National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Department of Geoengineering

Scientific Work on the Topic of Master's Thesis. Part 1. Fundamentals of the scientific research

Working program of the academic discipline (Syllabus)

Details of the academic discipline

Level of higher education	***Second (master's)***
Branch of knowledge	*18 Production and technologies*
Specialty	*184 Mining*
Educational program	*Geoengineering*
Discipline status	*Normative*
Form of education	*Intramural (daytime)/full-time (evening)/ extramural/distance/mixed*
Year of training, semester	*1 year of study, 1 semester*
Scope of the discipline	*2 credits / 60 hours (lectures - 9, practical - 18, IWS - 33)*
Semester control/ control measures	*Credit*
Lessons schedule	*http://rozklad.kpi.ua/*
Language of teaching	*Ukrainian/English*
Information about head of the course / teachers	*Lecturer: Doctor of Technical Sciences, Professor Oksana Vovk, Doctor of Technical Sciences, Associate Professor Oksana Tverda* *Practical training: Doctor of Technical Sciences, Professor Oksana Vovk, Doctor of Technical Sciences, Associate Professor Oksana Tverda*
Placement of the course	*Google Classroom (Google G Suite for Education, domain LLL.kpi.ua, platform Sikorsky-distance); access by invitation of the teacher*

Program of educational discipline

1. Description of the academic discipline, its purpose, subject of study and learning results

The teaching of the educational component "Scientific Work on the Topic of Master's Thesis. Part 1. Fundamentals of scientific research" (FSR) is determined by the fact that the development of the industry and technology with a separate direction of development of the underground space of urbanized territories requires specialists who possess not only professional knowledge, but and quite strong skills and abilities of a creative researcher.

The main task of the educational component is to teach students to use typical methods of scientific research to plan an experiment, process the received data, and evaluate the effectiveness of research works.

The educational material of the educational component of the FSR is based on the knowledge of the normative disciplines of bachelor's training and is the basis for the formation of the scientific component during the work on the master's thesis.

The goal of the discipline *is the formation of program competencies in students and the formation of program learning results for the preparation and writing of scientific works for publication in periodical specialized publications, or for defense as qualifying works for acquisition of certain knowledge:*

3K2. The ability to communicate with specialists and experts of various levels in other fields of knowledge.

3K4. The ability to act socially responsibly and consciously.

PH2. Communicate freely with specialists and experts of various levels in other fields of knowledge;

PH12. Implement general principles of complex optimization during project development

2. Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to the relevant educational program)

In order to successfully master the discipline, the student must have basic knowledge of mandatory components, including "Intellectual property and patent science", "Basics of engineering and technologies of sustainable development". The educational component of the FSR is the basis for writing and preparing a master's thesis.

3. Content of the academic discipline

TOPIC 1. *ORGANIZATION OF SCIENTIFIC RESEARCH Algorithms of the scientific research process. Problem selection and general requirements for the research topic. Specification of the research problem. Methods of planning scientific research.*

TOPIC 2. *INFORMATION BASE OF SCIENTIFIC RESEARCH The role of information in scientific research. Classification of scientific documents. Types, structure and purpose of scientific documents, areas of their creation and use. Patterns of growth, disposal and aging of scientific documents. Information provision of the research process and principles of information material collection. Global network Internet.*

TOPIC 3. *EXPERIMENTAL STAGE OF THE SCIENTIFIC RESEARCH PROCESS Creation of new (innovative) information as a result of observation, experiments, empirical-theoretical generalizations, etc., aimed at obtaining initial information about the object or subject of research. Carrying out research using empirical and theoretical methods. The final stage of the research process. Stages of implementation of the results of innovative research.*

TOPIC 4. *STANDARDS FOR THE FORMATION OF SCIENTIFIC WORKS Standards of Ukraine for qualifying scientific works for obtaining a certain academic title. Rules of Igor Sikorsky Kyiv Polytechnic Institute for the preparation of his master's thesis. Peculiarities of design of scientific publications in various specialized publications. Standards and rules for writing literary references. Peculiarities of copyright application when writing scientific works.*

TOPIC 5. *METHODOLOGY OF THE PREPARATION AND DEFENSE OF A MASTER'S SCIENTIFIC AND RESEARCH WORK Concept (general provisions) and meaning of a master's scientific and research work (dissertation). Determination and substantiation of relevance, competitive ability, scientific, social, economic, ecological, defense, innovative value of the conducted research. Structure of work. Rules of design of work. Generalization and approval (or implementation) of the results of scientific research. Submission of the finished work for consideration by the department (scientific department). Reviewing of completed research work. Preparation for defense. The procedure for defending a master's research work (dissertation). Text similarity check (plagiarism check).*

4. Educational materials and resources

Basic literature

1. *Andrews G. Writing Your Dissertation Literature Review: A Step-by-Step Guide (Essay and Thesis Writing Book 8). 2018.*
2. *Beins B., McCarthy M. Research Methods and Statistics. Cambridge University Press, 2018.*
3. *Hofmann A. Scientific Writing and Communication: Papers, Proposals and Presentations. Oxford University Press, 2017.*
4. *Gastel B. How to Write and Publish a Scientific Paper. USA, 2016*
5. *Reshetnyak, O. I. (2019), "Foresight methods in the management of scientific and technological development", Efektyvna ekonomika, [Online], vol. 12, available at: http://www.economy.nayka.com.ua/?op=1&z=7492 (Accessed 19 Jan 2020). DOI: 10.32702/2307-2105-2019.12.67*
6. *Scientific and technological foresight from society to research. National Research Council of Italy, 2018. URL: http://www.foresight.cnr.it/reports (дата звернення 14.01.2022).*

Literature, the bibliography of which is provided with a link, can be found on the Internet. Literature, the bibliography of which does not contain references, can be found in the library of Igor Sikorsky Kyiv Polytechnic Institute.

Educational content

5. Methods of mastering an educational discipline (educational component)

Lecture classes

Conducting lectures on the discipline "Scientific Work on the Topic of Master's Thesis. Part 1. Fundamentals of scientific research" is conducted in parallel with the consideration of issues submitted for independent work. When conducting lectures, video conferencing tools (Zoom, Google Meet, etc.) and illustrative material in the form of presentations are used, which are placed on the Sikorsky-distance platform. After each lecture, it is recommended to familiarize yourself with the materials recommended for independent study, and before the next lecture, repeat the material of the previous one.

	The name of the topic of the lecture and a list of main questions
1	*Topic 1. Algorithms of the scientific research process.* *Problem selection and general requirements for the research topic. Specification of the research problem. Methods of planning scientific research.*
2	*Topic 2. The role of information in scientific research.* *Classification of scientific documents. Types, structure and purpose of scientific documents, areas of their creation and use. Patterns of growth, disposal and aging of scientific documents.*
3	*Topic 2. Information provision of the research process and principles of information material collection.* *Review of literary sources on the research topic. Global network Internet.*
4	*Topic 2. Creation of innovative information.* *Creation of new (innovative) information as a result of observation, experiments, empirical-theoretical generalizations, etc., aimed at obtaining initial information about the object or subject of research.*
5	*Topic 3. Stages of implementation of research results.* *Carrying out research using empirical and theoretical methods. The final stage of the research process. Stages of implementation of the results of innovative research.*
6	*Topic 3. Acquiring the ability to substantiate the relevance and competitiveness of research work. Concept (general provisions) and meaning of a master's scientific and research work (dissertation). Determination and substantiation of relevance, competitive ability, scientific, social, economic, ecological, defense, innovative value of the conducted research.*
7	*Topic 4. Structure of work.* *Rules of design of work. Generalization and approval (or implementation) of the results of scientific research. Submission of the finished work for consideration by the department (scientific department). Reviewing of completed research work. Check for plagiarism. Preparation for defense. The procedure for defending a master's research work (dissertation). Text similarity check (plagiarism check).*
8	*Topic 4. Structure of scientific research work and standards of presentation of results in scientific works.* *Rules for submitting results in scientific papers. Standards and rules for writing literary references. Peculiarities of copyright application when writing scientific works. Preparation of the title and detailed plan of the scientific publication in view of the differences in the presentation of results: text, tables, system of equations. Stylistics of scientific works depending on the purpose and form of presentation of results.*
9	*Topic 5. Preparation of a literature review and design rules according to international standards* *Referencing literary sources and preparing a literature review. Introduction and conclusions as independent parts of scientific work, and scientific novelty and practical significance as its quintessence.*
	The total number of hours is 9

Practical classes

The main tasks of the cycle of practical classes are to teach students to use previously acquired knowledge for the ability to analyze scientific and research findings, to be able to conduct scientific research with a creative component, to be familiar with the standards of design of results for publication.

№	*Name of the subject of the lesson*	**Number of hours**
1	*Standards for the design of scientific works for promulgation and publication in professional and scientometric (Scopus) publications.*	3
2	*Collection of information material (patent search, foreign and national review of literary sources on the research topic) for information support of the research process.*	3
3	*Preparation of the title and detailed plan of a scientific publication, taking into account the differences in the presentation of results: text, tables, a system of equations or a figure.*	3
4	*Stylistics of scientific works depending on the purpose and form of presentation of results. Referencing literary sources and preparing a literature review.*	3
5	*Structure of work. Introduction and conclusions as independent parts of scientific work, scientific novelty and practical significance as its quintessence. Writing a research work with a volume limit according to design standards.*	3
6	*Presentation of scientific results at conferences.*	3
	The total number of hours	18

6. Independent work of a student/graduate student

The independent work of students (IWS) during the semester includes repeating the lecture material, preparing for practical tasks and preparing for the credit. The recommended number of hours allocated to preparation for the specified types of work:

Type of IWS	***Number of training hours***
Preparation for classroom classes: repetition of lecture material; preparation for practical tasks	*1-2 hours per week*
State standards of Ukraine for scientific reports	*2*
Requirements of the Ministry of Education and Science of Ukraine for scientific works	*2*
Examples of presentations at scientific conferences based on data from the Internet	*2*
Examples of design theses of reports on one page	*2*
Examples of design of the content of scientific reports and dissertations	*2*
Compare the style of writing scientific articles at the beginning of the 20th and 21st centuries	*2*
Requirements for review of literature according to the requirements of the Ministry of Education and Science of Ukraine and design of literature according to the requirements of the standards	*2*
Examples of introductions and conclusions from publications in professional publications	*2*
Preparation for the credit	*3*
Total on IWS	***33***

Policy and control

7. Policy of academic discipline (educational component)

In the normal mode of work of the university, lectures and practical classes are conducted in classrooms. In a mixed mode, lectures and practical classes are conducted through the Sikorsky distance learning platform. In remote mode, all classes are conducted via the Sikorsky distance learning platform or ZOOM. At the time of each lesson, both lecture and practical, the student must have the Zoom application installed on the device from which he works (in the case of distance learning), and the course "Scientific Work on the Topic of Master's Thesis. Part 1. Fundamentals of scientific research" on the "Sikorsky" platform (the access code to the course is provided at the first lesson according to the schedule) must be open. Syllabus; lecture material; assignments for practical classes are posted on the "Sikorsky" platform and in the "KPI Electronic Campus" system.

During the course "Scientific Work on the Topic of Master's Thesis. Part 1. Fundamentals of scientific research" students are obliged to adhere to the general moral principles and rules of ethical behavior specified in the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".

The deadlines for the completion of each task are specified in the course "Scientific Work on the Topic of Master's Thesis. Part 1. Fundamentals of scientific research" on the Sikorsky platform.

All students, without exception, are obliged to comply with the requirements of the Regulations on the Academic Plagiarism Prevention System at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".

For writing an article and its publication, the student is awarded 10 points (edition included in Scopus or Web of Science) or 6 points (professional publication of Ukraine). 5 points for publication of report abstracts at a scientific conference. The total amount of incentive points cannot exceed 10 points.

8. Types of control and rating system for evaluating learning results (RSE)

Current control: *tasks within the framework of a practical lesson (6 practical lessons × 10 points = 60 points) and performance of an individual creative task within the framework of the SRS (40 points).*

Tasks within the framework of a practical lesson are evaluated of 10 points according to the following criteria:

– "excellent" - a complete answer (at least 90% of the required information), appropriate justifications and a personal opinion are provided - 10 points;

– "very good" - sufficiently complete answer (at least 80% of the required information), provided justification - 9 points;

– "good" - a sufficiently complete answer (at least 70% of the required information), which is completed in accordance with the requirements for the "skills" level or contains minor inaccuracies - 8 points;

– "satisfactory" - an incomplete answer (at least 60% of the required information), completed in accordance with the requirements for the "stereotype" level and containing some errors - 6 points.

An individual creative task within the SRS (40 points) takes into account:

1) quality of training, relevance and scientific novelty - 20 points;

2) the ability to present and master the direction of research - 10 points;

3) the ability to communicate with specialists at the scientific level - 10 points.

and are evaluated according to the following criteria:

– "excellent" - a complete answer (at least 90% of the required information), relevant justifications and a personal opinion are provided - 36-40 points;

– "very good" - sufficiently complete answer (at least 80% of the required information), provided justifications - 32-35 points;

– "good" - a sufficiently complete answer (at least 70% of the required information), which is completed in accordance with the requirements for the "skills" level or contains minor inaccuracies - 27-31 points;

– *"satisfactory" - an incomplete answer (at least 60% of the required information), completed in accordance with the requirements for the "stereotype" level and containing some errors - 18-26 points.*

Calendar control: *is conducted twice a semester as a monitoring of the current state of fulfillment of the syllabus requirements. The condition for a positive first and second calendar control is to obtain at least 50% of the maximum possible rating at the time of the corresponding calendar control.*

Semester control: *credit. Conditions for admission to the semester control: all practical work has been completed and credited.*

Students who have met all the credit requirements and have a rating of 60 or more points receive a rating corresponding to the rating without additional tests. The sum of the rating points received by the student during the semester is transferred to the final grade according to the table.

If the sum of points is less than 60, the student completes a credit test. In this case, the sum of the points for the practical and for the credit control work is transferred to the final grade according to the table.

A student who received more than 60 points in the semester, but wants to improve his result, can take part in a credit test. In this case, the final result consists of the points obtained on the final test and the points of the practical work.

The credit control work is estimated at 78 points. The control task of this work consists of three theoretical questions from the list provided in the appendix to the syllabus.

Each question is evaluated in 26 points according to the following criteria:

– *"excellent" - a complete answer (at least 90% of the required information), relevant justifications and a personal opinion are provided - 26 - 24 points;*

– *"very good" - sufficiently complete answer (at least 80% of the required information),), provided justifications - 24-22 points;*

– *"good" - a sufficiently complete answer (at least 75% of the required information), which is completed in accordance with the requirements for the "skills" level or contains minor inaccuracies - 22 - 20 points;*

– *"satisfactory" - an incomplete answer (at least 60% of the required information), completed in accordance with the requirements for the "stereotype" level and containing some errors - 19 - 16 points.*

For extramural education

Current control: *the evaluation criteria are similar to those for intramural education and are given above.*

Semester control: *credit. Conditions for admission to semester control: completed and credited practical work.*

Students who have fulfilled the conditions for admission to the credit, perform the credit control work. The sum of all points is transferred to the final grade according to the table.

Credit control work is estimated at 78 points as for intramural education. The evaluation criteria are given above.

Table of correspondence of rating points to grades on the university scale:

Number of points	***Estimate***
100-95	Excellent
94-85	Very good
84-75	Good
74-65	Satisfactorily
64-60	Sufficiently
Less than 60	Unsatisfactorily
Admission conditions not met	Not allowed

9. Additional information on the discipline (educational component)

A student of higher education has the opportunity to take online course(s) on one or more topics provided by the work program of the educational component of the FSR. The student can choose an online course independently or on the recommendation of a teacher. 1 hour of the course is valued at 0.83 points. The maximum number of hours that can be credited based on the results of non-formal education is 12 hours, accordingly the maximum number of points for such results is 10 points.

Working program of the academic discipline (syllabus):

Compiled by Professor, Doctor of Technical Sciences, Vovk Oksana Oleksiivna

Approved by the Department of Geoengineering

Agreed by the Methodical Council of Igor Sikorsky Kyiv Polytechnic Institute