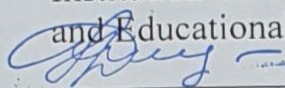


National Pirogov Memorial Medical University, Vinnytsya

“APROVE”

Vice-rector of a Higher Education
Institution from Scientific-Pedagogical
and Educational Affairs



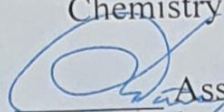
Prof. of HEI

Oksana SEREBRENNIKOVA

«02» September 2022 year

“ AGREED ”

Head of the Pharmaceutical
Chemistry Department



Assoc. Prof. of HEI

Tetiana YUSHCHENKO

«02» September 2022 year

SYLLABUS
of academic discipline
Resource science of medicinal plants

Specialty	226 Pharmacy, Industrial Pharmacy
Educational level	the second (master's) level
Educational programme	EPP "Pharmacy", 2022
Academic year	2022-2023
Department	Pharmaceutical Chemistry Department
Lecturer (if lectures are given)	Associate Professor, of HEI Candidate of Pharmaceutical Sciences Anna OCHERETNIUK
Contact information	<i>pharmchem@vnmu.edu.ua, Pirogov str., 56, tel. 55-39-54</i>
Syllabus compiler	Associate Professor, of HEI Candidate of Pharmaceutical Sciences Anna OCHERETNIUK

1. Status and structure of the discipline

Discipline status	Compulsory
Discipline code in EPP/ discipline place in EPP	CC 42/discipline of professional training
Course / semester	5 th year, IX semester
The amount of discipline (the total number of hours / number of credits ECTS)	60 hours / 2 credits ECTS
Number of content modules	2 modules
The structure of the discipline	Lectures 8 hours Practical classes 38 hours Independent work 14 hours
Language of study	English
Form of study	Full - time

2. Description of the discipline

Short annotation of the course, relevance. The discipline "Resource science of medicinal plants" belongs to the obligatory disciplines of the cycle of professionally-oriented training of specialists in the specialty 226 Pharmacy, industrial pharmacy. Resource science of medicinal plants is one of the fundamental disciplines in the system of higher pharmaceutical education, which forms the professional knowledge of a specialist. Preparations of plant origin are traditional medicines both in our country and in many others, and their use in modern medicine not only remains stable, but also tends to increase. During the study of the discipline, the modern value of the resources of individual medicinal plants will be considered, in particular with the search and accounting of plant resources for their rational exploitation and use in industrial pharmacy and medicine and other branches of the economy of Ukraine.

Prerequisites: Discipline " Resource science of medicinal plants":

a) is based on the knowledge gained by applicants in the study of Latin, pharmaceutical botany, organic, biological, analytical chemistry, biophysics, physical and colloid chemistry, normal and pathological human physiology;

b) lays the foundations for the study of pharmaceutical and toxicological chemistry, pharmacognosy, pharmacology, drug technology, clinical pharmacy, which involves the integration of teaching with these disciplines and the formation of skills to apply knowledge of pharmacognosy in further education and professional activities. As a science and academic discipline, resource science of medicinal plants plays a leading role in solving such pressing problems as the search for plant sources and the creation of effective medicines from natural raw materials, improving the quality of medicinal plant raw materials and herbal products, rational use of natural resources and others.

The purpose of the course and its significance for professional activities. The purpose of the discipline is the formation of professional knowledge and skills of a higher education (HEA) applicant of a holistic view of medicinal plants (MP), study of medicinal plant stocks and methods of their rational use. During the study of the discipline, the principles of the introduction of medicinal plants into medical and pharmaceutical practice are considered, at the expense of new researched species and the cultivation of plants of wild flora.

Mastering of the discipline will allow students to acquire, in addition to integral, the following competencies:

General (GC): GC 2, GC 3, GC 4, GC 6, GC 8, GC 9, GC 10, GC 11, GC 12.

Special (professional, subject): PC 16, PC 20.

Postrequisites. The knowledge and skills acquired during the study of the discipline will allow the future specialist, pharmaceutical worker at the appropriate level to solve complex problems and problems related to finding plant sources and creating effective medicines from natural raw

materials, improving the quality of medicinal plant raw materials and herbal remedies, rational use of natural resources, etc.

3. Learning outcomes.

To know the characteristics of medicinal plants and medicinal plant raw materials containing different groups of biologically active substances; Latin names of medicinal plants and medicinal plant raw materials; terminology, chemical and botanical nomenclature, plant taxonomy, morphology of vegetative and generative organs; regularity of accumulation of biologically active substances in medicinal plant raw materials depending on environmental factors and phases of vegetation of medicinal plants depending on the type of raw materials; physicochemical properties of the main groups of biologically active substances in medicinal plant raw materials; optimal timing of procurement of medicinal plant raw materials; frequency of operation of thickets of medicinal plants.

4. Content and logistic of the discipline

Module 1 «Rational selection of objects for resource studies. Study of cartographic material. Conducting a geobotanical description of selected associations. Rational methods of collection of medicinal plant raw materials of different morphological groups.».	IX semester 60 hours / 2 credits	Lectures № 1-4 Practical classes №№ 1-10 Topics for self- study №№ 1-10
--	-------------------------------------	---

The course includes 19 topics, which are divided into 2 content modules.

Module 1. «Rational selection of objects for resource studies. Study of cartographic material. Conducting a geobotanical description of selected associations. Rational methods of collection of medicinal plant raw materials of different morphological groups».

Topic 1 Rational selection of objects for resource studies. Compilation of the ecological and coenotic characteristics of the investigated medicinal plants. Wild plants make up the fund of exhausted renewable natural resources of the state. The raw materials of wild plants are used in various branches of the national economy. As a source of biologically active substances, the natural resources of medicinal plants meet the needs of the population and industrial enterprises in medicinal raw materials.

Topic 2. Identification of thickets of medicinal plants in the region based on literary and report data. Drawing up work routes. Description of associations, which are part of medicinal plants. During regional resource surveys, the first task of the preparatory period is the selection of medicinal plant species, the reserves of which must be determined in a given area. An inventory of resources is carried out either of all the main types of medicinal plants growing on the territory, or only of those species that are planned to be harvested in the current period.

Topic 3. Preparation of the calendar plan of resource research and preparation of the expedition route. The choice of objects of resource research determines the calendar terms of the expedition. The availability of plant growth sites, types of harvested medicinal plant material, terms of its harvesting, areas of thickets are taken into account. Before the start of field work, after

selecting the research objects, it is necessary to make a complete ecological and cenotic description of the studied medicinal plants.

Topic 4. Conducting a geobotanical description of selected associations. A geobotanical description is a documentary description of one plant group, with a precise indication of all its main features. To account for plant resources, it is necessary to learn to use the main geobotanical methods - geobotanical description and description of the place of growth and methods of accounting for quantitative relationships between plants in the phytocenosis. Geobotanical description is scientific information about all the main parameters of one plant group. The more accurate and complete the information about the time and place of the description, the environment, the peculiarities of the ecotope and the internal structure of the group, the more important, valuable and universal such a description will be, regardless of the time and purposes of its further application. A qualitatively executed geobotanical description will remain an important source of information both in a year and in 100 years. The quality of geobotanical descriptions depends not only on experience, but also on the accuracy and meticulousness of the researcher.

Topic 5. Selection of the method of evaluation of stocks of medicinal plant raw materials. Determination of stocks of medicinal plant raw materials by the method of accounting plots. The accounting area is an area of a certain size (from 0.25 m² to 10 m²), laid out within the boundaries of an industrial thicket or massif to determine the mass of raw materials, the number of plants, or the determination of projective coverage. The accounting area method is used for herbaceous plants, semi-shrubs and small bushes, in which the above-ground organs are the raw material. To determine the reserve, you need to know two values - the area of the thicket and the yield (stock of raw materials per unit area).

Topic 6. Determination of MPRM reserves by the method of model specimens. The method of calculating the possible error. A model specimen is an average raw material specimen (individual, shoot, bush, other accounting unit) of a raw plant, determined (selected) for a specific thicket or array. Model specimens are selected until the minimum and maximum value of the raw material differs by no more than 5-7 times.

Topic 7. Determination of stocks of medicinal plant raw materials by the method of projective coating. Projective coverage is the coverage of the surface of the soil with projections of aerial parts of plants, expressed as a percentage. Less than 10% - single plants, 100% - a complete close-up of plants. Projective coverage is determined squarely or with the help of a bisect (squares filled and partially filled with plants are "collected" and summed up in the frame). The accuracy of determining the projective coverage should be at least 5%.

Topic 8. Calculation of biological and operational reserves. Calculation of volumes of annual procurement. The biological reserve of raw materials is the amount of raw phytomass formed by all (marketable and non-marketable) specimens of a given species in any areas, both suitable and unsuitable for harvesting. When determining the yield, the raw materials of all marketable specimens are taken into account, but during harvesting, some of them are left for the restoration of thickets. Therefore, it is rational to calculate the operating reserve based on the lower yield limit. In some cases, the operational reserve for plants whose raw material is fruit (fruits of hawthorn, rosehip, gorse, etc.) is equal to the biological reserve. Exploitation (industrial) stock - the amount of raw phytomass, formed by marketable specimens in areas suitable for industrial harvesting.

Topic 9. Compilation of inventory information and a report on resource studies conducted in this region. The main calculations for determining the stock of raw materials are carried out after the completion of the expedition work in chamber conditions. In the process of processing expeditionary materials, the biological and operational reserves of raw materials, the amount of permissible annual use for specific massifs, individual administrative districts and regions as a whole are established. The inventory list and the summary list of plant resources are filled out, the dry raw material yield coefficient is determined, maps of raw material massifs are drawn up, and recommendations are developed for the rational procurement of medicinal plants in the region.

Topic 10. Rational methods of collecting medicinal plant raw materials of different morphological groups. Control of assimilation of the content module 1. There are rules for the procurement of medicinal plants, which provide for responsibility for the correct and rational collection and implementation of measures to preserve and increase stocks of medicinal plant raw materials. In order to preserve the raw material base, only part of its operational reserves are collected, since the complete collection of raw materials can lead to the depletion or disappearance of certain types of plants

Topic 11. Drawing up a plan for organizing the procurement of medicinal plant raw materials taking into account the rational use of resources. Development of recommendations for rational procurement of plant raw materials. Harvesting LRS is a process that includes a number of successive stages: collection of raw materials, primary processing, drying, bringing to a standard 17 state, packaging and storage. At all stages of the procurement process, the activities of procurement organizations should be aimed at preserving the BAR complex in raw materials and obtaining standard raw materials that meet the requirements of analytical and regulatory documentation (AND), as well as compliance with environmental protection measures.

Topic 12. Preparation of cartographic materials of resource studies. Mapping of places of growth and thickets of certain types of medicinal plants. For the expedition study of the resources of raw materials of wild medicinal plants, a survey route of the region should be drawn up. Since medicinal plants are elements of vegetation cover, it is most convenient to use administrative maps and maps of vegetation cover - geobotanical ones for this purpose.

Topic 13. Ecological and economic efficiency of MPRM harvesting and rational use of medicinal plant resources. The indicator of optimal stocking, which is estimated as the ratio of the value of the maximum allowable stock to the sum of such 2 values as the maximum allowable stock and recoverable reserves. A comprehensive criterion of ecological and economic efficiency of procurement is the product of ecological and economic indices of efficiency of procurement.

Topic 14. Normative and legal acts regulating the rational procurement of medicinal plant raw materials and protective measures for the preservation and reproduction of thickets of medicinal plants. Norms for the special use of natural plant resources are the permissible limits of the use of natural plant resources, taking into account the possibility of their reproduction. Norms for the use of natural plant resources of medicinal plant raw materials are approved for a period of 5-10 years by the Ministry of Ecology and Natural Resources of Ukraine (the main body of the state legislative power in the field of environmental protection) based on the materials of natural resource records of individual types of plants from which the raw materials are harvested.

Topic 15. Procurement process of medicinal plant raw materials (collection, primary processing, drying, storage, transportation). Protection of wild medicinal plants. Rules for harvesting medicinal plant raw materials: leaves, flowers, fruits, herbs, underground organs of perennial herbaceous plants. Periodicity of **MPRM** harvesting of different morphological groups. **MPRM** storage conditions. Storage groups

Topic 16. Camera processing of resource research data. The main calculations for determining the stock of raw materials are carried out after the completion of the expedition work in chamber conditions. In the process of processing expeditionary materials, the biological and operational reserves of raw materials, the amount of permissible annual use for specific massifs, individual administrative districts and regions as a whole are established. The inventory list and summary list of plant resources are filled out, the dry raw material yield coefficient is determined, maps of raw material massifs are drawn up, recommendations are developed for the rational procurement of medicinal plants

Topic 17. New sources of medicinal plant raw materials. Tissue and cell cultures of medicinal plants.

Topic 18. Methods of determining stocks of medicinal plant raw materials. Knowledge level control.

Topic 19. Final lesson - differential credit.

The topics of the lecture course reveal the problematic issues of the relevant sections of the discipline. Practical classes provide a theoretical justification of the main issues of the topic and the acquisition of the following practical skills:

know:

- ☐ types of classification of medicinal plant raw materials (chemical, pharmacological, botanical, morphological);
- ☐ resource base of medicinal plants;
- ☐ ways of finding new sources of raw materials;
- ☐ import of medicinal plant extracts and phytopreparations in Ukraine;
- ☐ phytophenological phases of plant development;
- ☐ nomenclature of medicinal plants, medicinal plant raw materials and medicinal products of plant and animal origin, approved for use in medical practice and use in industrial production;
- ☐ basic information about the distribution and place of growth of medicinal plants used in scientific medicine;
- ☐ influence of geographical and ecological factors on the productivity of medicinal plants;
- ☐ methods of macroscopic and microscopic analysis of whole, crushed, tableted and briquetted medicinal plant raw materials; fee analysis;
- ☐ morphological and anatomical features of medicinal plants and raw materials allowed for use in medical practice. Possible impurities;
- ☐ main groups of biologically active substances of natural origin and their physical and chemical properties; the main ways of biosynthesis of the main groups of biologically active substances;
- ☐ basic methods of qualitative and quantitative determination of active substances in medicinal plant raw materials; biological standardization of medicinal plant raw materials;
- ☐ numerical indicators that regulate the quality of medicinal plant raw materials and methods of their determination;
- ☐ requirements for packaging, labeling, transportation and storage of medicinal plant raw materials in accordance with NTD;
- ☐ documentation of the results of the analysis of medicinal plant raw materials; legal significance of pharmacognostic analysis;
- ☐ the main methods and forms of application of medicinal plant raw materials in pharmaceutical practice and industrial production;
- ☐ safety rules when working with medicinal plants and medicinal raw materials.
- ☐ legislative acts of Ukraine regulating the exploitation of plant resources;
- ☐ protection of medicinal plant resources.

be able to:

- ☐ identify medicinal plants in living and herbarium form by morphological features;
- ☐ to conduct resource research of medicinal plants of different morphological groups.
- ☐ rationally choose objects for research.
- ☐ to have different methods of determining the productivity of medicinal plants.
- ☐ draw up calendar plans and research routes.
- ☐ draft a plan for procurement of medicinal plant raw materials.
- ☐ carry out procurement and drying, primary processing and storage of medicinal raw materials;
- ☐ to possess the technique of macroscopic analysis of medicinal plant raw materials;
- ☐ determine the identity of medicinal plant raw materials of different morphological groups in whole, cut and powdered form, as well as in the form of briquettes, tablets, etc. forms with the help of a determiner;
- ☐ determine the composition of official medical fees;
- ☐ recognize impurities of botanically related plants during collection, acceptance and analysis of raw materials; carry out qualitative and histochemical reactions on the main groups of biologically active substances contained in medicinal plants and raw materials (polysaccharides, fatty oils, anthracene derivatives, flavonoids, coumarins, tannins, iridoids, essential oils, saponins, cardiac glycosides, alkaloids, vitamins, etc.);

- provide recommendations on the rational use of natural resources.

The student's independent work provides preparation for practical classes and intermediate tests, study of topics for independent extracurricular work, writing essays, preparation of presentations, tables. The control of mastering the topics of independent extracurricular work is carried out at the intermediate control classes and the final control of the discipline.

Individual work includes the study of scientific literature, preparation of reviews on the topics provided for presentation at the meetings of the student scientific circle, the implementation of scientific and practical researches, participation in specialized competitions, scientific and practical conferences and organization of students' research works.

Thematic plans of lectures, calendar plans of practical classes, thematic plan of independent extracurricular work, volume and directions of individual work are published on the website of the department.

The route for obtaining materials: Department of Pharmaceutical Chemistry / for students / Full-time education / (specialty 226 Pharmacy, Industrial Pharmacy) / 5th course / Educational materials / or through the link <https://www.vnmu.edu.ua/en/> department of Pharmaceutical Chemistry #. Access to the materials is carried out through the student's corporate account s000XXX@vnmu.edu.ua.

5. Forms and methods of monitoring academic performance

Current control in practical studies	Methods: <i>oral or written survey, testing, electronic survey, solving situational problems, conducting laboratory studies, interpreting them and evaluating their results (drawing up a protocol in a workbook)</i>
Control of mastering the thematic section of the discipline at intermediate control lessons	Methods: <i>oral or written survey, electronic testing, situational problem solving, control of practical skills</i>
Final control of the discipline - <i>differentiated credit</i>	Methods: <i>pre-examination testing, oral questioning</i> (according to the Regulation of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link https://www.vnmu.edu.ua/en/general-regulations)
Learning success diagnostic tools	Theoretical questions, tests, clinically-oriented situational tasks, practical tasks, practical skills demonstration

6. Assessment criteria

Knowledge assessment is carried out in accordance with the Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link <https://www.vnmu.edu.ua/en/general-regulations>)

Continuous assessment	On a four point system of traditional assessments: 5 «excellent», 4 «good», 3 «satisfactory», 2 «unsatisfactory»
Midpoint separation assessment	On a four-point system of traditional assessments
Control of practical skills	According to the four-point system of traditional assessments
Final control of the discipline	<i>Sum of points for pre-examination testing (12-20 points) and oral questioning (38-60 points) (for disciplines included in Step 1,2)</i> Exam grade:

	71-80 points - "excellent" 61-70 points - "good" 50-60 points - "satisfactory" Less than 50 points - "unsatisfactory" / did not pass
Discipline assessments:	Current academic assessment - from 72 to 120 points (conversion of the average traditional assessment of practical class on a 120-point scale): 60% of the grade for the discipline Final control - from 50 to 80 points: 40% of the grade for the discipline Individual work - from 1 to 12 points From 122 to 200 points in total.

Discipline Score Scale: National and ECTS

The sum of grades for all types of educational activities	Score ECTS	Score on a national scale	
		For exam, course project (work), practice	for credit test
180-200	A	excellent	credited
170-179,9	B	good	
160-169,9	C		
141-159,9	D	satisfactory	
122-140,99	E	satisfactory	-
120-140,99	E	-	credited
119-61	FX	unsatisfactory with the possibility of reassembly	is not credited with the possibility of reassembling
1-60	F	unsatisfactory with a mandatory reexamination of discipline	is not credited with mandatory reexamination of discipline

7. Policy of discipline / course

The student has the right to receive high-quality educational services, access to contemporary scientific and educational information, qualified advisory assistance during the study of discipline and mastering practical skills. The policy of the department during the providing of educational services is a student-centered, based on normative documents of the Ministry of Education and the Ministry of Health of Ukraine, the Statute of the University and the Procedure for the Providing of Educational Services regulated by the main principles of the organization of the educational process in National Pirogov Memorial Medical University, Vinnytsya and the principles of academic integrity (link <https://www.vnmu.edu.ua/en/general-regulations>).

Adherence to the rules of VNMU, safety techniques in practical classes.

Requirements for preparation for practical classes. Student should be present at the practical lesson on time, theoretically prepared according to the topic, adhere to the necessary for work in the laboratory form of clothing (medical gown, if necessary - hat, gloves, etc.). When performing a laboratory work, it is necessary to strictly follow the rules and safety precautions, experiments are possible only in the presence of a teacher or laboratory assistant in the classroom. Show tolerance, courtesy, tact and respect to other participants during the discussion.

Usage of mobile phones and other electronic devices. The use of electronic devices is allowed, but limited to individual cases. It is allowed to use these devices for testing on the Microsoft Teams platform, for mathematical calculations ("Calculator" function), for processing literary sources in

electronic form (agreement with teacher is required). It is forbidden to use electronic devices during classes for photo, audio and video recording without the consent of all participants of the educational process, for entertainment purposes, as well as during an oral survey.

Academic integrity. When studying the discipline, the student must be guided by the Code of Academic Integrity and Corporate Ethics of National Pirogov Memorial Medical University, Vinnytsya (link: <https://www.vnmu.edu.ua/en/general-regulations/> Code of Academic Integrity). In case of violation of the norms of academic integrity during the current and final controls student receives a grade of "2" and must work it out to his teacher in the prescribed manner within two weeks after receiving an unsatisfactory assessment).

Missed classes. Missed classes are working out in the manner prescribed by Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link <https://www.vnmu.edu.ua/en/general-regulations/>) at the time of work out schedule (published on the website of the department <https://www.vnmu.edu.ua/> department of Pharmaceutical Chemistry #) to the teacher on duty. To work out missed lesson student must provide permission from the dean's office, pass multiple choice questions (MCQ) on a missed topic and oral questioning, work out laboratory work (if the latter is in a particular topic), draw up a laboratory report and defend it to the teacher on duty.

Note. To ensure the completion of the laboratory works, it is necessary to apply in advance to the laboratory assistant of pharmaceutical chemistry department and indicate the topic and specific date of rework to prepare the necessary reagents, laboratory utensils, etc.

The reworks of missed lectures are carried out to the lecturer of the subject, with the permission of the dean, the abstract of the lecture, a short survey on the topic of the lecture is possible.

The procedure for admission to the discipline final control is given in the Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link <https://www.vnmu.edu.ua/en/general-regulations>). To the final control allowed students who do not have missed practical classes and lectures and received an average traditional grade of at least "3".

Additional points. Individual points in the discipline (from 1 to 12) that student can receive for individual work, the amount of which is published on the website of the department in the educational methodical materials of the discipline, the number of points is determined by the results of IRS according to Regulation of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link <https://www.vnmu.edu.ua/en/general-regulations>).

Conflict resolution. In case of misunderstandings and complaints to the teacher because of the quality of educational services, knowledge assessment and other conflict situations, student should submit his / her claims to the teacher. If the issue is not resolved, the student has the right to apply to the head of the department according to Complaints Consideration Procedure in VNMU named after M.I. Pirogov (link <https://www.vnmu.edu.ua/en/general-regulations>)

Politics in terms of remote learning. Distance learning regulated by the Regulations of the elements of remote learning in National Pirogov Memorial Medical University, Vinnytsya (<https://www.vnmu.edu.ua/> General information). The main training platforms for studying are Microsoft Team and Google Meets. Practical classes and lectures, exercises and consultations during distance learning is published on the website of the department ([https://www.vnmu.edu.ua/en/ Department of Pharmaceutical Chemistry / to Students or](https://www.vnmu.edu.ua/en/Department of Pharmaceutical Chemistry / to Students or) <https://www.vnmu.edu.ua/en/Department of Pharmaceutical Chemistry / News>).

Feedback from teachers is via messengers (Viber, Telegram, WhatsApp) or e-mail (at the teacher's choice) during working hours.

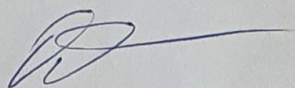
1. Educational resources.

Educational and methodological support of the discipline is published on the website of the department ([https://www.vnmu.edu.ua/ en/ department of Pharmaceutical Chemistry / for students](https://www.vnmu.edu.ua/en/department of Pharmaceutical Chemistry / for students)). Consultations are held twice a week according to the schedule.

2. **The timetable and distribution of groups** with assigned teachers are published on the web page of the department ((<https://www.vnmueu.ua> /en/ department of Pharmaceutical Chemistry / for students).
3. Questions to the intermediate and final semester control (credit) of the discipline are published on the web page of the department (<https://www.vnmueu.ua> / en/ department of Pharmaceutical Chemistry / for students).

The syllabus of the discipline " Resource science of medicinal plants " was discussed and approved at the meeting of the department of Pharmaceutical Chemistry (record №1, dated "01" September 2022)

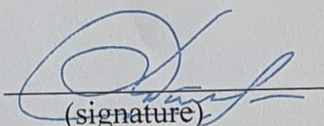
Responsible for the academic
discipline



(signature)

Assoc. Prof. of HEI
Anna OCHERETNIUK

Head of the department



(signature)

Assoc. Prof. of HEI
Tetiana YUSHCHENKO