FACULTY OF MEDICINE

STUDY PROGRAM 0912.1 MEDICINE 2

CHAIR OF PHARMACOLOGY AND CLINICAL PHARMACOLOGY

APPROVED
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum faculty of Medicine 2
Minutes No. 7 of 6.03.2018

Chairman _PHD, Associate Professor _____

Suman Serghei _____

APPROVED
at the Council meeting of the Faculty of Medicine 2
Minutes No. 6 of 20.03.2018

Dean of the Medicine nr. 2 Faculty
Associate Professor

Bețiu Mircea _____

APPROVED
At the meeting of the Committee of the department of pharmacology and clinical pharmacology
Minutes No. 9 of 06.12.2017
Head of department Corresponding Member of the AS of RM
Victor Ghicavîi _____

SYLLABUS

DISCIPLINE **PHARMACOLOGY**

Integrated studies

Type of course: **Compulsory**

Chisinau, 2017

I. PRELIMINARY

- **General presentation of the subject: place and role of the subject in formation of specific competences / specialities**

The discipline of pharmacology is an important component of preclinical education seeking knowledge about drugs, and the interactions of drugs and body.

The content of this subject is intended to form specific competences about drugs, including: prescription of drugs; basic compartmens of pharmacology (pharmacokinetics, pharmacogenetics, pharmacodynamics); general laws of interactions of drugs and body; characteristics of drug groups (principles of classification, mechanism of action and pharmacological effects, indications and contra indications, adverse reactions); selection of drugs for different diseases and different pathological states; highlighting of the importance for public health; problems of overdose and intoxication.

- **Purpose of the subject of pharmacology**

The main goal of this subject is to study the fundamental principles of pharmacokinetcs and pharmacodynamics of drugs, their interaction with the human organism, formation of knowledge about prescription and correct administration, effective and harmless treatment of multiple diseases and pathological conditions.

Achieving the goal will allow you: the formation of a theorethical basis about drugs; developing a logic way of thinking for the application of the obtained information; highlighting the importance of pharmacology as a medical- biological discipline to achieve a rational, effective and harmless treatment.

Knowledge about pharmacology and its continuous perfection is very important since medicine of the 21st century is a more personalized medicine.

- **Languages in which it is tought:** Romanian, Russian, English, French.
- **Adderessed to:** students of 3rd year, faculty of medicine 1 and medicine 2, medicine

II. ADMINISTRATION

Code of the subject		**F.05.O.041 / F.06.O.049**	
Name of the subject		**Pharmacology**	
Responsible		dr. hab.șt. med., prof. univ. **Victor Ghicavîi**	
year	**III**	Semesters	**5 and 6**
Sum of total hours, including:			**300**
Curs	**68**	Laboratory work	**50**
Seminars	**52**	Individual work	**130**
Form of evaluation	**C; E**	Credits	**10**

III. OBJECTIVES OF THE COURSE OF PHARMACOLOGY

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

- To know the structure of a prescription and the principles of drugs in different forms
- To identify the concept of raw drug material, substance, form and nomenclature
- To identify drug interactions and incompatibilities
- To know the basic principles of general drug classification
- To know basic principles of general and specia pharmacokinetics, pharmacodynamics, chronopharmacology and pharmacogenetics
- To acquire knowledge about groups of drugs andthe obligatory prescription of drugs in different forms
- To report about classification, mechanism of action, effects, indications, contraindications and side effects of groups of drugs and specific drugs

- To know components of certain groups of chemicals; pharmacodynamics of substances (mechanism and site of action, effects, indications, contraindications, side effects and toxicity), pharmacokinetics of substances (route of administration, elimination), comparative characteristics of drugs.
- To outweigh possibilities of using drugs for medical purposes based on the knowledge of their properties

✓ ***At the level of application:***

- To select and prescribe drugs in different diseases and pathological states;
- To analyze and describe pharmacological effects in experimental studies;
- To be able to apply the principls of cause and effect (dose-effect), benefit – injury;
- To apply the obtained knowledge in solving tests and problematic cases;
- To be able to solve emergencies;
- To select the most effective ways of drug administration based on their pharmacokinetic and pharmacodynamic properties, preventing interaction, incompatability and complications of the medical treatment;
- To apply rules of prescription and the prescription of drugs in all their medical forms;

✓ ***At the level of integration:***

- To assess the importance and role of pharmacology in the context of general medicine and its integration into related disciplines;
- To apply medical and biological knowledge in learning pharmacology;
- To establish correlations between physiological and pathological processes and pharmacological properties of drugs;
- To form basic principles of ethics and deontology in medical treatment (pharmacotherapy);
- To elaborate research programs to develop new drugs and study further known medical substances;
- To be able to implement and integrate the acquired knowledge of pharmacology in clinical disciplines;
- To be able to assess and self-assess acquired knowledge this field;
- To be able to acquire pharmacological news:

IV. CONDITIONS OF PRELIMINARY REQUIREMENTS

Students of third year have to know the following:

Pharmacology is a preclinical discipline studied at universities, contributing to obtaining basic knowledge of pharmacokinetics and pharmacodynamics of drugs, to be able to prescribe these properly, effectively and safely in the treatment of various diseases and pathological states; to obtain necessary information for a correct choice of drugs and their rational use; to foresee and prevent side effects of pharmacological therapy; to develop necessary skills to avoid drug poisoning and to deal with emergency cases quickly and properly.

Pharmacology is a field of medicine that is constantly and reflects the progress in medical, biological, technical and pharmaceutical sciences. As a result, several new, original drugs and hundreds of generical drugs in different medical forms with new commercial names appear on the pharmaceutical market annually. Nowadays, there are about 50,000 drugs and their systematization becomes more and more difficult. Pharmacology helps students to systematize the most important groups of drugs, to consider the action of drugs based on their pharmacological properties, mechanisms and place of action; to understand possibilities of using drugs for medical purposes based on the knowledge of their

properties; to be able to prescribe drugs in different diseases and pathological states, especially in emergency situations, taking pharmacokinetics and pharmacodynamics of the drugs into consideration.

- Confirmed competences in precedent medical-biological sciences (molecular biology, chemistry and biochemistry, physiology, anatomy, medical terminology), as well as tangent sciences (pathological anatomy, pathophysiology, semiology of internal and surgical diseases);
- digital competences (use of the Internet, document processing, electronic tables and presentations, use of graphics programs);
- ability to communicate and do team work;
- qualities – compliance, perseverance, fairness, tolerance, compassion, autonomy

V. TOPICS AND THE ORIENTATIVE REPRESENTATION OF THE HOURS

Basic components of the subject:

A. Lectures

Nr.	Topics	Hours
1	Pharmacology and its importance. Its relations with other disciplines. Development of drugs. Parts of Pharmacology and its main branches. Pharmacology in Moldova. History.	2
2	General pharmacokinetics. Pharmacogenetics. General pharmacodynamics.	2
3	Cholinomimetics and anticholinesterases.	2
4	Cholinoblockers.	2
5	Adrenomimetics and dopaminomimetics	2
6	Adrenoblockers, dopaminoblockers and sympatholytics.	2
7	General and local anesthetics. Astringent, mucilaginous, adsorbent and irritating drugs	2
8	Opioid and nonopioid analgesics	2
9	Ethanol. Hypnotics, anticonvulsants, antiepileptics, antiparkinsonic drugs.	2
10	Psycholeptics: Antipsychotics. Anxiolitics. Sedatives. Lithium salts.	2
11	Psychoanaleptics: Antidepressants. CNS Excitants. Nootropics. Analeptics. General tonic and adaptive drugs.	2
12	Drugs acting on the respiratory system.	2
13	Glycosides and tonicardiac drugs	2
14	Antiarrhythmics	2
15	Drugs influencing the respiratory system	2
16	Vasodilators (antihypertensive) and vasoconstrictors (antihypotensive)	2
17	Regional and local vasodilator medication	2
18	Diuretics. Drugs used in nephrolithiasis, gout and drugs with influence on acid-base balance	2
19	Drugs influencing haemopoiesis.	2
20	Drug substances influencing platelet aggregation, fibrinolysis and blood coagulability.	2
21	Drugs acting on digestive functions p.1	2
22	Drugs acting on digestive functions p.2	2
23	Anti-inflammatory medication	2
24	Anti-allergic medication and drugs with influence on immune processes.	2
25	Hormonal and anti-hormonal preparations	2
26	Hormonal and anti-hormonal preparations Ocitocics and tocolytics.	2

27	Vitamin drugs and vitaminoids. Enzymes used as drugs. Antienzymes and antiatherosclerotic remedies. Drugs used in osteoporosis and obesity.	2
28	Antiseptics and disinfectants. Antibiotics. P.1	2
29	Antibiotics. P.2 Sulfonamides. Antibacterial chemotherapeutic compounds with diverse chemical structure.	2
30	Antituberculous and antileprous drugs.	2
31	Antiviral, antispirochetous and antimicotic drugs.	2
32	Antiprotozoal and anthelmintic drugs.	2
33	Antineoplasic, radioprotective and radiopac drugs.	2
34	Side effects of drugs. Basic principles of treatment of acute poisonings. Drugs interactions.	2
	Total	68

Practical lessons (Seminars): Individual work

Nr.	Topics	S	P/W	I/W
1	Prescription order. Introduction. Prescription of solid drugs.	**1**	**2**	**4**
2	Semisolid drugs**.** Modified drug forms p.1	**1**	**2**	**4**
3	Liquid and injectibe drugs. Modified drug forms p.2	**1**	**2**	**4**
4	General pharmacokinetics. Pharmacogenetics. General pharmacodynamics.	**2**	**1**	**4**
5	**Totalizare: *Prescriptions. General pharmacology***	**1**	**2**	**4**
6	Cholinomimetics and anticholinesterases.	**1**	**2**	**4**
7	Cholinoblockers	**1**	**2**	**3**
8	Adrenomimetics and dopaminomimetics. Adrenoblockers, dopaminoblockers and symphatholytics.	**2**	**1**	**4**
9	**Totalizare: *Neurotrops: Remedies influencing peripheral innervation***	**1**	**2**	**4**
10	Opioid and nonopioid analgesics. General anesthetics.	**2**	**1**	**3**
11	Ethanol. Hypnotics, anticonvulsants, antiepileptics, antiparkinsonic drugs.	**2**	**1**	**4**
12	Psycholeptics: Antipsychotics. Anxiolytics. Sedatives. Lithium salts.	**2**	**1**	**4**
13	Psychoanaleptics: Antidepressants. CNS Exitants. Nootropics. Analeptics. General tonic and adaptive drugs.	**2**	**1**	**4**
14	**Totalizare*: "Drugs influencing the CNS***	**1**	**2**	**4**
15	Drugs acting on respiratory system	**1**	**2**	**3**
16	Antiarrhythmics	**2**	**1**	**3**
17	Glycosides, cardiotonic and cardiostimulant drugs.	**1**	**2**	**3**
18	Drugs with systemic vasodilation (antihypertensive) and vasoconstriction (antihypotensive)	**1**	**2**	**3**
19	Regional and local vasodilators	**1**	**2**	**4**
20	Diuretics. Drugs used in nephrolithiasis, gout treatment and their influence on the acid- base balance.	**1**	**2**	**4**
21	Drugs acting upon the digestive system p.1	**1**	**2**	**3**
22	Drugs acting upon the digestive system p.2	**1**	**2**	**3**
23	**Totalizare*: "drugs acting on effecter functions of organs and systems"* Drugs acting on the respiratory, cardiovascular and digestive system, diuretics''**	**1**	**2**	**4**
24	Drugs influencing haematopoiesis, platelet aggregation, blood coagulability	**2**	**1**	**4**

	and fibrinolysis.			
25	Antiinflammatory drugs. Antiallergic drugs with influence on the immune processes.	**2**	**1**	**4**
26	Hormonal and antihormonal drugs p.1	**2**	**1**	**4**
27	Hormonal and antihormonal drugs p.2. Oxytoxins and tocolytics	**2**	**1**	**4**
28	**Totalizare:**"***Drugs affecting inflammatory, immune and metabolic processes".***.	**1**	**2**	**4**
29	Antiseptics and disinfectants. Antibiotics.	**2**	**1**	**4**
30	Sulfamides. Antibacterial drugs with diverse chemical structures. Antituberculous and antileprous drugs.	**1**	**2**	**4**
31	Antiviral, antispirochetous and antimicotic drugs.	**2**	**1**	**4**
32	Antiprotozoal and antihelmintic drugs.	**2**	**1**	**4**
33	Antineoplazic, radioprotective, radiopaque drugs.	**2**	**1**	**4**
34	**Totalizare:„*Antimicrobal and antiparasitic drugs".***	**2**	**1**	**3**
35	Side effects of drugs. Basic principles of treatment of acute intoxification. Interaction of drugs.	**2**	**1**	**3**
	Total	**52**	**50**	**130**

VI. REFERENCE OBJECTIVES AND CONTENT UNITS

Objectives	Content units
Topic (part I) „General prescription. General pharmacology."	
• Define general terminology and general notions • Be able to work with nomenclature and names of drugs • Know the structure of the prescriptions, the prescription forms and the peculiarities of completing them • Be able to prescribe solid, semisolid, liquid, injectable and gaseous drug forms; • Continuously update knowledge about new forms of medicine (prolonged release forms, nanoparticles, etc.) • Define the notions of pharmacokinetics, pharmacodynamics, pharmacogenetics; • Know the main parameters of pharmacokinetics; • Know the mechanisms and laws of absorption, distribution, metabolism and drug removal; • Know the fields of pharmacogenetics • Have the ability to interpret the pharmacodynamic principles of drugs; • operate with the notion of doses and its variations • To interpret phenomena associated and repeated administration of drugs; to apply the knowledge gained in the study of special pharmacology and other disciplines. • Integration of the material	Orders are ruling the prescription and release of medication. Notions of drugs, composition of drugs, keeping of drugs. Chemical, official, international, commercial names. Prescriptions and components. Forms of prescriptions. Formal drug prescriptions. Solid, semi-solid, liquid, injectable and gaseous drug forms. New drug forms with modified prescription. Objectives of pharmacokinetics, pharmacogenetics, pharmacodynamics
Topic (part II) "Neurotropics: drugs influencing the peripheral innervations"	
• Define pharmacological groups and principles of classification • know the pharmacodynamic and pharmacokinetic particularities of the groups of drugs • understand the mechanisms for achieving	Cholinomimetics and anticholinesterases Cholinoblockers Adrenomimetics and dopaminomimetics,

Objectives	Content units
pharmacological effects • be familiar with indications, contraindications, side effects of drug groups, clinical picture of intoxications and treatment principles; • be familiar with the particularities of prescribing drugs and selecting drugs for diseases and pathological conditions; • Analyze tables, schematics and problem situations; • integration of the material	Adrenoblockers of dopaminoblockers and sympatholytics. Local anesthetics. Astringent, mucilaginous, adsorbing and irritating drugs
Topic (part III) "Drugs influencing the CNS"	
• Define pharmacological groups and principles of classification • Know the pharmacodynamic and pharmacokinetic particularities of the groups of drugs • Understand the mechanisms for achieving pharmacological effects • Be familiar with indications, contraindications, side effects of drug groups, clinical picture of intoxications and treatment principles; • Be familiar with the particularities of prescribing drugs and selecting drugs for diseases and pathological conditions; • Analyze tables, schematics and problem situations; • Integration of the material	General anesthetics. Opioid and nonopioid analgesics. Ethanol. Hypnotics, anticonvulsants, antiepileptics, antiparkinsonian drugs. Psycholeptics: antipsychotics. Anxiolytics. Sedatives. Lithium salts. Psychoanaleptics: Antidepressants. SNC exitants. Nootropics. Analeptics. General and adaptive tonic drugs.
Topic (part IV) "drugs influencing effecter organs and systems"	
• Define pharmacological groups and principles of classification • know the pharmacodynamic and pharmacokinetic particularities of the groups of drugs • understand the mechanisms for achieving pharmacological effects • be familiar with indications, contraindications, side effects of drug groups, clinical picture of intoxications and treatment principles; • be familiar with the particularities of prescribing drugs and selecting drugs for diseases and pathological conditions; • Analyze tables, schematics and problem situations; • Integration of the material	Drugs that act on respiratory system functions. Antiarrhythmias. Tonicardic glycosides and cardiostimulating drugs. Vasodilatory and vasoconstrictive systemic drugs. Regional and local vasodilators. Diuretics. Drugs used in nephrolithiasis, gout treatment and with influence on the acid-base balance. Drugs that act on the digestive tract.
Topic (part V) "drugs influencing inflammatory, metabolic and immune systems"	
• Define pharmacological groups and principles of classification • know the pharmacodynamic and pharmacokinetic particularities of the groups of drugs • understand the mechanisms for achieving pharmacological effects • be familiar with indications, contraindications, side effects of drug groups, clinical picture of intoxications and treatment principles;	Drugs influencing haematopoiesis, platelet aggregation, blood coagulability and fibrinolysis. Anti-inflammatory medication. Antiallergic drugs influencing the immune processes. Hormonal and antihormonal drugs. Oxytoxic and tocolitics. Vitamin drugs.

Objectives	Content units
• be familiar with the particularities of prescribing drugs and selecting drugs for diseases and pathological conditions; • Analyze tables, schematics and problem situations; Integration of the material	Enzymes used as a medicine. Antiatherosclerotic (hypolipidemic) drugs. Drugs used in osteoporosis and obesity.
Topic (part VI) „Antimicrobal and antiparasitic drugs”	
• Define pharmacological groups and principles of classification • know the pharmacodynamic and pharmacokinetic particularities of the groups of drugs • understand the mechanisms for achieving pharmacological effects • be familiar with indications, contraindications, side effects of drug groups, clinical picture of intoxications and treatment principles; • be familiar with the particularities of prescribing drugs and selecting drugs for diseases and pathological conditions; • Analyze tables, schematics and problem situations; • Integration of the material	Antiseptics and disinfectants. Antibiotics. Sulfonamides. Antibacterial chemotherapeutics with various chemical structures. Antituberculosis drugs. Antileprosis drugs. Antiviral, antispyrochemical, antimycotic drugs. Antiprotozoal and antihelmintic drugs. Antineoplastic, radioprotective, radiopaque drugs.

VII. PROFESSIONAL COMPETENCES (SPECIFIC (CS) AND TRANSVERSE (CT)) AND THE PURPOSE OF THIS SUBJECT

✓ **PROFESSIONAL COMPETENCES:**

- knowledge, understanding and use of specific terminology in pharmacology (CP1);
- knowledge, understanding and training of prescribing drugs in various forms (CP1); (CP2);
- knowledge, understanding and formation of the interpretation of general principles of pharmacokinetics, pharmacogenetics and pharmacodynamics of drugs (CP2);
- the use of different classifications of drugs for the systematization of knowledge (CP3);
- knowledge, understanding and formation of the characteristics of drug groups depending on their pharmacokinetic and pharmacodynamic properties (CP3);
- knowledge, understanding and correct selection of drugs for the treatment of diseases and pathologies (CP3);
- Explaining and interpreting the pharmacokinetic and pharmacodynamic properties of drugs in experimental research (CP3);
- application of virtual techniques in the consolidation of knowledge in the domain of drugs (CP4);
- modeling of pharmacokinetic and pharmacodynamic properties of drugs (CP4);
- solving problems and formulation of conclusions (CP4);
- comparative analysis of the groups of drugs used in the treatment of pathologies (CP4);
- development of clinical thinking for rational application of knowledge in the field of pharmacology (CP4).

✓ **TRANSVERSAL COMPETENCES (CT1):**

- application of the values and norms of professional ethics in the responsible execution of professional skills;
- developing logical reasoning in addressing professional problems;
- developing professional attitudes in solving health problems;
- improving the decision-making skills;

- formation of communication and interaction skills as a professional;
- implication in interdisciplinary projects, extracurricular activities,
- developing and perfecting skills in informational technology;
- building skills and techniques of learning;
- Selection of digital materials, critical analysis and making conclusions.
- Presentation of individual scientific projects.

✓ **PURPOSE OF THE SUBJECT**

- Know the particularities of prescribing drugs in their different forms
- Know the general principles of pharmacokinetics, pharmacogenetics and pharmacodynamics;
- Know the principles of classifying non medicinal drugs
- To characterize drug groups according to pharmacodynamic and pharmacokinetic properties;
- To acquire the prescription of prescriptive preparations and the selection of drugs in diseases and pathological conditions;
- Understand the necessity of material from previous subjects and tangents for assesing knowledge about pharmacology
- Understand the importance and necessity of knowledge about the drugs for professional activity;
- Develop skills to use knowledge in conducting tests, tables and problem situations;
- Be able to implement the knowledge gained in the research activity.

VIII. INDIVIDUAL WORK OF THE STUDENTS

Nr.	Expected outcome	Strategies of achievement	Criteria of evaluation	Time limit
	Working with sources of information	Examining (studying) the course and the material in the book about the subject. Studying the questions from the methodological guidelines. Studying of the complete material with emphasis on the specific topics according to the questions in the indication. Formulation of generalizations and conclusions according to the topic.	Ability to highlight the most essential and the ability to interpret the material	September-June
	Filling the notebook of practical lessons by each student itself	1) Analysis of the material from the lecture and the book; 2) Formulation of characteristics of obligatory drugs 3) Fulfilling exercises about general and specific drug prescription 4) Solving tables and problematic situations 5) Selecting additional information, using electronic addresses and additional bibliography	Workload, solving of tests, exercises of general and specific prescription, problematic situations, ability to formulate conclusions	September-June
	Application of different methods of learning		workload, understanding of the essence of different subjects, level of scientific argumentation, quality of	September-June

Nr.	Expected outcome	Strategies of achievement	Criteria of evaluation	Time limit
			conclusions, elements of creativity, demonstration of understanding the problem, formation of personal attitude	
	Working with additional material	Self-evaluation in the process of self-training, study of materials from additional sources	Results of self-evaluation	September-June
	Composing and giving presentations	Selection of the topic of research, establishment of the research plan, setting the terms of realization. Creating the PowerPoint presentation plan - topic, purpose, results, conclusions, practical applications, bibliography. Reviews of colleagues and teachers	workload, level of specificity about the topic of the project, level of scientific argumentation, quality of conclusions, elements of creativity, personal attitude formation, coherence of exposure and scientific correctness, presentation, presentation method	September-June

Suggestions for individual student activity:

If you want to succeed in the subject of pharmacology, follow the following steps:

Solve your homework by yourself. This includes: the characteristic of the mandatory drugs (in the form of a table), the prescription of these drugs in various forms and the selection of the most effective drugs depending on diseases and pathological conditions, all of which are based on a specific topic.

- Read the tests in the book "Self-Assessment Tests" and read the corresponding answers. This allows you to successfully pass the computer control test.
- Attend courses and practical lessons to become familiar with pharmacology and to learn how to properly arrange the material.
- Make notes during the lesson and compare this information with the material of other subjects.
- Organize time rationally. Pharmacology requires a lot of attention
- For better learning, form small groups of 2-3 students to obtain a broader and clearer understanding of the material. In addition, the ability to explain the material you have learned to your collegues will be very helpful in the future.
- Once you've mastered going over the material using the recommended literature, try repeating without inspiration and checking. If you didnt succeed as well, then repeat once more using the phrase "Repetitio est mater studiorum"
- That said, a savvy scholar for pharmacology would have to work individually for at least 5-7 hours a week.

IX. SUGGESTIONS FOR TEACHING- LEARNING- EVALUATION

- ***Methods of teaching and learning***

Pharmacology is taught in a classical manner: lectures and practical work. Lectures are read by the professors of the department. At practical seminars students deepen, and summarize theoretical knowledge acquired during the lectures and self-learning. It is necessary to mention that at the lectures students become familiar with the material. The role of practical seminars is to transform the process of familiarization and perception in learning.

Laboratory work is designed to provide students with research skills, including certain methods of research and scientific analysis. Laboratory work forms skills and professional knowledge. During practical seminars, students are taught to form their own opinion, to insist on it, and to appreciate other opinions. The goal of laboratory work is also to check student's knowledge on a current theme.

Laboratory work must change students' concept of "I know" to "I can".

Before planning a practical seminar, one must answer the basic questions:

- ***What are the methods used for working in the laboratory?***

First of all, laboratory work provides all information to help students to form professional skills and knowledge; secondly, theoretical issues of primary importance for study of the subject are being discussed.

Taking into consideration the goals that laboratory work must achieve, it is recommended: teachers to organize consultations for students to determine the most important information on the subjects;

I Laboratory work begins with the general characterization of a theme and its relevance, determines purposes and problems of the laboratory work, and practical skills needed to study other new topics of pharmacology. It also reveals the degree of importance of knowledge of the theme for medical practice..

II. Simultaneously, teacher points out difficulties students may face during the preparation for laboratory work and answer any unclear questions. The teacher must differentiate well prepared students who didn't understand some moments (teacher must explain simply, easily and comprehensively) and the students who are not ready for practical lessons and want to receive answers to one or another question. In the second case, students must be remembered the method of working with the book. Student's curiosity must be satisfied out of laboratory hours.

III. Then initial level of students' knowledge is assessed by means of a test which includes: classification of drugs, their use in various diseases and pathological conditions and, for obligatory drugs - forms of delivery and prescription.

IV. Test-control using computer program TEST-EDITOR. Students are offered a choice of 15 tests. The computer appreciates the test automatically.

V. While watching experimental evidence (virtual films), in other cases (no videos), students are allowed to use the book "the lab guide" or add-on instruction methods for preparing the onself theme. After viewing the experimental work, students must write down conclusions.

VI. . Assessment of student's knowledge of the current theme using an interrogative method. At the beginning, the teacher points out general principles of studying the theme, concrete drugs, the sequence of their study, discussion of their main comparative features of remedies and particularities of their indications. During the discussion of the material it is necessary to take into consideration the use of drugs in different clinical situations: for example, it is necessary to highlight the particular action of preparations in pregnant women, their action on neonates, calculation of the dose of medicine for a child, causes of poisoning in children, measures of prevention and treatment of poisoning.

It is recommended to ask a question, and after a short pause to call out a student. All students should take part in the correction, concretization and formulation of a complete answer. The lecturer must ask the opinion of those who are present.

The division of students into active and passive is not allowed. The lecturer must define the system of questions and the content of practical seminars before their beginning. It is not recommended to start the discussion of the topic with weak students or with the best ones. Better to start the media (the student's curiosity must be satisfied out of laboratory hours). Brilliant students must be asked deeply in order not to let them to get boring.

VII. Generalization of the basic topics of the theme. Lecturer generalizes the key-moments of the subject, carried out the analysis and exposure of the most difficult elements, mistakes and other inaccuracies, which were admitted at the test control.

VIII. Practical virtual work.

The last step is to determine the final level of knowledge of students. For this purpose will be used for level II tests, clinical cases, various situations that reveal the student's complex thinking, accurate claims assessment and logical links consisting of problem situations. Appreciation of students with marks should be based on argued and complete answers.

Methods of evaluation

- In the subject of pharmacology there are six "Totalizari" each composed of two parts (practical and theoretical) as follows:
- **Totalizarea Nr.1:** ***Prescription of drugs in different forms (Written)***
  General pharmacology (*Written or oral + computer test*)
- **Totalizarea Nr. 2:** ***Neurotropics: Drugs influencing peripheral innervations* (Written or oral + computer test*)***
- **Totalizarea Nr.3:** ***Drugs influencing CNS*. *(*Written or oral + computer test*)***
- **Totalizarea Nr.4:** ***Drugs acting of effecter functions of organs and systems (*Written or oral + computer test*)***
- **Totalizarea Nr.5:** ***Drugs affecting inflammatory, immune and metabolic processes (*Written or oral + computer test*)***
- **Totalizarea Nr.6:** ***Antibacterial and antiparasitic drugs (*Written or oral + computer test*)***

- ***Strategic/Technologic applications***

Virtual practical work. Computer test programs.

Demonstration of movies.

The final grade is calculated from the average of six (rounded on 0.5) and the final test in SIMU (rounded on 0.5), form in a sum rounded on 1,0.

Grading system

Average of the year and the exams	National grading system	Corresponding ECTS
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**	

Absence on examination without good reason shall be recorded as "absent" and is equivalent to 0 (zero). The student has the right to re-take the exam twice.

X. RECOMMENDET BIBLIOGRAPHY

a) *In Romanian*

1. Ghicavîi V. şi al. „Manual de receptură". Chişinău, 2015
2. Ghicavîi V., Bacinschi N., Guşuilă Gh.. „Farmacologie", Chişinău 2010, 2012
3. Harchevici D. A. „Farmacologia". CEP. Medicina, Chişinău. 2008, 2009
4. Ghicavîi V. şi colab. „Îndreptar pentru lucrări de laborator la farmacologie". Medicina, Chişinău, 2016
5. Ghicavîi V. şi al., „Farmacologia, Teste de autoevaluare". Chişinău, 2001
6. Medicamentele - baza farmacoterapiei raţionale (sub redacţia prof.univ. V.Ghicavîi). Chişinău, 2013
7. Ghicavîi V. şi al. „Indicaţii metodice pentru lucrări de laborator la farmacologie". Chişinău, 2006
8. Ghicavîi V. și al. "Farmacologia clinică. Ghid de cazuri clinice", Chișinău, 2017.
9. Ghicavîi V. și al. "Farmacoterapia modernă a dereglărilor digestive", Chișinău, 2017
10. Fulga I., "Farmacologie", București, 2006
11. Anca-Dana Buzoianu "Farmacologie" V.I. II. Editura medicală universitară "Iuliu Hațieganu", Cluj-Napoca, 2006
12. Cristea Aurelia –Nicoleta „Tratat de Farmacologie", Bucureşti, 2005

b) *In Russian*

1.Харкевич Д. А. „Фармакология". М. «Медицина», 2010
2. Харкевич Д. А. „Руководство к лабораторным занятиям по фармакологии". М., Медицина, 1988
3. Машковский М. Д. „Лекарственные средства", М., «Медицина», 2010
4. Маркова И. В., Неженцев М. «Фармакология». Санкт-Петербург. 1994

c) *In French*

1. Andre Herchueiz / Pharmacologie speciale. v.I, II, III, IV, Presses universitaeres de Bruxelles, 2008.
2. M. M. Bessard, /Cours de pharmacologie/ 1987,
3. Ghicavîi V., Stratu E., Gavriluţa V., Bacinschi N., Pogonea I., Chiriac T., Serbeniuc L. „Indications methodiques pour les travaux de la laboratoire a la pharmacologie" CEP „Medicina". Chişinău, 2006.

d) In English

1. 1. Richard A. Harvey; Pamela C. Champe; Mary J. Mycek and other. Lippincott's Illustrated Reviews, Pharmacology, 2nd edition. 2000.
2. Anthony J. Trevor; Bertman G. Katzung; Susan B. Masters. Katzung & Trevor's Pharmacology. Examination & Board Review. Sixth edition, 2002.
3. H. P. Rang; M. M. Dale; J. M. Ritter Pharmacology, Fouth edition. Chuchill Livingstone. 1999.

4. Alfred Goodman Gilman, Louis S. Goodman, Alfred Gilman. “The Pharmacological Basis of therapeutics”. Mc Graw Hill 2005.

5. Ghicavîi V., Bacinschi N., Guţu N., Stratu E., Gavriluţa V., Serbeniuc L., Chiriac T., Pogonea I. „Methodical indications for pharmacology laboratory works” CEP „Medicina”. Chişinău, 2005, 2011

Suplimentary literature

1.Ghicavîi V., „” Medicamentul-beneficiu sau prejudiciu”, Chişinău, 2009.
2. Cătălina Elena Lupușoru „ Farmacologie” V. I. II, III, Iași , 1994
3. Stroescu V. „Bazele farmacologice ale practicii medicale”. (vol. I, II) "Editura medicala", Bucureşti, 2004
4. Ghicavîi Victor „.Medicamente şi utilizarea lor raţională”, Chişinău, 2004
5. Muhin E., Ghicavîi V., Gonciar V., Bacinschi N., ”Medicația dereglărilor circulației cerebrale și periferice”, Chișinău, 1998
6. Ghicavîi Victor ”Medicamentul –beneficiu sau prejudiciu”, I.S.F.E.P. ”Tipigrafia Centrală”, Chișinău, 2009
7. Nichifor M, Scutariu M., ”Farmacologia și farmacoterapia sinapsei periferice” Iași, 2005.
8. Patraș X., Mungiu O. ”Miorelaxantele”, Iași, 2005
9. Ghicavîi V., Turcan L., Corețchi Ianoș, Stratu E., ”Cum procedăm în-...?”, Chișinău, 2017
10. Plauchntiu Mihail ”Transparent de Farmacologie și Toxicologie”, Arad, 1999.
11. Гикавый В. И. Синонимы, аналоги и взаимодействия лекарств. Кишинев. «Штиинца» 1993
12. Гикавый В. И., Бачинский Н. Г. «Справочник симтоматических лекарственных средств» Кишинев. 1995
13. Heinz Lullmann etc. /Atla de poche de pharmacologie/, Paris,1996, 2exemplare;
14. Rene Ndoze, Moise Oliveira et allea/Dictionnaire therapeutique/, edition atrique francophone, Digest, Medicine, 2000,
15. Izes Landri, Jean Pierre Gies / Pharmacologie. De cible vers l’indication therapeutic/, Paris, 2003.
16. Richard A. Harvez Pamela C. Champe Pharmacology is 2-end edition 2000,
17. Rational drug use: Consumer education and information (World Health organization - 1996
18. Friderich H. Mezers, Ernest Jamets Rewiew of Medical Pharmacology . 1990
19. D. G. Grahame-Smith; J. K. Aronson. Oxford Textbook of Clinical Pharmacology and Drug Terapy. Third Edition. Oxford University Press. 2002.