# FACULTY OF PHARMACY

## STUDY PROGRAM 0916.1 PHARMACY

### DEPARTMENT OF PHARMACEUTICAL AND TOXICOLOGICAL CHEMISTRY

**APPROVED**
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum, Faculty of Pharmacy
Minutes No. 2 of 21.12.2017
Chairman PhD. associate professor
UNCU Livia

**APPROVED**
at the Council meeting of the Faculty of Pharmacy
Minutes No. 2 of 22.12.2017
Dean of Faculty PhD. associate professor
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**APPROVED**
at the meeting of the chair of Pharmaceutical and Toxicological Chemistry.
Minutes No. 3 of 03.11.2017
Head of chair PhD. professor
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# SYLLABUS

DISCIPLINE **DRUG CONTROL**

**Integrated studies**

Type of course: **Compulsory**

**Chisinau, 2017**

# I. INTRODUCTION

- **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 ***Drug control*** discipline applies the knowledge from the very varied pharmaceutical fields for drug analysis; is a multidisciplinary "transfer" science of information acquired in analytical chemistry, physical chemistry, organic chemistry, chemical chemistry, pharmaceutical research methodology in the study of the chemical and physical behavior of the pure drug or pharmaceutical form.

Today we have a large arsenal of analytical procedures, thanks to which the pharmacist-analyst is able to answer the increasing and varied questions regarding the quality of the medicine. The technical evolution has enabled the development of advanced tools, bringing new research opportunities, thus noticing coupled methods and non-destructive analysis methods.

The aim of the discipline "***Drug control***" is to develop the methodology and strategy of drug analysis and control in line with the trends of continuous optimization of the methods of analysis and control and in accordance with the general analytical strategies to ensure the scientific and practical bases of drug analysis and control.

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

To provide students with knowledge on the concepts of Drug Control, as well as developing understanding skills, methods of drug analysis and quality control to ensure their effectiveness and harmlessness for qualitative pharmaceutical support to patients.

- **Language (s) of the course:** romanian; english

- **Beneficiaries:** students of the V year, faculty Pharmacy, specialty PHARMACY.

## II. MANAGEMENT OF THE DISCIPLINE

| | | | |
|---|---|---|---|
| Code of discipline | | **S.09.O.086** | |
| Name of the discipline | | **Drug control** | |
| Person(s) in charge of the discipline | | PhD in Pharmaceutical Sciences, professor **Vladimir Valica** | |
| Year | **V** | Semesters | **9** |
| Total number of hours, including: | | | **180** |
| Lectures | **28** | Practical/laboratory hours | **56** |
| Seminars | | Self-training | **96** |
| Form of assessment | **E** | Number of credits | **6** |

## 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 correctly finalize the studied object of the discipline;
  - to interpret the objectives of State Control and Internal Quality Control of Medicines under the current legislation;
  - to interpret the content of the Analytical Normative Documentation (AND) for the quality of finished drugs;
  - to reproduce the methodology for controlling the quality of pharmaceutical forms;
  - to distinguish the stages of AND development for different pharmaceutical forms;
  - to finalize the theoretical bases of drug stability;
  - describe and use methods for determining the shelf-life.
- ***at the application level:***
  - to organize and perform quality control of medicinal products in accordance with the AND provisions using general quality assessment methods and procedures as well as the provisions of the particular pharmacopoeial monograph (PhM);
  - to justify investigating the stability of medicinal products at various factors in relation to the physico-chemical properties of the drug substances and ancillary substances;
  - establish the terms of validity of the medicines;

- evaluate the quality of pharmaceutical forms.

- ***at the integration level:***
  - to develop drug ANDs;
  - to critically assess and estimate the quality of medicines by drawing up current documentation and reports on the control made based on the results of the evaluation of the quality of medicines;
  - to anticipate possible adverse changes to the medicinal products resulting from the preparation of the preservation and transport resulting from the physico-chemical properties of the active principles, the auxiliary substances and the packaging material;
  - to perform the statistical processing of the results of the pharmaceutical analysis;
  - to alidate analysis methods.

## IV. PROVISIONAL TERMS AND CONDITIONS

Drug control is a multidisciplinary science that combines the knowledge of inorganic chemistry, organic chemistry, physical chemistry and pharmaceutical chemistry previously accumulated and correlates with other disciplines such as pharmaceutical technology, pharmacology and pharmacognosis.

## V. THEMESAND ESTIMATEALLOCATION OF HOURS

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

| No. d/o | THEME | Number of hours | | |
|---|---|---|---|---|
| | | Lectures | Practical hours | Self-training |
| 1. | Product quality, objectives and issues. Organization of drug control in the Republic of Moldova. Current national quality standards for medicines.<br>Rules on quality assurance of the preparation of medicines (GMP). Basic Elements, Principles and Provisions, Implementation in Pharmaceutical Practice.<br>Good Laboratory Practice (GLP) rules, basics, principles and provisions. | 4 | 4 | 6 |
| 2. | Stability of medicines. Degradation of drugs through various mechanisms. Terms of validity. Methods of determination. Ways to solve instability problems. Validation of drug stability. Storage of drugs and packaging provisions in relation to their physicochemical properties and stability. | 2 | 4 | 10 |

| No. d/o | THEME | Number of hours | | |
|---|---|---|---|---|
| | | Lectures | Practical hours | Self-training |
| 3. | General issues of drug analysis and control. General analysis and control methodology. Current Trends in Analysis. Formulation and definition of the analytical problem. Obtaining of a representative sample. Phases of drug analysis and control. Taking samples for drug analysis and control. Organoleptic control. Determination of physical, chemical and physico-chemical properties. | 4 | 4 | 6 |
| 4. | Particularities of drug control. | 2 | 4 | 6 |
| 5. | Chemical methods in the analysis and control of drugs. Determination of the identity, purity and dosage of drugs by chemical methods. | 4 | 12 | 28 |
| 6. | Instrumental methods in drug control. Determination of identity, purity and dosing of medicaments by physico-chemical methods. | 6 | 12 | 28 |
| 7. | Standardization of medicines. Analytical Normative Documents (ANDs) regulating the quality of medicines: General and Particular Pharmacopeutical Monographs (PhMs) and Temporary Pharmacopeia Monographs (TPhMs), manufacturer's quality specifications. Develop AND. The role of AND in ensuring the quality of medicines. Standardization and quality control of medicines. | 2 | - | - |
| 8. | Framing of medicines: analytical and control aspects. | 4 | - | - |
| 9. | *Control assessments – 1, 2.* | - | 8 | 12 |
| 10. | *Practical skills attestation.* | - | 8 | - |
| **Total** | | **28** | **56** | **96** |

## VI. REFERENCE OBJECTIVES OF CONTENT UNITS

| Objectives | Content units |
|---|---|
| **Theme (chapter) 1. Product quality, objectives and issues.** | |
| • To define the basic concepts of Drug Control;<br>• to know the organization of drug control in the Republic of Moldova;<br>• to demonstrate the basics, principles and provisions, implementation in | The Fundamental objectives of Drug Control.<br>Current national quality standards for medicines.<br>Particularities of drug quality control;<br>Types of drug quality assessment by place of |

| Objectives | Content units |
|---|---|
| pharmaceutical practice;<br>• to integrate in drug activity the interrelation of drug quality with control methods;<br>• to apply criteria for drug analysis methods to assess their quality;<br>• to know the criteria for evaluating the quality of medicines. | production. |
| **Theme (chapter) 2. Stability of medicines.** | |
| • To Define the basic concepts of drug stability;<br>• to know its mechanisms and kinetics of degradation reactions;<br>• to integrate drug stability with a shelf-life;<br>• to know the methods and requirements for determining drug stability. | Fundamental concepts of drug stability.<br>Mechanisms of drug degradation (hydrolysis, oxidation, isomerization, decarboxylation, condensation, etc.).<br>Methods for determining the shelf life.<br>Knowledge of physical, chemical, physico-chemical methods of analysis. |
| **Theme (chapter) 3. General issues of drug analysis and control.** | |
| • to demonstrate the pearticularities of the general problems of drug analysis and control;<br>• to be familiar with the general analysis and control methodology;<br>• to demonstrate the stages of drug analysis and control;<br>• to know the methods of the organoleptic control;<br>• to know the methods of sampling for analysis;<br>• to know the determination of physical, chemical and physico-chemical properties. | Taking samples from warehouses and pharmacies.<br>Particularities of general problems of drug analysis and control.<br>General drug analysis and control methodology in line with AND. |
| **Theme (chapter) 4. Particularities of drug control. Chemical and instrumental methods in drug analysis and control.** | |
| • To define the methodological approach to quality control of medicines;<br>• to demonstrate the particularities of the analysis of the drug forms according to the type and place of manufacture;<br>• to form the ability to organize and perform drug analysis using contemporary methods of analysis;<br>• To acquire knowledge and skills to | Knowing the legal framework for quality control of medicinal products and compliance with the requirements for recording the results of the quality control of medicines.<br>Knowing the chemical properties of the drugs.<br>Physical, chemical, instrumental analysis methods.<br>Stages of drug control.<br>Skills for individual experimental work |

| Objectives | Content units |
|---|---|
| perform quality control of medicines in accordance with quality standards, state legislative and regulatory documents.<br>• know the methods of analysis of the drugs used in the pharmaceutical analysis; types of control in the analysis of the main forms;<br>• Apply mandatory control types in the analysis of master forms and record the results of the control;<br>• To be able to perform mathematical calculations;<br>• To be able to evaluate the quality of the analysed drugs. | (individually).<br>Elaboration of a drug quality control review protocol. |
| **Theme (chapter) 5. Drugs standartisation.** | |
| • be familiar with legal and regulatory requirements to standardize medicines;<br>• know the role of AND in ensuring the quality of medicines.<br>• to know the drug standardization system at the stages of manufacturing, manufacturing, distribution, transposition and storage according to GMP. | International standards.<br>AND (PhM, quality specifications, other documents in conformity with CTD standards) |

## VII. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

### ✓ Professional (specific) (SC) competences

- PC1. Identification and și use of the concepts and principles in abordation of determination of the drug quality.
- PC2. Knowledge of the logical succession of operations while performing drug quality control.
- PC3. Knowledge and skills in the use of legislative and regulatory documentation (government laws, orders of MHLSP RM and MA).
- PC4. Using modern methods to determine the stability and quality control of medicines.
- PC5. Solving the problems of the situation and formulating the conclusions.
- PC6. Use of information technologies in the drug analysis and.

## ✓ Transversal competences (TC)

- TC1. Applying rules for rigorous and efficient work, manifest of a responsible attitude towards professional activity, for optimal and creative utilizing of their own potential in specific situations, observing the principles and norms of professional ethics.
- TC2. Ensure effective deployment and effective engagement in group activities. Identifying training needs according to the evolution of quality control requirements; determining the priorities in the continuing professional training of the pharmacist.
- TC3. Identifying opportunities for continuous training and efficient use of learning resources and techniques for their own development.

## ✓ Study outcomes

At the end of the course the student will be able to:

- have the ability and readiness to analyze drugs using chemical, physicochemical and biological methods in accordance with Pharmacopoeia requirements (Ph. Eur.);
- have the ability and skills to evaluate and interpret the results of drug analysis;
- be able to prepare reactives for drugs analysis in conformity with the Pharmacopoeia requirements (Ph. Eur.);
- have the ability and readiness to determine the physico-chemical characteristics of the pharmaceutical forms, including tablets, ointments, injection solutions, and others.
- be familiar with the types of mandatory control in the analysis of the master forms and record the results of the control;
- be able to control the quality of medicines according to quality standards;
- be able and willing to provide advice to healthcare workers and consumers of medicines and other pharmaceuticals in accordance with the rules on the storage of medicines and other pharmaceuticals, taking into account their physicochemical properties;
- be able to work with scientific literature, be able to search for scientific information, analyze the obtained information, transform the found information in a tool for solving professional problems.

**Note.** **Study outcomes** (are deduced from the professional competencies and formative valences of the informational content of the discipline).

## VIII. STUDENT'S SELF-TRAINING

| No. | Expected product | Implementation strategies | Assessment criteria | Implementation terms |
|---|---|---|---|---|
| 1. | Working with lecture materials, methodical indication and AND. | Work systematically in the library and media.<br>Exploring the current electronic sources on the topic under discussion. | 1. Quality of formed judgments, logical thinking, flexibility.<br>2. The quality of systematization of the informational material obtained through its own activity. | During the semesters |
| 2. | Case study analysis. | Choice and description of the case study.<br>Analysis of the causes of the issues raised in the case study.<br>Prognosis of the investigated case.<br>Deduction of the expected outcome of the case. | 1. Analysis, synthesis, generalization of data obtained through own investigation.<br>2. Development of an algorithm of knowledge based on the obtained conclusions. | During the semesters |
| 3. | Working with materials on-line. | Online self-assessment, study of online materials on the SITE Chair, expressing your own opinions through forum and chat. | Number and duration of SITE entries, self-evaluation results. | During the semesters |

## IX. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

- ***Teaching and learning methods used***

La predarea disciplinei ***Drug control*** sunt folosite diferite metode și procedee didactice, orientate spre însușirea eficientă și atingerea obiectivelor procesului didactic. În cadrul lecțiilor teoretice, de rând cu metodele tradiționale (lecție-expunere, lecție-conversație, lecție de sinteză) se folosesc și metode moderne (lecție-dezbatere, lecție-conferință). În cadrul lucrărilor practice sunt utilizate forme de activitate individuală, frontală, în grup. Pentru însușirea mai profundă a materialului, se folosesc diferite sisteme semiotice (limbaj științific, limbaj grafic) și materiale didactice (tabele, scheme, fotografii). În cadrul

lecțiilor și activităților extracuriculare sunt folosite Tehnologii Informaționale de Comunicare – prezentări PowerPoint).

The teaching of the ***Drug control*** discipline uses different methods and didactic methods, oriented towards the efficient acquisition and achievement of the objectives of the didactic process. In the theoretical lessons, along with traditional methods (lesson-exposure, lesson-conversation, synthesis lesson), modern methods (lesson-debate, lesson-conference) are also used. For the deepening of the material, different semiotic systems (scientific language, graphical language) and teaching materials (tables, diagrams, photographs) are used. Inside lessons and extracurricular activities are used Communication Technologies - PowerPoint presentations).

- ***Applied teaching strategies / technologies*** *(specific to the discipline)*

***Inductive, deductive strategies,*** teaching and learning takes place using models (***analogue strategies***), ***algorithmic strategies***: explicative-demonstrative, intuitive, exponential, imitative and algorithmic ones; ***heuristic strategies*** - to develop knowledge through their own thinking effort, using problem-solving, discovery, modeling, hypothesis formulation, investigative experiment, which stimulates creativity.

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

**Current**: front and / or individual control via:

(a) application of docimological tests;
(b) solving problems / exercises;
(c) analysis of case studies;
(d) control assesments – 2;
(e) the current assessment of individual work at the end of the semester.

***The average annual / half-yearly average*** score will show the average score between the scores obtained in totals and the note for individual work.

**Final**: ***Examination*** - practical skills, test-editor and oral answer.

**The final mark** of the ***examination*** will be made up of the annual average mark (30%), practical skills (20%), test-editor (20%) and oral answer (30%).

**Method of mark rounding at different assessment stages**

| Intermediate marks scale (annual average, marks from the examination stages) | National Assessment System | ECTSEquivalent |
|---|---|---|
| **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 scores of all the final examination (computer assisted, test, oral) - all will be expressed in numbers according to the scoring scale (according to the table), and the final grade obtained will be expressed in two decimal digits will be transferred to the notes 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.*

## X. RECOMMENDED LITERATURE:

### *A. Compulsory:*

1. Course support.
2. Bojiţă M., Roman L., Săndulescu R., Oprean R. Analiza şi Controlul medicamentelor.Vol. I. - Cluj-Napoca: Editura Intelcredo, 2003.
3. Bojiţă M., Roman L., Săndulescu R., Oprean R. Analiza şi Controlul medicamentelor.Vol. II. - Cluj-Napoca: Editura Intelcredo, 2003.
4. European Pharmacopoeia - 8th edition. Council of Europe, 67075 Strasbourg Cedex, France - 2013.
5. Methodical indications.

## *B. Additional:*

1. Dănilă Gh. Medicamente moderne de sinteză.- Bucureşti: Editura ALL, 1994.
2. European Pharmacopoeia - 7th edition. Council of Europe, 67075 Strasbourg Cedex, France - 2010. (electronic version)
3. Farmacopea Română. Ediţia X-a –Bucureşti: Editura medicală, 1993.
4. Haţieganu E., Stecoza C. Chimie terapeutică. Vol. II. – Bucureşti: Editura Medicală, 2006-2008.
5. Haţieganu E., Stecoza C. Chimie terapeutică. Vol. II. – Bucureşti: Editura Medicală, 2006-2008.
6. Matcovschi C., Safta V. Ghid farmacoterapeutic (medicamente omologate în Rep. Moldova) – Ch.: „Vector V-N" SRL, 2010.
7. Muntean D., Bojiţa M. Controlul medicamentelor.– Cluj-Napoca: Editura Med. Univ. „Iuliu Haţieganu", 2004.
8. Muntean D.L., Bojiţă M. Controlul medicamentelor (Metode spectrale, cromatografice şi electroforetice de analiză). - Cluj-Napoca: Editura Medicală Universitară „Iuliu Haţieganu", 2004.
9. Roman L., Bojiţă M., Săndulescu R. Validarea metodelor de analiză şi control.-Cluj-Napoca: Editura medicală, 1998.
10. Мирошниченко И.И. Основы фрамакокинетики. – М.: ГЭОТАР-МЕД, 2002.
11. http://www.ema.europa.eu/ema/
12. https://www.edqm.eu