		Name of course	**Fundamentals of scientific research, invention and development**
Lecturer	**PhD, Assistant Professor Olexandr Susak**		
Assistant Lecturer	**Stanislav Grygorskyi**		
Training direction	**Oil and Gas Engineering**	**Code**	**6.050304**
Institute	**Petroleum Engineering**		
Department	**Oil and Gas Transportation and Storing**		

Form of study	**Full-time**	**Year**	**IV**	**Semester**	**7**	
Types of academic hours	**Total**	**Lectures**	**Practical trainings**	**Laboratory works**	**Independent +individual work**	**Course project**	**ECTS**
	180	**64**	**48**	**-**	**58+18**	**-**	**5**

Course goal and objectives

The goal of teaching bases of scientific research, the invention and the development engineering is to prepare students for independent creative research and design work, improving the quality of training and the usage of scientific potential of the university. The tasks of studying the subject " bases of scientific research, the invention and the development engineering" is that the student must know the process of scientific research methods and methodology of research, order processing research; to be able to choose the direction of research, put experiment, compile and process the results, draw • up and implement development to production, to evaluate the effectiveness, obtain skills in research work, invention and development engineering".

The list of subjects to be mastering the study course "Bases scientific research, invention and development engineering":

philosophy, mathematics, physics, chemistry, physics of oil and gas reservoir.

Form of control	Exam
Requirements for admission to the final control and the method of final evaluation	Examining is conducted in accordance with applicable regulations of the Ministry of Education and Science of Ukraine and the regulations "On the system of current and final control, students' knowledge evaluation and ranking of students".

Course of lectures

Science and research.

The role of science in human life. Classification of sciences. State of Science in Petroleum Engineering. The history of science, its differentiation and integration. The concept of science, its main purpose and features. Scientific research as the main form of existence of science.

Theory and its features.

The law and its place in the theory. Laws and their role in scientific research. The concept of "scientific law. "Empirical and theoretical laws, Dynamical and statistical laws.

Forecasting, planning and management science. Basic concepts of process organization and management science, its prediction. Methods forecasting science. Features planning research. Efficiency of scientific research.

Preparation and use of scientific and technical personnel. Postgraduate, training. Organization and methodological foundations of research students.

Intellect and cognition. The scientific potential. The concept of intellect and its features. The intellect of the individual. Collective intellect. Artificial intellect, Formation and management methods

of research teams.

The choice of topics and direction of research, The main areas of promising research projects in the oil and gas industry.

Information search. Search and processing of scientific information (information retrieval). Information sources, their classification and nature. Periodicals. Non-periodical publications. Unpublished sources.

Search necessary information on the Internet Accounting, processing and analysis. Ways to remember. Preparation of scientific review.

Scientific research. Fundamental and applied research. Basic principles of scientific research and its implementation.

Introduction. Industrial research and serial implementation. The main factors contributing to the fastest implementation of scientific developments into production.

Research principles of science. The theoretical principles of science. The main stages of cognition. The sequence of development of scientific theory (the emergence of ideas, formulation of principles, laws, judgments, categories, synthesis of scientific facts, using axioms nomination hypotheses, analysis and synthesis, induction and deduction).

Methodological principles of science. The concept of the methodology and its basic principles: scientific objectivity; comprehensive universal relationship; dialectical contradiction; unity of quality and quantity; dialectical negation; display. Empirical and theoretical levels cognition.

Technology research.

Theoretical studies and methods of their implementation. Plan a program of research. Classification methods of theoretical research (observation, comparison, counting, measuring, experiment, generalization, abstraction, formalization, axiomatics, analysis, synthesis, induction and deduction, hypothetical and historical methods).

The notion of similarity principles. Principles of similarity. Similarity criteria. Using the principle of similarity in oilfield practice.

Experimental research. The experiment, its purpose and meaning. The purpose of the experiment and its planning. The choice of experimental design factors and the conversion of a conventional scale. Drawing planning matrix and determine the coefficients of the linear regression equation.

Analysis of the regression equation. Estimation of variance reproduction or error of the experiment. Assessment of the significance of the regression coefficients. Assess the adequacy of the model.

Setting experiment. Equipment and appliances. Creation of the experimental setup. Requirements that apply to the experimental setup. Methods of experimental design and its results.

Processing and evaluation of experimental data. Errors of measurement. Determination of average values. Tabular and graphical representation of the experimental results.

Searching empirical formulas. The method of least squares.

The main forms of scientific production. Report, its contents and design. The scientific article. Monograph. Dissertation. The report and scientific report. The thesis of the report. Registration of student work.

Economic evaluation of research results. Social, technological and economic efficiency research. The method of calculation of efficiency in the oil and gas industry.

Seminars on the hearing of the best student work.

The theory of inventive problems. Methods activation of creative activity. Heuristics and theory

of inventive problems. The levels of creativity.

The method of trial and error.

The method of brainstorming.

Method garlands associations. Morphological analysis, Synektyka.

Value analysis. The method of control questions.

The concept of invention and utility model. Criteria of patentability of an invention (utility model). The subject of inventions.

The structure and rales of an application for an invention (utility model). Conducting state patent examination of patent applications.

Patent and patent research. Implementation of patents and royalties.

Drawing application for invention.

The concept of innovations. Drafting and design innovations.

The introduction of innovations and royalties.

The program of studies (practical, laboratory, course projects)

Practical studies :

Statistical analysis and evaluation of measurement errors.

Elements of the theory of dimension of physical quantities. The similarity of phenomena and processes. Similarity criteria.

The main theorem of similarity theory and their application.

Planning experiment, ihe choice of experimental design factors and the conversion of a conventional scale. Drawing planning matrix.

Determination of the coefficients of the linear regression equation.

Analysis of the regression equation. Estimation of variance reproduction or error of the experiment.

Assessment of the significance of the regression coefficients.

Assess the adequacy of the model.

Determination of parameters of empirical formulas.

Write and design of educational scientific article.

The calculation of the economic effects of the introduction of scientific developments.

Drawing application for invention. Determination of the facilities of the invention.

Patent research.

Definition analogue prototype and future significant differences invention.

A description of future claims.

Drawing abstract formulas and future claims.

Making an application for invention. Design drawings, diagrams. Making an application for a patent.

The calculation of the economic effects of the introduction of the invention and the size of the award.

Drafting and design innovations.

The calculation of the economic effects of the introduction of innovations and the size of the award.