



**MEDICAL UNIVERSITY - PLOVDIV**  
**PHARMACEUTICAL FACULTY**

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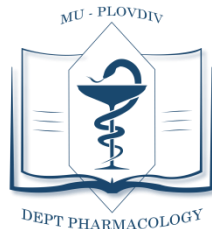
**ACADEMIC STANDARD**

**FOR**

**SCHOOL DISCIPLINE**

**TOXICOLOGY**

**MASTER OF PHARMACISTS**



**Approved by decision of the Department Council – Protocol № 13/12.04.2022**

## **1. Aim of the discipline**

Toxicology is a science that studies the effects of xenobiotics on humans in doses higher than pharmacological ones. The main goal of the training in the discipline "Toxicology" is the training of highly qualified personnel knowledgeable about the potential damage induced by xenobiotics of natural and synthetic origin, incl. the side effects of the drugs.

The goal is coordinated with:

- the public mission of the University - training that "contributes to the implementation of state policy for the development of higher medical education and medical science, to improve the health of the population" and "training of highly qualified specialists with higher medical education";
- the volume and the credit rating of the course (according to the ECTS system), evident from the education plan;
- the qualification characteristics of the specialty;
- educational degree (professional bachelor, bachelor, or master).

The goal is consistent with the place of the discipline in the specialty according to its importance and the chronology in the education plan. Toxicology is directly related to and builds knowledge related to disciplines such as anatomy, chemistry, biochemistry, biophysics, physiology and pathophysiology, and pharmacology. As a fundamental discipline, it provides a background for the next stages of training.

Upon completion of the training, students must have the following knowledge and skills about the toxicity of xenobiotics:

- the mechanisms of xenobiotic toxicity;
- the pharmacological safety profile of xenobiotics and medicines;
- the toxicological characteristics of the biologically active chemical ingredients and excipients in the medicinal products;
- side effects of drugs and the toxic effects of xenobiotics in overdose;
- recognition of poisonings of high social significance - the most common drug and household intoxications;
- for life-saving assistance in case of poisoning.

## **2. Learning content of the course**

The topics and hours of lectures, practicals, course assignments are listed on the Faculty website.

The educational content of the course is chronologically arranged so that each subsequent lecture / practical uses already studied topics and concepts. It is in line with the priority goals of the University and provides an opportunity to develop the personal qualities of the student. Unnecessary overlap or the existence of "white spots" between "related" disciplines according to the education plan is avoided. The educational content provides the acquisition of key competencies and skills that are of primary importance for the future professional realization of the student.

### **3. Background knowledge**

The student must have basic knowledge of biology, biophysics, pharmaceutical chemistry, biochemistry, pharmacognosy, microbiology, anatomy, pathoanatomy, physiology and pathophysiology, and pharmacology from the educational programs in the initial years of the educational course at the university to begin and complete the study of toxicology.

### **4. Academic resources**

The academic staff of the department consists of 8 lecturers with a basic employment contract. These include 2 habilitated lecturers (one Professor and one Associated Professor) and 6 non-habilitated lecturers with a scientific degree "Doctor of Philosophy" in the respective specialty. Of all the lecturers, 5 have acquired a specialty in Pharmacology, 1 in Clinical pharmacology and Therapy, 2 in Pharmacology and Pharmacotherapy, 1 in Toxicology and Toxicological Analysis, and 3 in Clinical pharmacy.

The habilitated lecturer in the discipline "Toxicology" has excellent theoretical and practical training, high professionalism, and many years of experience in teaching and research. The habilitated lecturer from the Department of Pharmacology, Toxicology and Pharmacotherapy is a member of scientific and professional organizations and a reviewer of scientific articles. The lecturers of the Department actively participate in the international exchange under the Erasmus and Erasmus + programs.

The lecturers in the department, occupying the respective academic positions, meet the national requirements, specified in the Higher Education Act, the Law for the Development of the Academic Staff, the Regulations for the Implementation of the Law for the Development of the Academic Staff at the Medical University of Plovdiv.

The lectures are given by a habilitated lecturer (Associate Professor) with a scientific degree "Doctor of Philosophy" and specialties in "Toxicology and Toxicological Analysis" and "Clinical Pharmacy".

The practical exercises are led by non-habilitated lecturers ("Chief Assistant"). Non-habilitated lecturers hold a Master's degree in Medicine or Pharmacy and are appointed following a competition.

### **5. Material resources**

The Department has:

- 4 classrooms with a total area of about 103 m<sup>2</sup>.
- 1 laboratory equipped with devices necessary for conducting experimental work. The total laboratory area of the department is about 30 m<sup>2</sup>. The laboratory equipment of the Department includes general and specific equipment, owned by the Department of Pharmacology and Clinical Pharmacology at the Faculty of Medicine of the Medical University of Plovdiv.
- 5 offices – about 16 m<sup>2</sup>.
- 8 computers, which allows each teacher to work independently. The Department has a permanent Internet connection and access to full-text publications through the library of MU - Plovdiv.

## 6. Lectures

The lectures are prepared and delivered in the form of multimedia presentations. The volume and format of the lectures are the choice of the lead lecturer.

The material considered in the lecture course precedes the practical exercises on the respective topic. The presentations that are used for lecture training allow preliminary preparation of students for each lesson.

## 7. Practicals

The practicals are conducted in student groups. For their preparation, the literary sources available in the Department and the library are used. Their content is updated periodically, which provides training corresponding to the dynamic changes in the science of "Toxicology". Individual and team tasks are appointed. As a methodological form, preference is given to teamwork. The preparation of the student and the results (acquired knowledge and skills) of the specific practical are checked with tests. The program for practical exercises also includes assignments for independent work, preparation of a paper, and their defense in the next lesson.

## 8. Seminars

Students are provided in advance with information and explanations about the upcoming inspection. The seminars are conducted with a whole group and start from the beginning with an individual oral examination, followed by a written examination on individually set topics. The results of the control are discussed in the next lesson.

## 9. Information resources. Basic literature. Internet sites.

The lecturer has developed lectures in electronic version. The practical exercises are conducted based on a published handbook. The Library and Information Center of MU-Plovdiv provides a sufficient amount of specific specialized information to support student learning.

### Main literature sources:

1. Casarett & Doull's Essentials of Toxicology, 4e, 2021  
Curtis D. Klaassen, John B. Watkins III
2. Goldfrank's Toxicologic Emergencies, 11e, 2019  
Lewis S. Nelson, Mary Ann Howland, Neal A. Lewin, Silas W. Smith, Lewis R. Goldfrank, Robert S. Hoffman
3. Basic and clinical pharmacology with toxicology / Nadka Boyadjieva, Delyan Delev, Damianka Getova, Iliya Kostadinov, Lyudmil Peychev et al.; Ed. Nadka Boyadjieva. - 3rd ed.- Sofia : ARSO, 2021.
4. Illustrated toxicology : With study questions / PK Gupta. - London : Elsevier, Academic press, 2018.
5. A textbook of modern toxicology. Earnest Hodson /ed/ IV ed. J. Wiley and sons, Hoboken, New Jersey, 2010
6. Basic principles of clinical toxicology. Yanko T. Iliev, Stefan Popov. - Plovdiv: Lax book, 2014.

Access and use of information resources, as well as the service for delivery of electronic articles for students, Ph.D. students, and employees of MU-Plovdiv are free of charge.

## 10. Control works

Students should study dynamically and intensively during the semester. Teachers monitor students' progress twice during the semester - during colloquium and seminar. Current control includes a test and a theoretical question. Students are provided in advance with information and explanations about the inspection. The results of the control are reviewed in the next practical, with explanations provided to support further preparation and understanding. The results of these tests are included as a component in the final mark for the semester.

### **11. Independent work and commitment of the student**

The independent work of the students is led by the teacher (assistant), who guides the student both in the literary sources and in the methods of their mastering. Sample tests and questions for self-preparation are included in the education plan of the course and are available online on the website of MU-Plovdiv ([http://mu-plovdiv.bg/wp-content/uploads/2016/09/uchebna-programa-farmatsiya .pdf](http://mu-plovdiv.bg/wp-content/uploads/2016/09/uchebna-programa-farmatsiya.pdf)).

### **12. Cooperation between students and teaching staff**

This cooperation consists of:

- Commitment of the teacher to the student and his preliminary preparation, current difficulties in mastering the material, and opportunities to achieve more with an individual learning program.
- Use of reception hours for consultations.
- Participation in a toxicology club.
- Involvement of students in teams for research tasks, scientific projects, etc.

### **13. Exams**

The current marks during the semester are given for:

- The student's results during practicals, discussions, tests and situational tasks, student work with the lecturer on research and projects, etc.;
- Written examinations (colloquium and seminar).

### **14. Evaluation standards**

At the beginning of the classes in the discipline "Toxicology" the assistant acquaints the students with the standards for assessment, the procedures for conducting current control, and the opportunities for receiving feedback on their progress during the semester.

Standards for assessing student achievement are defined to objectify student assessments. The evaluation criteria are the following:

- Poor (2) - scarce knowledge that could not serve as a basis for the next levels of education - preclinical and clinical disciplines.
- Average (3) - reproduction of knowledge about drugs in the "ready-made scheme" - classification, toxicodynamics, lack of basic knowledge about side effects; presentation of non-argued solutions to simple problems; toxic risk assessment; lack of knowledge and independent use of the acquired professional competencies; the terminology is not mastered, the exposition is characterized by poor language.
- Good (4) - key and additional knowledge of classification, toxicokinetics, toxicodynamics of xenobiotics and medicinal products and their adverse reactions (ADRs) is descriptively mastered;

there is limited independence and skills for solving simple tasks, although there is a good language culture, inaccuracies in the terminology are allowed.

- Very good (5) - very well mastered key and additional knowledge about the toxicokinetics and toxicodynamics of xenobiotics, the treatment of acute and chronic intoxications, and the most commonly used antidotes. Independent, non-standard, search for a new algorithm and analysis of the used literature data; skills for solving difficult tasks; tries to present and substantiate his thesis; adequate use of concepts from the scientific field of the studied discipline, has a good language culture.

- Excellent (6) - excellent knowledge of information sources and classification of xenobiotics; thoroughly mastered key and additional knowledge about the toxicokinetics, toxicodynamics of xenobiotics, adverse drug reactions and manifestations of toxicity in drug overdose, treatment of acute and chronic intoxications, the most commonly used antidotes. The student demonstrates his own logical, thinking and correct understanding of the matter; skills for applying what has been learned in solving complex problems; the presence of a creative element; accuracy, and rich linguistic culture of the exhibition.

## 15. Formation of the final mark

The final mark determines the extent to which the student has achieved the goal of education set at the beginning. The semester exam in toxicology includes three elements:

- Entrance test (MCQs) with a duration of 15 minutes. The test is considered successfully passed with 60% correct answers.
- Written exam lasting one hour.
- Oral exam - checking the knowledge of the written exam, test, important topics from the syllabus, and discussion on them.

The student receives a poor mark in case of:

- Cancellation of an exam.
- Failure to meet the minimum test requirements.
- If they have not written on all the questions included in the written exam, regardless of how they exposed the other questions.

Upon re-appearance, the student takes the three elements of the exam again.

In forming the final mark, the grades from the colloquium and seminar held during the semester are also taken into account. The current mark for the semester is obtained as the arithmetic mean of these marks. In case of a poor mark on the colloquium/seminar, the student receives an additional question from the material of this colloquium/seminar. The answer to the additional question participates in the formation of the mark for the oral exam.

The final mark is obtained as the sum of the scores on a six-point scale of the various components multiplied by the respective coefficients of significance, namely:

$$Q_{\text{final mark}} = k_1 Q_{\text{mark from written exam}} + k_2 Q_{\text{mark from oral exam}} + k_3 Q_{\text{mark from current control (during the semester)}}$$

$k_1 = 0.33; k_2 = 0.33; k_3 = 0.33.$

In case of a failure in the test, or a poor mark in a written or oral exam, the final mark is Poor 2.

The exam materials are stored and the students are allowed to get acquainted with them and the grounds for assessment according to the order and procedure announced in advance. The period in which students have access to the examination materials and results is not longer than 5 working days after the date of the examination.

Each discipline has specifications to which the student is given access at the beginning of the study course.

The academic standard for academic discipline was approved by the Decision of the AC - Protocol № 9 / 26.11.2015 and was published on the website of MU - Plovdiv.

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