Syllabus
Course Program

ELECTROMAGNETIC COMPABTIBILITY

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 (169)

Educational level
Master's degree

Course type
Free choice of specialized training

Semester
2

Language of teaching
Ukrainian, English

Lecturers and course developers

Oleksandr Serkov

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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 390 scientific and methodical 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

Vitaliy Breslavets

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Candidate 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 75 scientific and methodical publications
Courses: "Electromagnetic compatibility", "Scientific-Research work", "Information systems and databases".

general information

Abstract

The discipline is aimed at mastering the methods of organization and research of real systems and systems that are at the design stage. It allows you to master the methods of applying system, mathematical, physical and informational knowledge during modeling, designing and developing telecommunication systems during scientific research in the field of electronics and telecommunications.

Purpose and objectives of the disciplines

To develop theoretical ideas and practical skills in the master's student regarding the formulation, analysis and synthesis of solutions to scientific problems of electronics and telecommunications at an abstract level by decomposing them into components using modern technology and summarizing the results obtained.

Format of classes

Lectures, laboratory work, independent work, consultations. The final control is an exam.

Competences

GC1. Ability to abstract thinking, analysis and synthesis.
GC2. Ability to apply knowledge in practical situations.
GC7. Ability to conduct research at an appropriate level.
SC4. The ability to solve the problems of ensuring the reliability, survivability, immunity, information security and bandwidth of electronic communication and radio technical systems, taking into account economic, legal, security and other aspects.
SC5. The ability to develop, improve, and use modern software, hardware, and software for electronic communication and radio technical devices (tools, systems, complexes).
SC7. Ability to find and evaluate information on electronic communications, radio engineering and related issues.
SC8. The ability to solve complex professional tasks based on the use of the latest technologies for transmitting, receiving and processing information.

Learning outcomes

LO 7 - to localize and assess the state of the problem situation at the stages of research, design, modernization, implementation and operation of modern and promising telecommunication and radio engineering systems, complexes, technologies, devices and their components, formulate proposals for its solution with the elimination of identified shortcomings
LO 8 – apply general and specialized programming languages, analytical and simulation modeling packages, as well as software and hardware development tools to solve complex problems of telecommunications and radio engineering.
LO 10 – to ensure reliability, survivability, immunity, information security and bandwidth of telecommunication and radio engineering systems

Scope of the discipline

The total volume of the discipline is 120 hours. (4 ECTS credits): lectures – 32 hours, laboratory work – 16 hours, independent work – 72 hours.

Prerequisites for studying the discipline (prerequisites)

"Modern telecommunication technologies, "Design of digital telecommunication networks", "System modeling methods", "Technology of multi-service networks".

Features of the discipline, methods and technologies of education

Classes are conducted interactively using multimedia technologies. Applied lectures with presentations, laboratory works, consultations. Protection of laboratory tasks, oral express surveys, control work, (CAS), review of notes, exam (FAS). Study materials are available to students on the department's website.

Program of educational discipline

Topics of lectures

Topic 1. Introduction. Basic concepts of EMC. Tasks of providing EMC. Sources of electromagnetic influences.
Topic 2. Problems, tasks, classification of EMC. Mechanisms of interference penetration.

Topic 3. Parameters of electromagnetic interference.
Topic 4. Waste emission.
Topic 5. Periodic impulse disturbances in electric power systems.
Topic 6. Non-periodic impulse switching disturbances.
Topic 7. External electromagnetic influences.
Topic 8. Measurement of conductive disturbances.
Topic 9. Measurement of field disturbances.
Topic 10. Impact of interference.
Topic 11. Methods of protection against interference.
Topic 12. Methods of protection against interference.
Topic 13. Methods and equipment for testing and certification.
Topic 14. Methods and equipment for testing and certification.
Topic 15. Antenna systems for broadband radiation.
Topic 16. Antenna systems for broadband radiation.

Topics of practical classes

There are no practical classes.

Topics of laboratory works

Topic 1. Use of the "MATLAB" package for research.
Topic 2. Use of the "MATLAB" package for research.
Topic 3. Creation of animated drawings in "MATLAB".
Topic 4. Creation of animated drawings in "MATLAB".
Topic 5. Methods of solving differential equations in "MATLAB".
Topic 6. Methods of solving differential equations in "MATLAB".
Topic 7. Modeling the occurrence of impulse disturbances when the inductive load is turned off.
Topic 8. Modeling the occurrence of impulse disturbances when the inductive load is turned off.

Independent work

Elaboration of lecture material. Preparation for laboratory work. Independent study of topics and issues that are not taught in lectures. The course involves the implementation of an individual task on the development of a model, its research and evaluation of modeling results. Students are also recommended additional materials (videos, articles) for independent study and analysis

Literature and educational materials

Basic literature:
1. Theory and practice of electromagnetic compatibility of telecommunication systems: monograph / S. Panchenko, O. Serkov, K. Trubchaninova. - Kharkiv: UkrDUZT, 2020. - 249 pp., fig. 170, tab. 17.
2. Electromagnetic compatibility of telecommunication systems: Laboratory workshop / N. Zhenyuk, B. Lazurenko, O. Serkov, I. Yatsenko. - Kharkiv: NTU "KhPI", 2021. - 60 pp., fig. 8, tab. 3.

Additional literature:
1. Kravchenko V.I., Serkov O.A. Radio-electronic means of combat, suppression and force damage: monograph / V. Kravchenko, O. Serkov. – Kharkiv: NTU "KhPI", 2022. – 422 p., fig. 108, tab. 15. Ukr. as.
2. Kravchenko V.I. Electromagnetic terrorism. - Kharkiv: Issue-in - "NTMT". 2011. – 392 p.

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 (50%) and the current assessment (50%)
Laboratory works 30
Independent work, individual tasks 20

Rating scale

Total 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	Unsatisfactory (requires further study)	FX
1–34	Unsatisfactorily (re-study required)	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	02.06.2023	Head of Department Pavel PUSTOVOYTOV
	02.06.2023	Guarantor OP Oleksandr SERKOV