharmacology» is to equip the students with 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

The mastering of the discipline "Pharmacology" is aimed at the formation of the following competencies of students: GPC-3, GPC-4, GPC-5, GPC-7, PC-3.

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

Competence code	Competence	Indicators of Competence Formation (within the framework of this discipline)
GPC-3	Being able to counter doping in sports and fight against it	GPC-3.2. Being able to analyse biochemical, physical and chemical, and molecular and biological mechanisms of the development of pathological processes in the cells of the athlete's body tissues when taking prohibited drugs; defining the principles of the biochemical processes when taking illegal drugs
GPC-4	Being able to use medical devices provided for by the procedure for medical care, and conduct patient examinations in order to determine a diagnosis	GPC-4.1. Being able to use medical devices in accordance with the current procedures for the provision of medical care, clinical guidelines (treatment protocols) on the provision of medical care, care taking into account the medical care standards.
		GPC-4.2. Being able to assess the effectiveness and safety of medical devices.
GPC-5	Being able to assess morpho-functional, physiological conditions and pathological processes in the human body to solve professional tasks	GPC-5.2. Being able to evaluate the results of clinical, laboratory and functional diagnosis when dealing with professional tasks.
GPC-7	Being able to prescribe treatment and monitor its efficacy and safety	GPC-7.1. Mastering skills in the methods of general clinical examination, interpretation of laboratory results, instrumental diagnostic methods.

PC-3.	Being able to prescribe treatment and monitor its efficacy and safety	PC-3.1. Being able to develop a treatment plan for a disease or condition taking into account the diagnosis, age and clinical picture in accordance with the current procedures for the provision of medical care, clinical guidelines (treatment protocols) on the provision of medical care taking into account the standards of medical care.
		PC-3.2. Being able to prescribe medicinal drugs, medical devices and medical nutrition taking into account the diagnosis, age and clinical picture of the disease and in accordance with the current procedures for the provision of medical care, clinical guidelines (treatment protocols) on the provision of medical care taking into account the standards of medical care.
		PC-3.4. Being able to assess the efficacy and safety of the use of drugs, medical devices, medical nutrition and other treatment methods
		PC-3.6. Being able to organize personalized treatment for a patient, including pregnant women, elderly and senile patients; assess the efficacy and safety of treatment.

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-10	Able to solve standard tasks of professional activity using information, bibliographic	Mathematics Medical informatics Biochemistry Biostatistics	General surgery Radiology Anesthesiology, Resuscitation, Intensive Care

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
	resources, biomedical terminology, information and communication technologies, taking into account the basic requirements of information security		Medical Rehabilitation Professional Diseases Telemedicine Medical Enzymology Modern Methods of Medical Statistics
GPC-6	Able to prepare and apply scientific, research and production, design, organizational, managerial and regulatory documentation in the healthcare system	-	Public Health and Healthcare, Healthcare Economics Hygiene Medical Enzymology

* To be filled in according to the competence matrix of the higher education programme.

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course "Pharmacology" is 7 credits (252 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		**158**	**90**	**68**
including:				
Lectures (LC)		35	18	17
Lab work (LW)		123	72	51
Seminars (workshops/tutorials) (S)		-	-	-
Self-studies		**58**	**36**	**22**
Evaluation and assessment (exam/passing/failing grade)		**36**	**18**	**18**
Course workload	academic hours_	**252**	**144**	**108**
	credits	**7**	**4**	**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.	LW
	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, LW
	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, drug elimination, half-life, drug excretion routes, clearance. Factors affecting the value of pharmacokinetic parameters. Pharmacokinetic curve. Pharmacokinetic interaction of drugs.	LC, LW
Module 2. Pharmacology of drugs groups. 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	LC, LW

	Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	
	4. Adrenolythics and sympatholytics. Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC, LW
Module 3. Pharmacology of drugs groups. 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, LW
	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. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	LC, LW
	3. Antihypertensive agents Ways to affect the renin-angiotensin system (RAS): pharmacology of ACE inhibitors and angiotensin receptor blockers. Tactics of prescribing ACE inhibitors and angiotensin receptor blockers in hypertension and CHF. Dihydropyridine calcium antagonists: 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. 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, ethacizin, propafenone, flecainide) - 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 (oolokirol-1), drugs with alpha-1-blocking activity (labetalol, carvedilol). Beta-blockers 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, atropine, digoxin.	LC, LW
	6. Drugs to manage heart failure Drugs with a positive inotropic effect: cardiac glycosides, non-glycoside inotropic agents. Classification of inotropic agents. Inhibitors of RAS, gliflozins and other drugs for chronic heart failure. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients. Diagnostics,	LC, LW

	management, and prevention of adverse reactions. Drug interactions.	
Module 4. Pharmacology of drugs groups. 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 factor VII, coagulation factor IX). Ethamsylate. 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, LW
	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, LW
Module 5. Pharmacology of drugs groups. 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 (cromoglicic 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,	LC, LW

	management, and prevention of adverse reactions. Receptor desensitization syndrome.	
	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: pirenzepine. Pharmacology of proton pump inhibitors (omeprazole, esomeprazole, lansoprazole, pantoprazole, rabeprazole). Prescribing antisecretory agents for the treatment and prevention of gastric ulcer and duodenal ulcer. Pharmacology of prokinetics (metoclopromide, domperidone, trimebutine). Pharmacology of gastrocytoprotectors (bismuth, colloidal bismuth 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. Eradication of H.pylori.	LC, LW
	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), glinides (repaglinide), biguanides (metformin), α-glycosidase inhibitors (acarbose), thiazolidinediones (rosiglitazone), dipeptidyl peptidase inhibitors -4 (DPP-4) (vildagliptin), GLP-1 analogues and agonists (liraglutide), amylin analogues (pramlintide acetate), gliflozins (dapagliflozin). 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.	LC, LW
	4. Steroid hormones Sex steroids. Contraceptives. Anabolic steroids. Glucocorticoids.	LC, LW

	Classification. Pharmacodynamics, mechanism of action. Pharmacokinetic parameters. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.	
	5. Drugs affecting immune processes. Cytostatics: Alkylating agents: cyclophosphamide Antimetabolites: azathioprine methotrexate Glucocorticoids: prednisone, etc. Monoclonal antibodies Polyclonal antibodies - anti-thymocyte immunoglobulin 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. 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.	LC, LW
	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: 1) agents that prevent the release of histamine and other mediators of allergy - glucocorticoids, cromoglycic acid; 2) antihistamines - H1-histamine blockers; 3) symptomatic agents - adrenergic agonists, myotropic bronchodilators. Drugs for the treatment of delayed-type hypersensitivity reactions: GCS, cytostatics. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse	LC, LW

	reactions. Drug interaction. Use in special categories of patients.	
Module 6. Pharmacology of drugs groups. Drugs affecting the central nervous system. Drugs 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
Module 7. Pharmacology of drugs groups. Antibacterial, antiviral and antifungal agents	1. Antimicrobial pharmacotherapy. Principles of rational antibiotic therapy. Beta-lactam antibiotics: Beta-lactam antibiotics. Pharmacology of penicillins (benzylpenicillin, amoxicillin, ampicillin, oxacillin, piperacillin). Pharmacology of cephalosporins (1st generation: cefazolin, cephalexin, cefaclor; 2nd generation: cefamandole, cefuroxime; 3rd generation: cefoperazone, cefotaxime, ceftriaxone; 4th generation: cefepime, 5th generation: ceftobiprole). Pharmacology of carbapenems (imipenem, meropenem) and monobactams (aztreonam).	LC, LW
	2. Non-beta-lactam antibiotics and synthetic antimicrobials: Non-beta-lactam antibiotics. Pharmacology of aminoglycosides (gentamicin, amikacin, tobramycin, netilmicin).	LC, LW

	Pharmacology of macrolides (erythromycin, roxithromycin, azithromycin, clarithromycin). Pharmacology of tetracyclines (tetracycline, doxycycline) and glycopeptides (vancomycin, teicoplanin). New groups of antibacterials: 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. Adverse reactions. Drug interaction. Use in special categories of patients.	
	3.Antiviral, antifungal agents. Antifungals: amphotericin B, itraconazole, ketoconazole, clotrimazole, nystatin, sertaconazole, fluconazole. Antivirals: anti-herpetic, anti-cytomegalovirus, anti-influenza (M2 channel blockers, neuroaminidase inhibitors), antiretroviral drugs.	LC, LW
	4. Anti-tuberculosis drugs. 1st line drugs, 2nd line drugs. 3rd 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.	LC, LW
	5. Antiprotozoal, antisyphilitic, anthelminthic drugs 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.	LC, LW

* - 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)
Lab work	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 Classrooms 349, 350, 352	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.
Self-studies	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 349	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.
Computer Lab	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 Lab No 1 on the base of the city clinical hospital No 24	Wall projection screen, magnetic floor information marker board, Optoma HD36 multimedia projector, Lenovo 15.6 laptop, centrifuge 5804, analytical scale AF225DPCT, Vortekx shaker, CryoCubeF101h freezer

* The premises for students' self-studies are subject to **MANDATORY** mention

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 (based) sources

1. Electronic libraries with access for RUDN students:

-Electronic library network of RUDN – ELN RUDN
http://lib.rudn.ru/MegaPro/Web

- ELN «University Library online» http://www.biblioclub.ru
- ELN Urait http://www.biblio-online.ru
- ELN «Student Advisor» www.studentlibrary.ru
- ELN «Lan» http://e.lanbook.com/

2. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation
http://docs.cntd.ru/
- search system Yandex https://www.yandex.ru/
- search system Google https://www.google.ru/
- abstract database SCOPUS http://www.elsevierscience.ru/products/scopus/

*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-3, GPC-4, GPC-5, GPC-7, PC-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 the Department of General and Clinical Pharmacology		O.I. Butranova
position, department	signature	name and surname
Head of Department of the General and Clinical Pharmacology		S.K. Zyryanov
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HEAD OF EDUCATIONAL DEPARTMENT:

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

HEAD

OF HIGHER EDUCATION PROGRAMME:

Head of the Department of General Medical Practice		N.V. Sturov
position, department	signature	name and surname