FACULTY OF PHARMACY

STUDY PROGRAM 0916.1 PHARMACY

DEPARTMENT OF PHARMACOLOGY AND CLINICAL PHARMACY

APPROVED
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum Faculty of Pharmacy
Minutes No. 2 of 09.11.2021
Chairwoman of the Committee, PhD, associate professor
UNCU Livia _____

APPROVED
at the meeting of the Faculty Council, Faculty of Pharmacy
Minutes No. 3 of 16.12.2021
Dean of the Faculty, PhD, associate professor
CIOBANU Nicolae _____

APPROVED
approved at the meeting of the Department of Pharmacology and Clinical Pharmacy
Minutes No. 2 of 15.09.2021
Head of Department, PhD, associate professor,
SCUTARI Corina _____

SILLABUS

DISCIPLINE **PHARMACOLOGY**

Integrated studies

Type of course: **Compolsory Discipline**

Curriculum developed by the team of authors:

Scutari Corina, PhD, associate professor

Bodrug Elena, PhD, associate professor

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I. PRELIMINARY

- General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional/specialty training program

The Pharmacology course is an important component of pharmaceutical education and aims to study the action of drugs in all aspects: the study of the basic chemical, physical, physicochemical, physiological, biochemical processes, that occur as a result of drug administration, at molecular, cellular, tissue level, in the living organism (human, animal).

The content of the course is structured to form the fundamental knowledge required in the field of pharmacokinetics and pharmacodynamics of drugs, in order to prescribe and administer them correctly, effectively and harmlessly in the treatment of multiple diseases and pathological conditions; acquiring the necessary notions for their rational selection and use, supervising and preventing adverse reactions and pharmacotherapeutic complications, creating the necessary skills to avoid intoxication and solving the emergency situations. Pharmacology develops and helps the student to systematize the most important drug groups, analyze drug action based on pharmacological properties, mechanisms and site of action, assess the possibilities of using drugs for pharmacotherapeutic purposes based on knowledge of their properties, to prescribe drugs in the form of a recipe for certain diseases and pathological conditions, especially in emergency situations, resulting from the pharmacodynamic and pharmacokinetic particularities of the medicinal preparations.

- **Mission of the curriculum (aim) in professional training**

One of the main objectives of the course is developing working skills with informative literature on pharmacology, with drug annotations, orientation in medical guides; generalization by the pharmacist of information about traditional and new medicines that exist in the pharmaceutical market and informing the doctors, pharmacy workers and population, paying special attention on „ The list of essentials and vital important medical substances ”, main and additional preparations, and also informing on pharmacoeconomic expenditures for the prophylaxis of specific maladies.

- **Language (s) of the course:** Romanian, English.

- **Beneficiaries:** students of the third year, Faculty of Pharmacy, Pharmacy specialty.

II. MANAGEMENT OF THE DISCIPLINE

Code of discipline		**S.05.O.044, S.06.O.051**	
Name of the discipline		**Pharmacology**	
Person(s) in charge of the discipline		PhD, associate professor, **Scutari Corina**	
Year	**III**	Semester / Semesters	**5, 6**
Total number of hours, including:			**300**
Lectures	**75**	Practical / laboratory work	**90**
Seminars	**-**	Self-training	**135**
Form of assessment	**E**	Number of credits	**10**

III. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the discipline study, the student will be able to:

✓ ***At the level of knowledge and understanding:***

- To know the content of pharmacology and its tasks. The history of pharmacology.
- To understand the sources of obtaining drugs and the stages of implementation in medical practice.
- To know the general prescribing (pharmacography), pharmaceutical forms of drugs and their destination, prescribing of different pharmaceutical forms.
- To know general pharmacology, pharmacokinetics and pharmacodynamics of drugs.
- To know the principles of classification of drugs. groups of drug after system classification, etc.
- To know the classification of drugs within the group. group membership according to the mechanism of action, chemical structure, etc. the international name of drug and their commercial synonyms.
- To know the characterization of the mandatory drugs: mechanism of action, effects, adverse reactions, indications, contraindications.
- To know the comparative presentation of the drugs of the concrete group; biological standardization of drugs.

✓ ***At the application level:***

- To determine the group membership of the specific drug;
- To select the drugs indicated for the specific disease;
- To select specific indications for the specific drug;
- To be able to replace a drug with another analogue if necessary;
- To perform comparative presentation of the drug of the concrete group;
- To possess the ability to select information from the specialty literature (manuals, pharmacotherapeutic guide, etc.);
- To be able to inform the patient about the rational use of the drug, possible side effects, their prophylaxis and combating.

✓ ***At the integration level:***

- To be able to determine the position and the importance of the discipline Pharmacology in the ensemble of all the disciplines provided by the study plan (with pharmaceutical profile, pathophysiology, human physiology, biochemistry, microbiology etc.);
- To be able to use the knowledge gained in other disciplines in the interdisciplinary integration of pharmacology;
- To be able to accumulate the theoretical and applicative knowledge of drugs as a reference for their subsequent use in pharmaco- and phytotherapy (pharmacy) and in medical practice;
- To be able to use the knowledge gained in pharmacology to organize and deliver the population with drugs.

IV. PROVISIONAL TERMS AND CONDITIONS

Student of the third year requires the following:

- Certified skills in fundamental sciences (physiology, pathological physiology, biochemistry, anatomy);
- Digital competences (use of the Internet, document processing, electronic tables and presentations, use of graphics software);
- Ability to communicate and team work;
- Qualities - tolerance, compassion, autonomy.

V. THE MESAND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

Nr.	Theme	*Number of hours*		
		Lectures	Practical works	Self train.
1.	Introduction to Pharmacology. General pharmacology.	4	-	-
2.	Introduction to the general prescription. Solid pharmaceutical forms.	-	3	4
3.	Prescription of semisolid pharmaceutical forms. Prescription of solutions for internal and external administration.	-	3	4
4.	Prescription of solutions for parenteral administration. Extractive solutions.	-	3	4
5.	Totalisation: *General prescription*.	-	3	-
6.	General pharmacology (p. I). Pharmacokinetics.	2	3	4
7.	General pharmacology (p. II). Pharmacodynamics.	2	3	4
8.	Introduction to the pharmacology of the vegetative nervous system. Cholinomimetics. Anticholinesterases. Colinoblocants.	2	3	4
9.	Adrenomymetics.	2	2	4
10.	Adrenoblockants. Symphatolitics.	2	2	4
11.	Totalisation: *Cholinergic and adrenergic drugs*.	-	2	-
12.	Ethylic alcohol. Hypnotics. Wide-spectrum anticonvulsants. Antiepileptics. Antiparkinsoniens.	2	3	4
13.	Opioid analgesics (narcotics), non-opioid (antipyretics) and mixed.	2	3	4
14.	Neuroleptics. Anxiolytics. Lithium salts. Sedatives.	2	3	4
15.	Psychostimulants. Nootropics. Antidepressants. Adaptogens.	2	3	4
16.	Totalisation: *The drugs acting on the central nervous system.*	-	2	-
17.	Drugs acting on the respiratory system.	2	3	4

18.	Cardiotonics and cardiostimulators.	2	3	4
19.	General anesthetics. Drugs acting on afferent innervation.	2	3	4
20.	Antihypertensive and antihypotensive drugs.	2	3	5
21.	Antianginals and antiarrhythmics.	2	3	4
22.	Diuretics. Antigouts. Drugs used to regulate acid-base and hydrosalin balance.	2	3	4
23.	Blood medication	2	3	4
24.	Drugs used in the central and peripheral blood circulation disturbances. Hypolipidemic drugs.	2	2	4
25.	Local anesthetics. Drugs acting on the afferent innervation.	2	-	4
26.	Medication of the digestive system	4	3	5
27.	Totalisation: *Drugs acting on the respiratory, digestive and cardiovascular systems.*	-	2	-
28.	Hormonal and antihormonal drugs. Drugs used in osteoporosis.	6	3	4
29.	Vitamins. Enzymatic and nonenzymatic drugs.	4	3	4
30.	Antiinflammatory drugs. Antiallergic and immunomodulator drugs.	4	3	5
31.	Totalisation: *Drugs that act on inflammatory, metabolic and immune processes.*	-	2	-
32.	Antiseptics and disinfectants. Basic principles of chemotherapy.	3	2	4
33.	Antibiotics.	4	3	4
34.	Sulfamides and other antimicrobials of synthetic origin. Antituberculosis drugs.	2	2	4
35.	Antimycotics. Antiviral. Antiprotozoycs. Antihelmintics.	4	3	4
36.	Anticancer drugs	2	-	4
37.	Adverse reactions and pathological conditions caused by drugs.	1	-	4
38.	General principles of treatment of acute drug poisoning.	1	-	4
39.	Totalisation: *Antimicrobials. Antiparasitics.*	-	2	4
Total		**75**	**90**	**135**

VI. CLINICAL SKILLS ACQUIRED AT THE END OF THE COURSE

- To determine the pharmacologic group of the specific drug;
- to select the drugs indicated for the specific disease;
- to select specific indications for the specific drug;
- to be able to replace a drug with another analogue if necessary;
- to perform comparative presentation of the drug of the concrete pharmacologic group;
- to be able to select information from the specialty literature (books, pharmacotherapeutic guide, etc.);
- to be able to inform the patient about the rational use of the drug, possible side effects, their prophylaxis.

VII. REFERENCE OBJECTIVES AND CONTENTS UNITS

OBJECTIVES	CONTENTS UNITS
Chapter 1. General prescription.	
• To define pharmacology. • To be familiar with the structure, rules for prescribing, prescription forms used • To know general notions about medicine, drug nomenclature • To acquire the drug starting substance, drug substance, pharmaceutical forms and their classification • To learn the prescribing methods of solid, semisolid and liquid pharmaceutical forms.	**Pharmacology** - a branch of pharmacology that sets prescribing rules for medicines **Pharmacokinetics** - a branch of general pharmacology pursuing the road of drug in the body from absorption and continuing with distribution and elimination **Pharmacodynamics** - a branch of general pharmacology that investigates the effects and mechanisms of action of drugs **Recipe** - a medico-legal document issued by the doctor, the doctor's written order to the pharmacist regarding the preparation and / or delivery of the medicines. **Drug** - a substance used to prevent, improve, heal or diagnose diseases **Drug substance** - a substance with a defined chemical structure, of natural origin, semisynthesis or synthesis and with a certain pharmacodynamic action **Pharmaceutical form** - containing one or more drug substances and auxiliary substances processed through a pharmaceutical operation.
Chapter 2. Drugs that influence on the vegetative nervous system (Cholinergic and	

OBJECTIVES	CONTENTS UNITS
adrenergic drugs).	
• To know the notion about the cholinoreceptors, their classification (M- and N-cholinoreceptors), the classification of substances with influence on cholinergic synapses. • To be aware of the pharmacological action, indications, contraindications and adverse reactions of M-cholinomimetics, N-cholinomimetics and anticolysterasic preparations. • To know the pharmacological action, indications, contraindications and adverse reactions of M-cholinoblockers and N-colinoblockers. • To know the classification of substances with action on impulse transmission in adrenergic synapses. • To know the pharmacological action, indications, contraindications and side effects of alpha-adrenomymetics, beta-adrenomymetics and alpha, beta-adrenomymetics. • To know the pharmacological action, indications, contraindications and side effects of alpha-adrenoblockers, beta-adrenoblockers and alpha, beta-adrenoblockers. • To know the pharmacological action, indications, contraindications and side effects of sympathomymetic and sympatholytic preparations. • To know the pharmacological action, indications, contraindications and side effects of dopaminergic preparations.	Structure of cholinergic synapse. Cholinoreceptors. M-cholinomymetics. N-cholinomymetics. Anticholiensterasics. M-cholinoblockers. N-cholinoblockers. Ganglioblockers. Muscle relaxants. Structure of adrenergic synapse. Adrenoreceptors. α-, and β-adrenomymetics. α-Adrenoblockers. β-Adrenoblockers. Dopaminergics. Sympathomymetics. Sympatholytics.
Objectives	**Content units**
Chapter 3. Drugs acting on the central nervous system.	

OBJECTIVES	CONTENTS UNITS
• To understand the pharmacokinetics and pharmacodynamics of ethanol, indications for use. • To know the classification of hypnotic drugs (after chemical structure, duration of action). • To know the pharmacological action, indications, contraindications and adverse reactions of hypnotic, anticonvulsant, antiepileptic, antiparkinsonian medicines • To know the principles of classifying analgesic drugs. Group specificities of opiate and non-opiate analgesics. • To understand the pharmacological action, indications, contraindications and adverse reactions of psycholeptics drugs (antipsychotics, anxiolytics, sedatives) • To understand the pharmacological action, indications, contraindications and adverse reactions of psychoanaleptic drugs (antidepressants, psychostimulants, nootropes, general tonics, adaptives)	Pharmacology of ethanol. Hypnotics. Anticonvulsants. Antiepileptics. Antiparkinsoniens. Opiate and non-opiate analgesics Psycholeptic preparations: Hypnotics, Neuroleptics, Anxiolytics (Tranquilizers), Sedatives. Psychoanaleptic preparations: Nootrope, Antidepressants,
Chapter 4. Drugs acting on the respiratory, digestive and cardiovascular systems.	
• To know the classification of cardiotonic drugs. • To know the specifics of pharmacodynamics and pharmacokinetics of cardiotonic and cardiostimulatory drugs. • To know the principes of classification of antihypertensive and antihypotensive drugs, their pharmacological action, indications, contraindications and adverse reactions. • To understand the pharmacological action,indications, contraindications, and adverse reactions of antihypertensive and antihypotensive preparations. • To understand the pharmacological action, indications, contraindications and adverse reactions of antianginal and antiarrhythmic drugs. • To know the principles of classification of preparations with influence on coagulation and hematopoietic processes (anticoagulants,	Steroidal glycosides. Neglycosidic cardiotonics. Cardiostimulators. Antihypertensive drugs that reduce sympathetic tone at different levels. Musculotrope vasodilators. Potassium channel stimulants. Calcium channel blockers. Diuretics. Conversion enzyme inhibitors. Angiotensin II receptor antagonists. Systemic vasoconstrictive antihypotensives. Antihypotensive preparations that increase heart rate. Plasma volume substitutes (dextrans). Antiarrhythmic sodium channel blockers. Medicines that predominantly increase effective refractory time. Preparations that reduce the need for myocardium in oxygen (organic nitrates, calcium channel blockers, β-adrenergic blockers). Drugs that improve myocardial metabolism. Anticoagulants. Antiaggregants. Fibrinolytics.

OBJECTIVES	CONTENTS UNITS
antiplatelets, fibrinolytics, hemostatics): their mechanism of action, posology, indications and usage references, adverse effects. • To know the pharmacology of cerebral and peripheral vasodilators. • To know the principles of classification of preparations with influence on the respiratory system: their mechanism of action, posology, indications and usage references, adverse effects. • To understand the pharmacological action, indications, contraindications and adverse reactions of drugs with action on digestive tract organs.	Haemostatics. Anti-fibrinolytics. Platelet antiagregants. Antianemic medication. Leukopoiesis Inhibitors and Stimulents. Anti-ischemic vasodilators. Neurotrophic vasodilators. Peripheral vasodilators. Angioprotectors. Antimigraine. Respiratory anapletics. Antitussives. Expectorants. Mucolytics. Bronchodilators. Preparations that influence the appetite. Drugs that influence the secretion of gastric juice. Antacids. Gastroprotectors. Drugs that influence the peristalsis of the digestive tract (vomitives, laxatives, antivomitives, antidiarrheals, antiflatables). Hepatoprotectors. Choleretics and cholecystokinetics.
Chapter 5. Drugs acting on inflammatory, metabolic and immune processes.	
• To know the definition, the principles of classification of hormonal and antihormonal preparationssă cunoască particularităţile farmacodinamiei şi farmacocineticii preparatelor hormonale și antihormonale • To be familiar with the classification and pharmacological action, indications, contraindications and adverse reactions of the preparations influencing the tonus and contractile activity of the miometer • To understand the pharmacological action, indications, contraindications and side effects of anti-inflammatory preparations • To understand the pharmacological action, indications, contraindications and side effects of antiallergic and immunomodulatory preparations • To be familiar with the principles of classification of vitamins and vitamin-like: their mechanism of action, posology, indications and usage references, adverse effects • To know the pharmacology of enzymatic and anti-enzymatic preparations.	Hormone, hormonal preparation and antihormonal preparation. reparations of pituitary hormones and their antagonists. Hormonal preparations of the thyroid gland and their antagonists. Preparations of parathyroid glands. Hormonal preparations of the pancreas. Peroral antidiabetic agents. Ovarian hormones. Antioestrogens. Antioestrogens. Contraceptives. Androgen preparations. Antiandrogens. Anabolics. Preparations of mineralocorticoids and their antagonists. Preparations of glucocorticoids and their antagonists. Ocytocics. Tocolytic. Preparations that increase the myometric tone. Nonsteroidal, steroidal, basic anti-inflammatory drugs. Anti-inflammatory anti-TNFα. Immunopharmacology notion. Antihistamines. Inhibitors of mast cell degranulation. Medicines that diminish cytotoxic reactions and the formation of circulating immune complexes. Immunomodulators. Immunosuppressives.

OBJECTIVES	CONTENTS UNITS
	Immunostimulatories. Notions about hypovitaminosis and hypervitaminosis. Hydrosoluble vitamins. Liposoluble vitamins. Vitaminoids. Notions about enzymatic and nonenzymatic drugs.
Chapter 6. Antimicrobials. Antiparasitics.	
• To define chemotherapy and its basic principles • To know the principles of classifying antiseptics and disinfectants: their mechanism of action, posology, indications and usage references, adverse effects • To know the principles of antibiotic classification: their mechanism of action, posology, indications and usage references, adverse effects • To be familiar with the principles of classifying chemotherapeutic preparations with a diverse chemical structure: their mechanism of action, posology, indications and usage references, adverse effects • To understand the pharmacological action, indications, contraindications and side effects of anti-tuberculosis and anti-leprosis preparations • To know the principles of classifying antispirochetes and antiviral preparations: their mechanism of action, posology, indications and usage references, adverse effects • To understand the pharmacological action, indications, contraindications and adverse reactions of antifungal preparations • To be familiar with the principles of classification of antiparasitic preparations: their mechanism of action, posology, indications and usage references, adverse effects • To be familiar with the general classification and characterization of pharmacotherapy complications, drug surveillance and pharmacovigilance system in the country.	Antiseptics and disinfectants (oxidants, dyes, heavy metal salts). Detergents and volatile oils. Antibiotics. Beta-lactam antibiotics. Penicillins. Cephalosporins. Monobactams, tribactams and carbapenems. Aminoglycosides. Macrolides and azaleas. Lincozamines. Tetracyclines. Chloramphenicol. Glycopeptides. Polypeptides. Anzamicines. Bacterial resistance. Sulfonamides. Derivatives of nitrofuran and 8-oxyquinoline. Quinolines and fluoroquinolones. Quinoxalines and nitroimidazole derivatives. Antiuberculosis drugs. Antivirals. Antispirochetis. Antifungal. Antiprotozoycs. Anthelmintics. Complications of drug therapy.

VIII. PROFESSIONAL (SPECIFIC (SS) AND TRANSVERSAL (TS)) SKILLS AND LEARNING OUTCOMES

✓ Professional Skills (PS)

PS1: Knowing, understanding and using the specific language of pharmacology, knowledge and understanding of the sources of obtaining the medication and the stages of implementation in medical practice, explaining and interpreting the mechanisms of action and the pharmacological effects of drugs from different groups, knowledge of basic pharmacodynamic and pharmacokinetics particularities of essential drugs, knowledge of the principles of classification of various drugs by group membership, mechanism of action, chemical structure, etc., knowledge of the international name of medicinal products and their more common commercial synonyms for replacing a preparation with another analogue if necessary, the comparative analysis of the medicines from the pharmacological groups concerned.
PS2: Knowing of pharmacological action, indications, contraindications, adverse effects, mode of administration, drug interactions.
PS3: Using and adaptation of pharmacology knowledge in drug prescribing control, counseling of ICD and drug synonyms, posology and administration; knowing how to access and select online materials.
PS4: Presentation of individual scientific projects and fitting into the scientific circle with new results in the field of pharmacology.
PS5: Knowing the preclinical drug research methodology; identification of scientific research issues in the field of pharmacology, scientific correlation with biopharmaceutical knowledge.
PS6: Using of capacity to solve situations; using of information technologies to solve the tests and to reproduce the pharmacological effects through digital technologies.

✓ Transversal Skills (TS)

TS 1: Promoting effective, harmless and pharmaco-economically advantageous drugs in the therapy of various pathologies; compliance with pharmaceutical ethics and deontology rules in the prescribing of OTC drugs and the release of drug remedies for the population and medical institutions.
TS 2: Formation of personal attitude; pharmacist-patient, pharmacist-doctor interaction, group activity with different roles in drug counseling ; improving the decision-making autonomy in the prescription, selection and release of medicines.
TS 3: Making teamwork by performing scientific projects; promoting the spirit of initiative, dialogue and cooperation through various techniques of acquiring the material; respect for positive attitude, empathy and respect for others, critical analysis and formulation of conclusions, for the pharmacist's daily activity.

✓ Study Outcomes

At the end of the discipline studies, the student will be able to:

- To be able to assess the importance and role of pharmacology in the context of general medicine and integration with related pharmaceutical disciplines.

- To apply medical-biological knowledge in pharmacology studying.
- To be able to determine the group membership of that medicine.
- To know the preparations indicated in the respective diseases and the specific indications for the given preparation.
- To know the comparative peculiarities of the drugs of the respective group.
- To be able to evaluate the place and role of pharmacology in the pre-clinical training of the medical student.
- To be competent to use the knowledge and methodology of pharmacology in the ability to explain the mechanisms of action and the pharmacological effects of drugs.
- To be able to implement the knowledge gained in the work of a researcher.
- To possess the ability to select information from the literature (books, compendia, pharmacotherapy guidebook, etc.).
- To be able to inform the patient about the rational use of the drug, possible side effects, their prophylaxis and combat.
- To acquire the theoretical and applied knowledge of medicines as a reference for their subsequent use in pharmaco- and phytotherapy (pharmacy) and in medical practice.
- To be competent to use critically and confidently the scientific information obtained using the new information and communication technologies.

IX. STUDENT'S INDIVIDUAL WORK

No.	Expected product	Implementation strategies	Assessment criteria	Implementa-tion terms
	Working with information sources:	Read the lecture or the material in the manual on the subject. Reading self-training questions in the subject that require reflection on the subject. To get acquainted with the list of additional information sources on the topic. Select the source of additional information for that theme. Reading the text entirely, carefully and writing the essential content. Wording of generalizations and conclusions regarding the importance of the theme / subject.	The ability to extract the essentials; interpretative skills; the volume of work	During the year
	Working with the practical lesson notebook:	Until solving the tasks on the notebook, to analyze the information on the subject in the lecture and handbook. Solving consecutive tasks. Brief characterization of mandatory preparations, registration of all pharmaceutical forms of mandatory medicines, indication of preparations in various pathologies. Selection of additional information, using electronic addresses and additional bibliography.	Workload, situation problem solving, ability to formulate conclusions	During the year
	Prescribing medical prescriptions	Prescribing medical prescriptions of composory drugs in various pharmaceutical forms, assessing the accuracy of prescribing, posology and administration.	The quality of prescribing medical prescriptions, compliance with the	During the year

No.	Expected product	Implementation strategies	Assessment criteria	Implementa-tion terms
			requirements for different prescription forms.	
	Preparing and supporting presentations / portfolios:	Selection of the research theme, establishment of the research plan, setting the terms of realization. Establishing project /PowerPoint presentation components - theme, purpose, results, conclusions, practical applications, bibliography. Reviews colleagues. Teacher reviews	The volume of work, the degree of penetration in the essence of the project theme, the level of scientific argumentation, the quality of the conclusions, the elements of creativity, the formation of the personal attitude, the coherence of the exposure and the scientific correctness, the graphic presentation, the presentation method	During the year

X. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING - ASSESSMENT

Teaching and learning methods used

When teaching the subject of Pharmacology, different methods and teaching methods are used, oriented towards the efficient acquisition and achievement of the objectives of the didactic process. During the theoretical lessons, along with traditional methods (lesson-exposure, lesson-conversation, synthesis lesson), modern methods (lesson-debate, lecture-conference, problem-lesson) are also used. During the practical lessons are used forms of individual, frontal, group, virtual lab work. Control work (prescribing prescriptions, indications, testing Editor) in writing to highlight the initial level of knowledge; practical activities (group work): problem solving, testing Editor, video demonstration. In order to acquire deeper material, different semiotic systems (scientific language, graphical and computerized language) and teaching materials (tables, diagrams, photo) are used. Within the lessons and extracurricular activities are used Informational Communication Technologies - PowerPoint presentations, on-line lessons.

Verifying knowledge on questions from methodological guidelines and putting tasks on the next topic of practical work (individual work).

Final: Exam (Semesters V and VI).

- **Applied teaching strategies / technologies (specific for the discipline);**
  „Brainstorming”, „Round table”; „Group interview”; „Study case”; „Portofolio”.

- **Methods of assessment** (including the method of final mark calculation).

  Current: frontal and / or individual control:

  - Motivation (the actuality of the subject). Determining the purpose of practical work, answering students' questions.

- Written control (test) work to highlight the initial level of knowledge.
- Practical activities: solving situation problems, questions from Methodical Indications for laboratory work in Pharmacology (faculty of Pharmacy), conducting experiments on laboratory animals, demonstration of videofilms.
- Talking on the questions in the methodical directions, analyzing the experimental results.
- Verification of final knowledge and task assignment for the next topic of the practical work (self- work from home).

At Pharmacology, during the year of study, there are 5 totalisations. At the end of each semester the student's individual work is appreciated.

Thus, the formative evaluation is made up of 5 totalisations and 2 marks of individual work. Each totalization and individual work is appreciated separately with marks from 0 to 10 and can be sustained 2-3 times.

The annual average mark is formed from the sum of the points accumulated during the study year based on the totalisations marks and individual work.

- **Final:** Exam (semesters V and VI). At the promotion exams on Pharmacology are not admitted students with the average annual mark over «5», as well as students who have not recovered absences from courses and practical papers. The exams at Pharmacology (summative assessment) consist of the oral part, the test (test-SIMU, SUMPh "Nicolae Testemitanu" variant) and practical skills. The practical skills consist of 4 exercises of general prescription and 4 indications for the use of respective medications. The student has 30 minutes to prepare the answer.

The final mark will consist of 4 components: average annual mark (coefficient 0,3), the oral part (coefficient 0,3), practical skills (coefficient 0,2) and test in SIMU (coefficient 0,2).

The roundup of the grades at the evaluation steps

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	2	F
3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,0	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B

8,51-8,00	**9**	
9,01-9,50	**9,5**	**A**
9,51-10,0	**10**	

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations.

XI. RECOMMENDED BIBLIOGRAPHY

A. Mandatory:

1. Kharkevitch D.A. Pharmacology. Moscow, GEOTAR-Media Publishing Group, 2019.
2. Whalen Karen. Pharmacology. Sisth edition. Lippincott Illustrated Reviews., 2015, 664 p.
3. Brunton. Goodman Gilman Pharmacological Basis of Terapeutics. Graw-Hill, 2005.
4. Nicolai S., Melnic S., Scutar C., Cazacu V. Practical prescribing. Chisinau, Polygraphic Editorial Centre Medicina, 2004, 106 p.

B. Additional:

1. V. Gonciar, Ed. Cheptea, C. Scutari (et al). Methodical indications for practical work in pharmacology: (Fac. of Stomatology) / State Univ. of Medicine and Pharmacy "N.Testemitanu" Ch., CEP "Medicina". 2011, 83 p.
2. H.P. Rang, M.M.Dale, J.M. Ritter, R.J. Flower. Rang and Dale"s Pharmacology. Seventh edition. Elservier Inc., 2012, 777p.
3. Katzung B. USMLE ROAD MAP. Pharmacology, New-York, 2003.
4. Stringer Y. Basic concepts in pharmacology a student's survival guide. - 2nd ed. - Boston, 2001.
5. Tests on Pharmacology for III-year students. Under the editorship of V. Ghicavîi, CEP Medicina, 236 p.