



Organization of scientific and innovative activities

Work program of the discipline (Syllabus)

Details of the discipline

Level of higher education	<i>Third (educational and scientific)</i>
Branch of knowledge	<i>18 Production and technology</i>
Specialty	<i>184 Mining</i>
Educational program	<i>Geoengineering</i>
Discipline status	<i>Normative</i>
Form of study	<i>full-time, external</i>
Year of preparation, semester	<i>2nd year, autumn semester</i>
The scope of discipline	<i>4 credits</i>
Semester control / control measures	<i>Test</i>
timetable	
Language of instruction	<i>English</i>
Information about course leader / teachers	Lecturer: Practical training:
Course placement	Link to remote resource: Google classroom

Curriculum of the discipline

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

Globalization, which has become one of the defining characteristics of the modern world economy, raises the question of finding new forms and methods of adapting the national economic and scientific-technical environment to systemic and qualitative changes. Ukraine's transition to innovative development is important for increasing the competitiveness of the domestic economy. The main goal of the innovative type of development is to obtain the maximum economic effect from each unit of the implemented and converted into a product of the invention and technical idea. To implement an innovative approach to research for PhD students introduced the discipline "Organization of research and innovation", which will promote the orientation of creative ideas and research results on practical implementation in the economic (industrial) environment.

The purpose of the discipline is the formation of innovative thinking of PhD-students, the development of knowledge on the methodology of scientific creativity and organization of scientific and innovative activities during the preparation of the dissertation of the doctor of philosophy and registration of its results.

The subject of the discipline is scientific and innovative activity.

Program learning outcomes:

knowledge:

- current problems of the mining and geo-building industries;
- methods of scientific and innovative activity;
- basics of engineering creativity and inventive activity;

- organization of startup projects (business based on innovative technologies),
- psychology and organization of scientific and innovative activities;
- general requirements for the PhD-dissertation and its practical (innovative) component;
- norms of dissertation design and implementation of research results;

skills:

- use the regulatory framework for innovation in Ukraine;
- assess the prospects and current challenges of innovative development of the mining and geo-building industries;
- assess the relevance of the PhD-dissertation, in particular taking into account the practical (innovative) value of the work;
- to review the state of the issue in the international context (search and analysis of information);
- to formulate the purpose, methods and tasks of innovative researches; describe their results and formulate scientific provisions and practical value;
- apply for an invention (utility model) and manage intellectual property;
- to carry out technical and economic assessments of innovative technologies and risks of innovative activity;
- interact with technology parks and venture companies;
- formulate a proposal and justify the provisions of the startup project;

experience:

- systematic vision of scientific and technical problems of development of georesources;
- generalization and analysis of innovative developments in the field of research (dissertation work), accumulation and analysis of scientific information;
- mastering modern methods of scientific research (analytical, laboratory, field, computer simulation);
- substantiation of innovative approaches to resource saving and energy saving of mining and geo-building enterprises;
- independent creative and inventive activity;
- participation in startup projects.

2. Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

The discipline is taught in the second year of training a doctor of philosophy, is a special subject and requires students to basic training in natural and technical sciences (geotechnology), as well as scientific skills acquired (in particular) during the preparation of a master's thesis. Such disciplines as "Economics and organization of production", "Computer-mathematical modeling and design of underground structures", "Fundamentals of scientific research", "Research work on the topic of master's dissertation" and others are important. Placement of the discipline in accordance with the structural and logical scheme of training a doctor of philosophy in the initial block of training due to the need at the first stage of the dissertation to understand the task of practical (innovative) implementation of research results in production, as well as organizational principles and research methods of PhD dissertation.

3. The content of the discipline

Topic 1. Science as a sphere of human activity

Topic 2. Research and innovation

Topic 3. Regulatory framework for innovation in Ukraine

Topic 4. Psychology and organization of scientific and innovative creativity

Topic 5. General methodology of scientific creativity

Topic 6. Innovative approaches to resource conservation, energy conservation and safety of mining and geographic enterprises

Topic 7. Invention, utility model and management of intellectual property

Topic 8. Startup project

Topic 9. The dissertation of the doctor of philosophy and its practical (innovative) value.

Topic 10. Design and defense of PhD-dissertation

Topic 11. Integration of Ukrainian science in the world and European scientific and educational space.

4. Training materials and resources

Recommended reading:

1. James M. Utterback. Mastering the Dynamics of Innovation. – Boston, Massachusetts: Harvard Business School, 1996. - 253 p.
2. Peter Drucker. Innovation and Entrepreneurship. – New York: HarperCollins Publishers, 2011. – 288 p.
3. Robert P. Morgan. Science and technology for development: The role of U.S. universities (Pergamon policy studies ; no. 38) Hardcover – January 1, 1999. – 400 p.
4. Innovative activity of universities of Ukraine: analytical review [electronic resource: <https://www.uzhnu.edu.ua/en/infocentre/get/9718>]

Educational content

5. Methods of mastering the discipline (educational component)

Lectures:

Lectures 1, 2. Science as a sphere of human activity

The concept of science. Scientific communication and scientific school. Formation and development of science in Ukraine. Training and certification of scientific and scientific-pedagogical staff. Doctor of Philosophy degree. Research and innovation work of PhD students.

Lectures 3, 4. Research and innovation

The essence and main components of the innovative approach. Innovative development of the global economy. Tasks of modernization of Ukraine's economy. An innovative approach to the development of science. The current state of development of scientific and innovative activities in the universities of Ukraine.

Lectures 5, 6. Regulatory framework of innovation in Ukraine

Laws of Ukraine "On Innovation", "On Priority Areas of Science Development and equipment "; "On priority areas of innovation in Ukraine", "On higher education", Order of the Cabinet of Ministers of Ukraine "On approval of the Concept of development of the national innovation system."

Lectures 7, 8. Psychology and organization of scientific and innovative creativity

Psychology of scientific creativity. Organization of creative activity. Working day of a scientist. Scientist's workplace. Personal computer, communication technologies, Wikididactics and other means of educational and scientific work. Business communication. Business correspondence. Personal archive and library of the researcher.

Lectures 9, 10. General methodology of scientific creativity

Research methodology. Research methods and techniques: theoretical; experimental (laboratory and full-scale); computer simulation. Application of logical laws and rules. Basic methods of scientific research in mining and geo-building industries. Implementation of research results.

Lectures 11, 12. Innovative approaches to resource conservation, energy conservation and safety of mining and geographic enterprises

Modernization of mining enterprises: new equipment, materials, information and intelligent systems. Mining geotechnologies: shale gas and oil production, underground coal gasification, bottom gas hydrate production, ore leaching and fluid extraction. Innovations in underground construction. A systematic approach to the development of underground urban planning.

Lectures 13, 14. Invention, utility model and innovative management of intellectual property

Applying for a patent for an invention (utility model). Features of the claims and the structure of the description of the application. Application. Evaluation of economic efficiency and innovative potential of the invention. Interaction with technology parks and venture companies.

Lectures 15, 16. Startup project

Business based on innovative technologies. The essence and types of startup projects. Competitions of startup projects in Ukraine and the world. Application for participation in the competition of startup projects. Creating a startup company. Development of a startup company.

Lectures 17. The dissertation of the doctor of philosophy and its practical (innovative) value.

General characteristics of the PhD-dissertation. Choosing an innovative topic. Review of the state of the issue and setting research objectives. General scheme of dissertation research. Substantiation of research methods. Description of methods, progress and results of experimental and theoretical research. Computer simulation. Scientific provisions of the work. Introduction of research results into production. Design and defense of PhD-dissertation. Language and style of the dissertation. General design requirements. Numbering. Submission of text material. Illustrations, drawings. Tables. Formulas. Link. Additions. List of sources. Graphic part. Scientific publications: concepts, main types, volume and minimum number. Abstracts of scientific reports at the conference. Dissertation report.

Lecture 18. Integration of Ukrainian science into the world and European scientific and educational space. Expanding access to global information resources. US and EU grant programs, in particular Horizon Europe. China research grants for mining research. Scholarships for graduate students to study at foreign universities.

Issues on preparation of scientific manuscripts, analysis of modern scientific periodicals, for printing preparation, scientometric databases and indicators.

Bill's list (motivation of applicants to comply with the norms of academic integrity).

Practical works:

1. Development of a research scheme on the topic of PhD-dissertation.
2. Bibliographic description of different types of literature sources on the topic of research. General requirements and assembly rules.
3. Characteristics of the regulatory framework for innovation in Ukraine
4. Application for an invention (utility model) on the topic of dissertation research.
5. Registration of the application for competition of start-up projects.
6. Presentation of a scientific report at a conference.
7. Substantiation of the economic effect of the introduction of an innovative idea (invention) in production.

6. Independent work of the graduate student

No	The name of the topic that is submitted for independent study	Number of hours
1	Formation and development of science in Ukraine. History of scientific research in the field of mining and underground construction.	4

	The main stages of development of mining education, science, literature.	
2	Scientific libraries of Ukraine and methods of their work (based on Internet resources and personal work in the Scientific Library of KPI named after Igor Sikorsky).	4
3	Modern possibilities of information technologies in scientific and innovative activity.	4
4	Description of the application for the invention. Intellectual Property.	4
5	Analysis of startup projects.	4
6	Innovative activity of universities of Ukraine, innovative-scientific development in Igor Sikorsky Kyiv Polytechnic Institute.	2
7	Acquaintance with materials of conferences of young scientists «Energy. Ecology. Man»	2
8	Individual task - preparation of a startup project on the topic of dissertation research for participation in the Festival of innovative projects Sikorsky Challenge	26

Policy and control

7. The policy of the discipline (educational component)

- attendance at lectures is mandatory (in case of absence for a good reason - you need to make a summary of the missed lecture);
- learning activities, prior knowledge of the lecture, the use of communication tools to search for information on the Internet, dialogic forms of communication are welcomed in the classroom; questions with the specifics of graduate dissertation research.
- rules for the defense of individual tasks: deadline - two weeks before the end of the semester, the defense of individual tasks takes the form of an interview, the application for the International Festival of Innovative Projects "Sikorsky Challenge" is accepted annually until June 15;
- in case of skipping classes without good reason on the topic of the missed lecture is written an abstract of 10-12 pages);
- at the end of the semester there is an additional opportunity to pass / retake test indicators;
- policy on academic integrity - borrowing materials without reference to the author's work is not allowed, attempts at plagiarism (publishing other people's achievements as their own) make it impossible to obtain credit.

8. Types of control and rating system for assessing learning outcomes (RSO)

Current control: 2 tests (score of each 12-25 points), 7 practical works (score of each 3-5 points), individual work (7-15).

Calendar control: conducted twice a semester as a monitoring of the current state of compliance with the requirements of the syllabus.

Semester control: credit

Conditions of admission to the semester control: minimum positive assessment for tests, practical work and individual task, semester rating more than 52 points.

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

<i>Rating</i>	<i>Estimation</i>
100-95	Perfectly
94-85	Very good
84-75	Fine
74-65	Satisfactorily
64-60	Enough

Less than 60	Unsatisfactorily
Admission conditions are not met	Not allowed

Work program of the discipline (syllabus):

Compiled by Professor of Geoengineering, Doctor of Technical Sciences, Prof. Hennadii Haiko

Approved by the department _____ (protocol № __ from _____)

Approved by the Methodical Commission of the faculty (protocol № __ from _____)