Syllabus
Program of educational discipline

BASICS OF SCIENTIFIC RESEARCH

Specialty
172 – Electronic communications and radio engineering

Institute
Institute of Computer Modeling, Applied Physics and Mathematics

Educational program
Network technologies and telecommunications

Department
Information systems named after V.O. Kravets (169)

Educational level
Master's level

Course type
Special (professional), Mandatory

Semester
1

Language of teaching
English

Lecturers and course developers

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Doctor of technical sciences, professor, professor of the department of information systems named after V.O. Kravets of NTU "KhPI"

Author and co-author of more than 400 scientific and methodological publications Courses: "Theory of information and coding", "Switching systems in telecommunications", "Electromagnetic compatibility", "Fundamentals of scientific research", "Experimental research methods". Learn more about the teacher on the department's website

general information

Abstract

The discipline is aimed at mastering methods of organization and conducting research of real systems, systems that are at the design stage, as well as methods of applying system, mathematical, physical and informational knowledge during scientific research.

Purpose and objectives of the disciplines

To develop theoretical ideas and practical skills in the master's student regarding the methodology of conducting scientific research using modern technology and generalization of the obtained results in the process of scientific work.

Format of classes

Lectures, practical classes, consultations. Final control - exam

Competences

GC2. Ability to apply knowledge in practical situations. ZK4. Ability to communicate in the national language both orally and in writing. ZK6. Ability to use information and communication technologies. ZK-7 Ability to conduct research at the appropriate level.
GC8. Ability to search, process and analyze information from various sources.
GC9 Ability to develop projects and manage them.

SC2. The ability to implement the principles of a system approach when conducting research into the processes occurring in electronic communication and radio engineering systems, complexes and devices.

SC4. The ability to solve the problems of ensuring reliability, survivability, immunity, information security and bandwidth of electronic communication and radio technical systems, taking into account economic, legal, security and other aspects.
SC6. Ability to protect intellectual property, comply with legal and ethical standards on intellectual property.
SC7. Ability to find and evaluate information on electronic communications, radio engineering and related issues
SC9. The ability to solve current scientific problems in the field of electronic communications and radio engineering with the justified use of modern theoretical and experimental research methods.

Learning outcomes

LO – 1 To organize one's own professional, research and innovation activities based on the principles of the system approach and the methodology of scientific research. Know the current level of the latest technologies in the field of telecommunications and information technologies;
LO - 2 Take into account social and moral and ethical norms, establish effective cooperation in the team when conducting scientific research and implementing projects;
LO - 6 Analyze development trends and the latest standards in the field of telecommunications and radio engineering; RN - 10 Ensure reliability, survivability, immunity, information security and bandwidth of telecommunication and radio engineering systems;
LO – 16 Identify and solve current scientific problems in the field of telecommunications and radio engineering, choose and use effective theoretical and experimental research methods.

Scope of the discipline

The total volume of the discipline is 120 hours: lectures - 32 hours, practical classes - 16 hours, independent work - 72 hours.

Prerequisites for studying the discipline (prerequisites)

To successfully pass the course, you must have knowledge and practical skills in the following disciplines: "Modern telecommunication technologies", "Optimization of digital telecommunication networks", "Modeling of telecommunication systems", "Technologies of multi-service networks".

Features of the discipline, methods and technologies of education

Classes are conducted interactively using multimedia technologies. In practical classes, a project approach to learning is used, attention is focused on the application of information technologies. Study materials are available to students on the department's website.

Program of educational discipline

Topics of lectures

Topic 1. Basic concepts of scientific research.
Topic 2. The concept of science and scientific thinking. Basic categories of science.
Topic 3. Scientific research. Concept, classification and planning of scientific research. Topic 4. Technology of working with scientific literature.
Topic 5 Providing the results of scientific research.
Topic 6. Scientific creativity and heuristics. Basic concepts of heuristics. Topic 7. Heuristic methods. Classification of scientific research methods. Topic 8. Generally logical methods of research Methodology of working with concepts. Topic 9. Classification of objects. Methods of theoretical research.
Topic 10. Modeling methods.

Topic 11. Concept of model. Classification of models.
Topic 12. System approach and system thinking.
Topic 13. Basic concepts of systems theory. Types of system description. A complex system.
Topic 14. Research of complex systems. Methods of research of complex systems.
Topic 15. Purpose, function, structure of the system. A generalized model of system functioning.
Topic 16. Classification of systems functioning models. sample

Topics of practical classes

Topic 1. Analysis of the state of development in the selected subject area. Topic
2. Development of a simulation model.
Topic 3. Study of the developed model. Classification of research results. Topic 4. Assessment of modeling results. Optimizing the results of the experiment. Topic 5. Algorithm for building a scientific paper.
Topic 6. Preparation of research materials for publication.
Topic 7. Plan, sections, results of the experiment and their analysis. Conclusions.
Topic 8. Preparation of research materials for publication.

Topics of laboratory work

Laboratory work is not provided

Independent work

The course involves the completion of an individual task on model development, its research and assessment of modeling results. The modeling results are presented in the form of a report and the results are published at a professional conference. Students are also recommended additional materials (videos, articles) for independent study and analysis.

Literature and educational materials

Basic literature

1. Shishkina E.K., Nosyrev O.O. Methodology of scientific research [Text]: teaching. manual / E.K. Shishkina, O.O. Nosyrev. - Kh.: "Disa Plus" Publishing House, 2014. - 200 p.
2. Grabchenko A. I. Methods of scientific research: teaching. manual / A. I. Grabchenko, V. O. Fedorovych, Y. M. Harashchenko. – Kharkiv: NTU "KhPI", 2009. – 142 p.
3. Mathematical foundations of the theory of telecommunication systems [Text] / edited by V.V. Popovsky - Kh.: SMIT Company, 2006. - 564 p.

Additional literature

1. Kolesnikov, O. V. Fundamentals of scientific research: teaching. manual / O. V. Kolesnikov. — 2nd ed., ed. and additional — K.: Center of Educational Literature, 2011. — 144 p.
2. Azarenkov V.I. Presentation. The technology of preparing public speeches: a study guide / Serkov O.A., Breslavets V.S. Scientific research work. Educational and methodological manual for independent work of students. Part 1. How to write articles and reports. . - X: NTU "KhPI", 2023. - 6 p.
3. Serkov OA, Breslavets VS Methodology of scientific research. Educational and methodological manual for independent work of students - Kharkiv: NTU "KhPI", 2023. - 14 sl.

Evaluation system

Criteria for evaluating student performance and distribution of points

100% of the final grade consists of the results of the assessment in the form of an exam (60%) and the current assessment (40%)

Control works	10
Practical work	20
Independent work, individual tasks	10

Rating scale

Sum points	National assessment	ECTS
90–100	Perfectly	A
82–89	Fine	B
75–81	Fine	C
64–74	Satisfactorily	D
60–63	Satisfactorily	E
35–59	Unsatisfactorily (additional required study)	FX
1–34	Unsatisfactorily (need to repeat study)	F

Norms of academic ethics and policy of the course

The student must adhere to the "Code of Ethics of Academic Relations and Integrity of NTU "KhPI": show discipline, education, benevolence, honesty, responsibility. Conflict situations should be openly discussed in study groups with the teacher, and if it is impossible to resolve the conflict, it should be brought to the attention of the employees of the institute's directorate. Regulatory and legal support for the implementation of the principles of academic integrity of NTU "KhPI" is posted on the website:http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/

Coordination

Syllabus agreed	05/22/2023	Head of Department Pavel PUSTOVOYTOV
	05/22/2023	Guarantor OP Vitaly Breslavets