MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
ODESSA I.I. Mechnikov NATIONAL UNIVERSITY
Department of mathematical support of computer systems

"APPROVED"
Vice-rector for scientific and pedagogical work

_____ 20___

WORKING PROGRAM OF EDUCATIONAL COURSE

OK12 *"Professional research practice"*
(course name)

Level of higher education _____Second (master's)_____

Field of knowledge _____12 – Information technologies_____

Specialty _____126 – Information systems and technologies_____
(code and name of specialty)

Educational and professional program _____Information systems and technologies_____
(EPP/ESP name)

ONU - 2022

Working program of the study course "Professional-research practice". – Odesa: ONU, 2022. – 13 p.
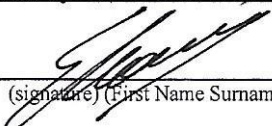

Developers:
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The work program was approved at the meeting of the Department of Mathematical Support of Computer Systems

Protocol No. _1_ from "_25_" ____08____ – 20_22_year

Head of the department _____ (_Eugene MALAKHOV_)
    (signature) (First Name Surname)

Agreed with the guarantor of the EPP _"Information systems and technologies"_

_____ (_Eugene MALAKHOV_)
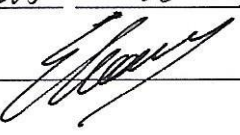   (signature) (First Name Surname)

Approved by the educational and methodological commission (EMC) for IT specialties of the FMPhIT

Protocol No. _1_ from "_31_" ____08____ 20_22_year

Head of EMC _____ (_Alla Rachynska_)
    (signature) (First Name Surname)

Reviewed and approved at the meeting of the department _____

Protocol No. _1_ from "_29_" ____08____ – 20_23_ year

Head of Department _____ (_____)
(signature) (First Name Surname)

Reviewed and approved at the meeting of the department _____

Protocol No. ___ from "____" _____20__ year

Head of Department _____ (_____)
    (signature) (First Name Surname)

1 Description of the academic discipline

Name of indicators	Field of knowledge, specialty, specialization, level of higher education	Characteristics of the academic discipline	
		full-time education	*external form of education*
The total number of: credits - 6 hours - 180 content modules - 3	Branch of knowledge 12 - Information technologies Specialty 126 – Information systems and technologies Level of higher education: *Second (master's)*	*Mandatory*	
		Year of preparation:	
		2nd	
		Semester	
		1st	
		Lectures	
		Practical, seminar	
		Laboratory	
		48 hours	16 hours
		Independent work	
		132 hours	164 hours
		Final control form: credit	

* - in the presence

2   Introduction

Professional research practice of masters is a mandatory component of the educational and professional program for obtaining the master's qualification level in the relevant specialty and aims at the student's acquisition of professional skills and abilities related to independent professional and research work.

Professional and research practice is formed in accordance with the educational and professional program "Information systems and technologies» preparation of master's degrees in the specialty 126 – Information systems and technologies and is one of the main elements of the educational process.

Professional and research practice is final in the cycle of practical training master to independent professional and research activity Therefore in an important prerequisite for a successful internship is the study of professionally oriented disciplines by students. If the theoretical preparation of the master's degree is determined by the disciplines of the normative and selective parts of the curriculum, then its practical training is provided by practice, preparation and defense of the qualification work.

It is conducted on practice bases (enterprises, organizations, institutions and their divisions).

Professional research practice is built in the form of independent performance by the student of the general and individual tasks defined by the program in accordance with the established goals and tasks of the performance of qualification work in real conditions. The integration of general and professional education not only contributes to a significant increase in motivation to acquire knowledge and the formation of relevant competencies, but is also a stimulus for the innovative content of education as a whole.

This program deals with general issues of organizing, conducting and summarizing professional research practices of students.

3   Purpose and tasks of practice

The purpose of the professional research practice is deepening, consolidating and applying the acquired knowledge of a master's student, acquiring skills in practical and research work together with professional researchers in the field of information analysis, development of information technologies and their implementation in the development of information systems and control systems, approbation of research results on real data, as well as to clarify the content of the qualification work.

Writing qualification work involves the student's collection, systematization and independent analysis of information about phenomena and processes related to information technologies, the development or improvement of mathematical methods and information technologies, as well as the formation and development of conclusions of a theoretical and applied nature.

In the specialty 126 "Information systems and technologies" at the faculty of MFIT, it has been implemented two training lines:

– data mining,
– information technologies in mechanics.

Task of the professional research practice

а) is defined task for qualifying work:

– examination of the subject area (object of research) and setting a task for research;

– analysis of existing methods and technologies designed to solve similar problems;

– development of new or improvement of existing methods of solving problems, as well as information technologies based on these methods;

– development of an information system or software modules that implement the proposed methods and technologies and ensure their approbation on real data;

б) provides:

– familiarization with the activities of the practice base and its divisions, which provide information analysis and information support for decision-making;

– familiarization with the problems of the subject area of the practice base;

– mastering skills in collecting, analyzing information and presenting research results;

– studying the experience of creating and applying specific modern information technologies and information support systems for solving the problems of organizational and managerial activities of the practice base.

Competences of the student, which are formed as a result of the internship (according to the OPP "Information Systems and Technologies" from 2022):

а) general:

ZK02. Ability to communicate in a foreign language.

ZK05. The ability to evaluate and ensure the quality of the work performed.

б) special (professional):

SK01. Ability to develop and apply IST necessary for solving strategic and current tasks.

SK03. Ability to design information systems taking into account the specifics of their purpose, incomplete/insufficient information and conflicting requirements.

Depending on the topic of the qualification work, professional research practice is aimed at the formation of other special competencies.

Program learning outcomes:

PH01. Search for necessary information in scientific and technical literature, databases, other sources, analyze and evaluate this information.

PH02. Communicate freely in national and foreign languages in scientific, industrial and social spheres of activity.

PH06. Justify the choice of technical and software solutions, taking into account their interaction and potential impact on solving organizational problems, organize their implementation and use.

RNM02. Choose the most expedient for the company option of organizing the marketing of software products and present in general the sequence of works on the organization and functioning of any channel for the sale of software products and information technologies.

Professional research practice allows to improve other program learning outcomes taking into account the topic of the qualification work.

4 Organization conduct and content of practice
4.1 Organizational conditions of practice

Before entering the professional research practice, the student must pass:
– instruction on practice technology;
– safety training;
– receive tasks from the manager.

The distribution of students for practice is carried out by the graduation department after the preliminary assignment of the topics of qualifying papers.

Students who have entered into contracts (agreements) with the enterprise for employment undergo professional research practice at the place of contracting.

Students who do not have employment contracts undergo internships at the departments of MZKS, MAIT or enterprises that are able to provide high-quality internships according to its program and have expressed their consent to internships for the purpose of selecting students from interns for employment.

In order for professional research practice to be organized, it must correspond to the study profile. Bases of professional and research practice of students of the master's degree in the specialty 126 "Information systems and technologies" can be:
– IT companies;
– production enterprises of state, communal and private ownership;
– state institutions and organizations;
– banking institutions;
– schools.

The distribution of students according to the place of practice takes place taking into account the individual learning trajectory (previous experience of conducting scientific research work, subject of qualification work, acquired experience of practical and research activities under other circumstances). Taking into account the specifics of the place of passage professional and research practice, the practice manager from university formulates an individual task for each student.

During the internship, students should strictly follow the rules of labor protection and fire safety adopted at the enterprise, with mandatory briefings (introductory and at each specific place of work).

The distribution of students according to the places of practice takes place according to the decision of the department, which is approved by the Academic Council of the faculty and the order of the rector.

A student who is assigned to professional research internship under a one-time agreement, provides a second copy of the one-time agreement, signed by the head of the enterprise/institution and certified with a seal, before the beginning of the internship.

4.2 Practice content

The practice is designed to form the student's professional skills, the skills of making independent decisions in a specific area of work in real, industrial conditions by performing the duties inherent in their future professional activity.

The set goals are realized through independent study of production and performance by each student in the conditions of the enterprise of individual production tasks required by the program.

During your stay at professional research in practice, students should make the most of the opportunity to gain practical experience. For this purpose, the student fills out a diary of industrial practice, indicating the types of work, tasks performed on the instructions of the head of practice from the enterprise.

Contents of practice:
– acquisition of practical knowledge and skills by specialty in specific positions;
– familiarization with new achievements in the field of information technologies, software;
– work with reference literature, collection and systematization of materials for qualification work;
– application and exploitation of modern information technologies in the work of the enterprise;
– application of system analysis to the selected object or process of computerization, analysis of the subject area, development or improvement of methods and technologies intended for solving the problems of the subject area;
– approbation of the results of master's research on real data of a certain subject area;
– familiarization with the nomenclature and content of regulatory and technical documentation for the development and support of software intelligent information processing and decision-making systems;

– analysis and improvement of existing technical and software means of information protection at the enterprise against unauthorized access;

– development and introduction of means of increasing the reliability of processing and saving information.

Practice thematic plan, the main types of work and the terms of their execution are given in the table

No	Stage and content of the work	Number hours
1	Clarifying the statement of the problem. As a result of the examination of the object of research, the graduate must name those questions that remained unresolved in the field of information systems and technologies, therefore, determine his place in solving the problem of improving methods and technologies for solving problems in the subject area of the object of research; familiarize yourself with the literature and other sources of information on the subject area of the research object. It is desirable to end this section with a short summary regarding the relevance of improving methods and information technologies with the formulation of a research problem.	50
2	Final analysis of existing methods and information technologies, focused on solving the actual problem formulated in a certain subject area. Formulation of conclusions regarding the need to improve methods and technologies.	50
3	Creation of an information system or software modules for approbation of developed or improved methods and information technologies using datasets of the practice base.	70
4	Formulation of conclusions regarding the effectiveness of the developed methods and information technologies, prospects for their implementation and improvement.	10
	In total	180

4.3 Requirements for a report on professional research practice

Based on the results of practice, students prepare a report on practice, signed and evaluated directly by the head of the practice base and, together with the diary, submit it to the head of the department for review. The report may include appendices that provide illustrative materials, drawings, graphs, copies of documents, etc. The main part of the report contains a description and results of all sections of the practice program and individual assignment. At the same time, there should be references to illustrative

materials supplementing the report. The conclusions and proposals reflect the results of the individual task, the chosen approaches to its solution, the used design technologies and the creation of software modules of the system, the obtained results.

The entire text of the practice report must be prepared in accordance with the requirements of the "Methodical instructions for the preparation of diploma and course theses".

The recommended literature should indicate the sources that reveal the issues of the subject area under analysis.

4.4 Practice calendar schedule

No	Types of work	Number
1	Acquaintance with the activity, structure, organizational principles of the place of practice	3 working days
2	Practical activity	2 weeks
3	Keeping a practice diary	during practice
4	Collection, processing and analysis of information in accordance with the assigned task	during practice
5	Development of an applied field for testing the research results	during practice
6	Approbation of the research results on the data of the practice base	1 week
7	Preparation of a report, an analytical note	during practice
8	Obtaining a description with an assessment for practice from the head of the institution, return of literature, property of the institution	2 working days

5 Forms and methods of control

Traffic control professional and research practices are carried out by a practice supervisor from a higher education institution and a practice supervisor from an enterprise/institution.

Upon completion professional and research internships, the student submits to the head of the university:

1) practice diary, signed by the head of practice from the enterprise and certified by the enterprise with a seal.

In the diary, the scope of work that was performed during the internship is noted, the intern's attitude to the performance of assignments and duties is characterized, and the ability to work independently is noted.

2) progress report professional and research practice

The report should include a description of the subject area of the study, the relevance of the study, analysis and conclusions regarding the existing methods and technologies for solving the problems of a certain subject area, proposals for their improvement.

The distribution of points for professional research practice is given in the table

Assessment of practice by the manager from the enterprise	Completeness and correctness of practice tasks and quality, preparation of the report	Student defense of the practicum report	Sum
30	30	40	100

6 Evaluation criteria

At the end of the internship, the student submits to the department a report on the internship, a diary of the internship with a description issued by the supervisor of the internship from the enterprise/institution.

During the assessment, students defend their reports before a committee appointed by the head of the department. The defense includes an oral report, presentation of graphic materials.

Based on the results of the presented report and its defense, the student receives a grade of the professional research practice on a 100-point scale.

The results of production practice are evaluated on:

"excellent" (from 90 to 100 points), if the student constantly worked at the workplace during the internship and completed all the tasks of the internship, provided appropriately prepared documentation and a thorough report on time; there is a positive characteristic of the management of the enterprise/institution regarding its work; during the defense of practice results, the student is fluent in the material and answers all the questions.

"good" (from 75 to 89 points), if the student constantly worked at the workplace during the internship, completed the internship tasks, but not in full for individual tasks, there is a positive characteristic of the management of the enterprise/institution that accepted the student for internship; the student knows the material and answers most of the questions during the defense of practice results;

"satisfactory" (from 60 to 74 points), if the student worked at the enterprise, but there were comments and complaints from the management regarding conscientiousness or timely completion of assignments; the student submitted the report documentation on time, but the diary and the report indicate a low level of performance of practice tasks;

the student orients himself in the material and answers questions during the defense of practice results;

"unsatisfactory" and the industrial practice is considered not credited (59 points or less) if the student actually did not work at the enterprise without valid reasons or showed indiscipline, did not perform the tasks and instructions of the management, the practical tasks were not completed, the reporting documentation was presented in an incomplete volume, the characteristic on the student under the signature of the head of the enterprise/institution is absent or negative; the student has little or no orientation in the material and does not answer questions during the defense of practice results.

According to the results of the defense, a differentiated assessment is given, which is entered in the student's credit report and credit book under the signature of the head of practice from the department.

7 Methodical support

1. Program of professional research practice.
2. Guidelines for the execution and drawing up of qualification works for specialties of the branch 12 "Information technologies" in the Odesa I.I. Mechnikov National University/ Malakhov E.V., Gunchenko Yu.O., Voloshchuk L.A., Roznovets O.I., Trubina N.F. // Approved by EMC for IT specialties of FMFIT ONU I.I. Mechnikov (minutes No. 3 dated 03/17/2021). - ONU, 2021. - 38 p.
3. Materials and instructions on safety technology (departmental and in each practice base institution), statutes and internal work procedures of practice bases.
4. Textbooks and study guides, periodical and Internet sources, library materials.

8 Recommended Books
8.1 Basic literature

1. DSTU 3008:2015. Information and documentation. Reports in the field of science and technology. Structure and design rules. - K.: SE "UkrNDNC", 2016. - 26 p.
2. DSTU GOST 7.1:2006. Bibliographic record, bibliographic description. General requirements and rules of composition: method. recommendations on proceedings / concluded by Halevich O.K., Shtogrin I.M. - Lviv, 2008. -20 p.
3. DSTU2.105-95 - EUSKD. General requirements for text documents.
4. Vitchenko A. O., Vitchenko A. Yu. Basics of scientific research in higher education: tutorial. - Kyiv: FOP Yamchynskyi O.V., 2020. - 272 p.
5. Doumont, J., ed. English Communication for Scientists. Cambridge, MA: NPG Education, 2010. - Access mode: https://www.nature.com/scitable/ebooks/english-communication-for-scientists-14053993/. – Updated: January 17, 2014.

6. Wortman-Wunder, Emily, & Kate Kiefer. (1998). Writing the Scientific Paper. – Writing@CSU. Colorado State University. - Access mode: https://writing.colostate.edu/guides/guide.cfm?guideid=83

7. Designing information systems: Manual/ Ed. V.S. Ponomarenka K.: Academy, 2002. - 488 p. (Alma mater).

8. Priymak V.M. Project management: A study guide. - K.: Kyiv National University named after Taras Shevchenko, 2017. - 464p.

9. Katrenko A.V. IT project management. Book 1. Standards, models and methods of project management. - Kyiv: KNEU, 2011.

8.2 Auxiliary literature

1. T. Connolly, C. Begg, Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition / Pearson, 2014. - 1440 p.

2. Maklakov S.V. BPwin and ERwin. CASE-tools for the development of information systems. - Moscow: Dialog-MYFI, 2000. - 256 p.

3. Troelsen E. C# 7 programming language and .NET and .NET Core platforms, 8th edition. / trans. with English - - Apress; St. Petersburg: Dialektika, 2018 — 1328 p.

4. Troelsen E. C#2010 programming language and .NET 4.0 platform; / trans. with English – M.: LLC "Y.D. Viljams", 2011 – 1392 p.

5. Naigel K. C# 5.0 and the .NET 4.5 platform for professionals / - M.: "Williams" 2013. - 1440 p.

6. Steven Sanderson ASP.NET MVC Framework with C# examples for professionals / - M: "Williams" 2010. -1230 p.

7. Tuzovsky, A.F. Design and development of web applications: Yurayt Publishing House, 2017. — 218 p. – Access mode in Ukrainian: https://stud.com.ua/97571/informatika/proektuvannya_i_rozrobka_web-dodatkiv

8. Beekeeper V.V. Web design. Education textbook. Approved by the Ministry of Education and Culture of Ukraine, Magnolia 2006 Publishing House, Lviv, 2012 – 518 p.

9. Birta G. O. Methodology and organization of scientific research. [text] : education manual / G.O. Birta, Y.G. K. Burgu: "Center for Educational Literature", 2014. - 142 p.

10. Sydorenko V.K. Basics of scientific research: Textbook / V.K. Sydorenko, P.V. Dmytrenko. - K.: RNNC DINIT, 2000. - 260 p.

8.3 Electronic information resources

1. National V.I. Vernadsky Library of Ukraine [Electronic resource] / Access mode: http://www.irbis-nbuv.gov.ua/cgi-bin/irbis64r_81/

2. OMG standard developer site [Electronic resource] / Access mode: http://www.omg.org.
3. Digital library of the Faculty of Electronics of NTTU "KPI" [Electronic resource] / Access mode: http://fel.kpi.ua/
4. Electronic scientific archive of Lviv Polytechnic National University [Electronic resource] / Access mode: http://ena.lp.edu.ua