The syllabus of the discipline
Routing in communication networks

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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	Routing in communication networks
Number of ECTS credits	4
Discipline structure (distribution by types andhours of study)	24 hours - 12 lectures, 4 hours – 2 practice classes, 20 hours - 5 laboratory classes, 14 hours - 7 consultations, 54 hours - homework, **type of control**: credit
Schedule (terms) of studying the discipline	4th year, VIII semester
Prerequisites for studyingthe discipline	Basic knowledge of disciplines: Local area networks
Competences, knowledge, skills, understanding, whichis acquired by the applicantin higher education in the learning process	The discipline is used to form the following competencies: - make an informed choice of routing protocol in depending on the dimension and structure of the network, characteristics input streams; - configure and perform additional network configuration equipment for both static and dynamic routing routing protocols; - calculate routing tables; - to adjust the load balancing mechanisms.
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

Description and content of the discipline

The purpose of studying the discipline - is to gain knowledge of the basic protocols used in the construction and operation of local area networks. Acquisition of practical skills in setting up active network equipment, as well as setting up and research of dynamic routing protocols: RIPv1, RIPv2 EIGRP, OSPF. Learning the principles of finding routes in the routing tables of different protocols, as well as the use of static routing.

Content

Content module1. Conceptual foundations of routing
1.1 Subject and objectives of the course.
1.2 Components of routing algorithms.
1.3 Classification of routers by application. Basic characteristics, functions and capabilities of routers.

Content module 2. Hardware construction of the router
2.1 Functional diagram of the router
2.2 Router Schemes: Shared Memory, AGS +, Cisco 7500 Series
2.3 Routers with language and data integration.

Content module 3. Routing tables in communication networks
3.1 Examples of routing tables for different types of routers. Assign routing table fields.
3.2 Sources and types of entries in the routing table.

Content module 4. Mathematical models of internal static routing methods.
4.1 The method of choosing the shortest path.
4.2 Filling method.
4.3 Flow-based routing method.

Content module 5. Internal dynamic routing protocols.
5.1.Analysis and classification of dynamic routing protocols. Comparative characteristics of the main routing methods. Distance vector and channel state routing protocols.
5.2 Remote-vector protocols (RIP v.1, RIP v.2, EIGRP).
5.3 Channel Status Protocols (OSPF, IS-IS).
5.4 Features of dynamic routing protocol configuration.
5.5 Configure dynamic routing using Cisco Systems network simulation models.

Content module 6. Autonomous systems and IP-addressing.
6.1 Types of autonomous systems
6.2 Basics of IP address allocation. Using masks in routing tables on IP networks.

Learning outcomes of higher education

As a result of studying the discipline students should:

KNOW:

- principles of routing in communication networks;
- mathematical bases of construction of routing protocols;
- modern routing protocols used in communication networks and prospects for their further improvement;

BE ABLE:

- make an informed choice of routing protocol depending on the size and structure of the network, the characteristics of incoming streams;
- configure and perform additional configuration of network equipment for both static routing and dynamic routing protocols;
- calculate routing tables;
- to adjust the load balancing mechanisms.

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

To assess the work of a student during the semester, the final rating score Q_{sem} is calculated as the sum of marks for different types of classes and control activities.

Each practical lesson is evaluated in 5 points (2 points for attendance and 8 points for work in class). Each laboratory work is evaluated at 10 points (2 points for attendance, 3 points for practice, 5 points for defense). Home control work DKR - 10 points. The maximum rating during the semester is 100 points.

Type of lesson / control measure	Rating
Lb №1	10
Pr №1	10
Lb №2	10
Control testing 1	10
Checkpoint № 1	40
Pr №2	10
Lb №3	10
Control testing 2	10
Checkpoint № 2	30
Pr №3	10
Lb №4	10
Control testing 3	10
Checkpoint № 3	30
Total for the semester	100

Credit is provided as a form of final control in the discipline "Routing in communication networks". With this type of control, the final grade is determined by the work for the semester.

Qualitative evaluation criteria in the national scale and ECTS

Satisfactory, D, E (60-74). Have a minimum of knowledge and skills. Work out and defend all laboratory work and IDPs.

Well, C (75-89). Know the main topics of the discipline. Work out and defend all laboratory work and ID.

Excellent, A, B (90-100). Know all the topics of the discipline. Work out and defend all laboratory work and IDPs. Prepare essays on each of the content modules.

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

Methical support

Basic literature

1. Astrakhantsev A.A., Bezruk V.M. Marshrutyzatsiia v merezhakh zviazku. – Kh.: TOV «Kompaniia SMIT», 2010. – 368 s.

2. Olyfer V.H., Olyfer N.A. Kompiuternye sety. Pryntsypy. Tekhnolohyy. Protokoly. 3-e yzd. – SPb.: Pyter, 2006 – 958 s.

3. Vehensha Sh. Kachestvo obsluzhyvanyia v setiakh IP: Per. s anhl. – M.: Yzdatelskyi dom «Vyliams», 2003. – 386 s.

4. Osterlokh Kh. Marshrutyzatsyia v IP-setiakh. Pryntsypy, protokoly, nastroika. – S.Pb.: BHV-S.Pb., 2002. – 512 c.

5. Kheleby S., Mak-Ferson D. Pryntsypy marshrutyzatsyy v Internet. – M: Yzdatelskyi dom «Vyliams», 2001. – 1100 s.

6. Rudenko Y. Marshrutyzatori CISCO dlia IP-setei. – M.: KUDYS- OBRAZ, 2003. – 656 s.

7. Rukovodstvo po tekhnolohyiam ob`edynennykh setei / Nastolnyi spravochnyk spetsyalysta po setevym tekhnolohyiam. 3-e yzdanye. – M.: Yzdatelskyi dom «Vyliams», 2002. – 1040 s.

Support literature
1. D. Shvarts, T. Lemml. CCIE. Uchebnoe rukovodstvo. Per. s anhl. – M.: Lory, 2002 – 791 s.
2. T. Lemml. CCNA. Uchebnoe rukovodstvo. Per. s anhl. – M.: Lory, 2002 – 576 s.
3. Bertsekas D., Hallaher R. Sety peredachy dannykh. – M.:Myr,1989. – 544 s.
4. Vyshnevskyi V.M., Liakhov A.Y. y dr. Shyrokopolosnye besprovodnye sety peredachy ynformatsyy. – M.: Tekhnosfera, 2005 – 592 s.
5. Ford L., Falkerson D. Potoky v setiakh: Per. s anhl. – M.: Myr,1966.– 276s.
6. Tanenbaum Э. Kompiuternye sety. – SPb.: Pyter, 2002. – 848 s.
7. Adams B., Chenh Э. Rukovodstvo po mezhdomennoi mnohoadresnoi marshrutyzatsyy.: Per. s anhl. – M.: Yzdatelskyi dom «Vyliams», 2004 – 320 s.

Methodical instructions for different types of classes
1. Metodychni vkazivky do laboratornykh robit z dystsypliny «Zakhyst informatsii v telekomunikatsiinykh systemakh» dlia studentiv napriamu «Telekomunikatsii» spetsialnosti 8.092402 – Informatsiini merezhi zviazku. / Uporiad. V.A. Zolotarov, A.A. Astrakhantsev, O.V. Fedorov, – Kharkiv, KhNURE, 2008. – 108 s.
2. Kryptolohiia u prykladakh, testakh i zadachakh: navch. posibnyk / T.V. Babenko, H.M. Hulak, S.O. Sushko, L.Ia. Fomychova. -Dnipropetrovsk.: Natsionalnyi hirnychyi universytet, 2013. - 318 c. 3. Poliakov N.L., Tyshchenko A.V. Matematycheskye osnovy kryptohrafyy. Zadachy y reshenyia. – M.: Fynansovыi unyversytet, 2015. – 25 s.
3. Pravovyi zakhyst informatsii. Navchalnyi posibnyk. / N.I.Lohinova, R.R.Dorozhbur – Odesa, Feniks, 2015 – 264 s.

Electronic sources
1. http://www.comsoc.org/livepubs/surveys/public
2. http://www.ieee-infocom.org
3. http://www.computer.org/publications/
4. http://www.cs.fsu.edu/
5. http://www.acm.org/sigs/sigcomm
6. http://www.osp.ru/lan
7. http://www.vestnik-sviazy.ru/archive
8. http://www.ccc.ru/magazine/topics/
9. http://www-nrg.ee.lbl.gov/ns/

Information support
1. OS Widows 2000/XP.
2. OS Unix.
3. Network Simulation Package Network Simulator.
4. Icket modeling package Packet Tracer 4.01.