

The syllabus of the discipline
Fundamentals of computer modeling and design of TCRT tools

V.V. Rapin,
professor IMI, Doctor of Technical Sciences, Professor
E-mail: volodymir.rapin@nure.ua

Field name	Detailed content, comments
Name of the faculty	Faculty of Infocommunications
Level of higher education	First (bachelor's)
Code and name of the specialty	172 Telecommunications and radio engineering
Type and name of educational program	EPP "Information and Network Engineering"
Name of the discipline	Fundamentals of computer modeling and design of TCRT tools
Number of ECTS credits	6
Discipline structure (distribution by types and hours of study)	36 hours – 18 lectures, 8 hours – 4 practical classes, 20 hours - 5 laboratory classes, 12 hours - 6 consultations, 96 hours - homework, type of control: exam
Schedule (terms) of studying the discipline	1 st year, II semester
Prerequisites for studying the discipline	- thorough knowledge of such sections of mathematics as differential calculus, integral calculus, differential equations; -knowledge and understanding of fundamental, natural and engineering disciplines, including physics and circuitry; - C ++ programming skills; - knowledge of the basic provisions of the course of computer science.
Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process	The discipline is used to form the following competencies: FC-1. Ability to understand the essence and importance of information in the development of modern information society, to understand the dangers and threats that arise in this process, to comply with the basic requirements of information security, including the protection of state secrets. FC-4. Ability to have skills of independent work on the computer and in computer networks; to carry out computer modeling of networks, devices, systems and processes with use of universal packages of applied computer programs. FC-5. Ability to use regulatory and legal documentation specific to the field of telecommunications networks, telecommunications and radio systems (laws of Ukraine, technical regulations, international and national standards, recommendations of the International Telecommunication Union, etc.). FC-6. Ability to perform instrumental measurements in telecommunication networks, telecommunication and radio systems.

The quality of the educational process	Educational-methodical and material-technical resource provision of the educational program, within the framework of which the discipline is studied, meets the licensing requirements and accreditation conditions of the educational activity of the university. Annual monitoring and revision of the curriculum of the discipline in accordance with the requirements and recommendations of the Ministry of Education and Science, state certification of acquired competencies of graduates, standards of cooperation with employers to ensure a competitive level of training. Adherence to the principles of academic integrity (https://lib.nure.ua/plagiat). Contains public information on the requirements, competencies, level of education within the current educational program.
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Description and content of the discipline

The purpose of the discipline is to form basic knowledge of bachelors on the principles of organization of models of telecommunication networks and means of radio engineering, use of analytical methods and software packages of their research, as well as design of networks and their radio components.

Content

Content module 1. General information about telecommunications and radio engineering.

- Topic 1. Principles of organization and operation of telecommunications networks.
- Topic 2. Radio engineering means of information and communication systems.
- Topic 3. Packages of circuit modeling programs

Content module 2. Modeling of telecommunication networks.

- Topic 1. Simulation modeling
- Topic 2. Modern universal graphics simulators.
- Topic 3. Design, modeling, scanning and analysis of WiFi networks.

Learning outcomes of higher education

As a result of studying the discipline, students must:

know: general principles of organization of communication systems and networks. basics of modeling theory and principles of model building, general approach and basic modern software tools for design and modeling of telecommunications and radio engineering;

be able to: use the acquired knowledge in practice, develop and analyze models of telecommunications networks and radio equipment, choose the appropriate program or software package to solve the problem,

to own: PRN1. Knowledge of basic theories and methods of basic and general engineering sciences to the extent necessary to solve specialized problems and practical problems in the field of telecommunications and radio engineering; PRN 4. Ability to install and configure simulators of telecommunications networks and software design and modeling of radio devices within its competence, skills in documenting the results of work,

as well as the ability to use modern computer simulation tools to study telecommunications and radio systems and networks; PRN5. Ability to use computer-aided design systems to develop devices for telecommunications and radio systems and networks; PRN 8. Ability to analyze the performance of software products, to have the means of their software debugging and testing, to apply modern technologies of visual design of software products.

Assessment system according to each task for passing the test / exam

The form of final control for the discipline is:

- exam for full-time study.
- examination for distance learning.

At the exam, the final grade P_p is calculated by the formula:

$$P_n = 0,6 \times Q_{\text{sem}} + 0,4 \times Q_{\text{isp}},$$

where Q_{sem} - assessment for the semester in a 100-point system,

Q_{isp} - exam score in the 100-point system.

The exam ticket consists of two theoretical questions and two practical tasks. Theoretical questions are evaluated on a 100-point scale of 20 points each, and practical tasks - 30 points each.

Type of lesson / control measure	Rating
Lb № 1, 2	$(6...10) \times 2 = 12..20$
Pr № 1, 2	$(6...10) \times 2 = 12..20$
Checkpoint 1	24...40
Lb № 3, 4, 5	$(6...10) \times 3 = 18...30$
Pr № 3, 4	$(6...10) \times 2 = 12..20$
Control testing	6...10
Checkpoint 2	36...60
Total for the semester	60...100

Qualitative evaluation criteria in the national scale and ECTS

Satisfactory, D, E (60-74). Show the required minimum of theoretical knowledge. Know the ways and methods of solving practical problems and be able to use them in practice.

Well, C (75-89). Firmly know a minimum of theoretical knowledge. Demonstrate the ability to solve a practical problem and justify all stages of the proposed solution.

Excellent, A, B (90-100). Show complete knowledge of basic and additional theoretical material. Unmistakably solve a practical problem, explain and justify the chosen method of solution.

Assessment scale: national and ECTS

The sum of points for all types of educational activities	ECTS assessment	Score on a national scale	
		for exam, course project (work), practice	for offset
90 – 100	A	perfectly	credited
82-89	B	fine	
74-81	C		
64-73	D	satisfactorily	
60-63	E		
35-59	FX	unsatisfactory with the possibility of reassembly	not credited with the possibility of re-assembly
0-34	F	unsatisfactory with mandatory re-examination	not credited with compulsory re-study of the discipline

Methodical support

Basic literature

1. Tanenbaum, E. Kompiuternye sety / D. Uezeroll. – SPb: Yzd-vo Pyter, 2013, – 960 s.
2. Telekommunikatsionnye systemy y sety. Pod red. Shuvalova V.P. – M. Telekom. 2015.
3. Vorobiienko P.P., Nikitiuk L.A., Reznichenko P.Sh., Telekomunikatsiini ta informatsiini merezhi. –Kyiv, 2010
4. Vladymyrov S.S. Protokoly, servyisy y usluhy v IP setiakh. – S.Pb, 2017.
5. V. Olyfer, N. Olyfer. Kompiuternye sety. 3-e yzdanye. Uchebnyk. S-Peterburh, Pyter, 2006 h.
6. Komashynskiy, V. Y., A. V. Maksymov. Systemy podvyzhnoi radyosviazy s paketnoi peredachei ynformatsyy. Osnovy modelyrovaniya – M.: Horiachaia lynyia – Telekom, 2007. – 176 s.
7. Retana Alvarado, Slais Don, Uait Rass. Pryntsypy proektyrovaniya korporativnykh IP-setei. / Per. s anhl. – M.: Vyliams, 2002.
8. Zaichenko Yu.P., Honta Yu.V. Strukturnaia optymyzatsiya setei EVM. – K.: Tekhnika, 1986. – 168 s.
9. Oliinyk V.F. Osnovy teorii system zviazku: Matematychni modeli telekomunikatsiinykh system. - K.: Tekhnika, 2000.
10. Zakharchenko M.V., Popovskiy V.V., Horokhov S.M., Oliinyk V.F. Osnovy teorii system zviazku: Navchalnyi posibnyk. – Odesa: ONAZ, 2001.
11. Zakharov H.P. Metody yssledovaniya setei peredachy dannykh. - M. Radyo y sviaz. 1987.-208 s.
12. Sait razrobotchykov prohrammy Netemul [Ynternet resurs] / URL: <http://netemul.sourceforge.net>.
13. Sait razrobotchykov prohrammy OPNET Modeller (RiverbetModeller) [Ynternet resurs]/URL: <https://www.riverbed.com/gb/products/steelcentral/opnet.html>
14. Sait razrobotchykov prohrammy OMNET++ [Ynternet resurs] / URL: <https://omnetpp.org/documentation/>

Supporting literature

15. Ynternet resurs. <https://foxford.ru/wiki/informatika/postroenie-minimalnogo-ostovnogo-dereva>
16. Ynternet resurs <https://www.intuit.ru/studies/courses/12181/1174/lecture/25267?page=6>
17. Ynternet resurs <https://prog-cpp.ru/deikstra/>
18. Boev V.D. Ymytatsyonnoe modelyrovanye system. – M. Yurait, 2017.
19. Vasylev K.K., Sluzhyvyi M.N. Matematycheskoe modelyrovanye sy stem sviazy. – Ulianovsk, 2010.
20. Belov V.V., Chystiakova V.Y. Proektyrovanye ynformatsyonnykh system. – M. Yzd. tsentr “Akademyia”, 2013.
21. Shennon R. Ymytatsyonnoe modelyrovanye system - yskusstvo y na- uka. M.: Myr, 1978.

Methodical instructions for different types of classes

20. Konspekt lektsii z dystsypliny «Osnovy kompiuternoho modeliuвання ta proektuvannya zasobiv TKRT», dlia studentiv spetsialnosti «Telekomunikatsii ta radiotekhnika» / Uporiad. V.V. Rapin.. – Kharkiv: KhNURE, 2018. – 92 s.
21. Metodychni vkazivky do kontrolnykh zavdan z dystsyplin «Osnovy kompiuternoho modeliuвання ta proektuvannya zasobiv TKRT», dlia studentiv spetsialnosti «Telekomunikatsii ta radiotekhnika» / Uporiad. V.V. Rapin. – Kharkiv: KhNURE, 2018. – 12 s.
22. Metodychni vkazivky do laboratornykh robit z dystsypliny «Osnovy kompiuternoho modeliuвання ta proektuvannya zasobiv TKRT» / Upo- riad. V.V. Rapin.– Kharkiv: KhNURE, 2018. – 21s.
23. Metodychni vkazivky do praktychnykh zaniat z dystsypliny «Osnovy kompiuternoho modeliuвання ta proektuvannya zasobiv TKRT» dlia studentiv spetsialnosti «Telekomunikatsii ta radiotekhnika»/ Uporiad. V.V. Rapin. – Kharkiv: KhNURE, 2018. – 22 s.

Information support

1. Matlab
2. Cisco Packet Tracer
3. Riverbed Modeler