The syllabus of the discipline

Local area networks

N.A. Kharchenko,
Associate Professor of INE dept, Ph.D., Associate Professor
E-mail: nataliia.kharchenko@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	Local area networks
Number of ECTS credits	7,5
Discipline structure (distribution by types and hours of study)	30 hours - 15 lectures, 10 hours - 5 practical classes, 20 hours - 5 laboratory classes, 10 hours - 5 consultations, 84 hours - homework, **type of control**: exam
Schedule (terms) of studying the discipline	3rd year, V and VI semesters;
Prerequisites for studying the discipline	The basis of successful mastering of the course of LAN is the knowledge received by students when studying the courses "Introduction to the profession", "Telecommunication and information networks", "Network technologies"
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: - be able to plan and build structured LAN at the level of the department, organization or company, evaluate the processes in the LAN on the physical (environmental characteristics) and channel Etrhernet levels.
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 the discipline - the formation of basic knowledge of bachelors on the principles of organization of local and corporate networks, methods, methods of encoding and transmission of information, the operation of computer network protocols in them according to the model of open systems (OSI).

Content

Content module 1. Subject, purpose and objectives of the course. The concept and classification of the local network. Principles of construction of local networks.

Topic 1. Introduction. General information about local networks. Subject, purpose and objectives of the course. Concept of local, city and corporate network. Model of interaction of open systems and functions of each level. Concept of protocol, protocol stack and interface.

Topic 2. Physical level of the LAN. Standardization in networks, sources of standardization. Topology LAN. Characteristics of communication lines and types of cables in LAN. Throughput and bandwidth. Physical coding in LAN, methods of digital coding Logical coding in LAN. Network equipment in the construction of LAN.

Content module 2. Protocols and technologies of the LMJ link layer.

Topic 3. LMJ channel level. IEEE 802.x Standards Committee. LLC(802.2) protocol. Ethernet technology (802.3), media access method, protocol characteristics (PDV, PVV). Fast Ethernet (802.3u), GEthernet (802.3z), 10G Ethernet technologies. Specification of the physical environment.

Topic 4. Technologies of ring LAN. Main characteristics of Token Ring (802.5) and FDDI technologies. Marker way to access the environment.

Content module 3. Functioning of higher level protocols.

Topic 5. Implementation of the TCP/IP protocol stack based on LAN. Fundamentals of the TCP / IP stack, the functions of each of its levels. Principles of addressing and routing at the OSI network layer. The concept of an IP address, classes of IP addresses, masks, network subnetting, routing basics. The concept of encapsulation. Movement of IP packets in LAN, ARP protocol.

Topic 6.Implementation of applied network programs based on LAN. Basic applied network protocols DHCP, DNS, HTTP, FTP - principles of operation. Virtual data channels, tunnel protocols. Implementation of a corporate network based on VPN. Peer networks.

Content module 4. Fundamentals of switching and routing in local networks.

Topic 7. Switches and hubs LAN. Structure and principles of operation of LAN concentrators and switches. Types of switching.

Topic 8. MPLS Label Switching Technology. MPLS principles, architecture fundamentals, FEC forwarding equivalence classes, MPLS label switched paths, label stack and encapsulation, LDP label distribution protocol and its relationship to RSVP, implementation of MPLS in routers.

Topic 9. Fundamentals of wireless LV. Fundamentals of wireless technologies Wireless Ethernet. A collection of 802.11x standards. Modulation and encryption in WE.

Learning outcomes of higher education

As a result of studying the discipline, students must:

- to have an idea of the most promising areas of LAN development and the components used to build them.
- know the principles of organization of local and corporate networks

OSI requirements, algorithms and interaction of modern protocols of channel and network layers at data transmission in LAN,

- be able to plan and build structured LANs at the department, organization or company level, evaluate processes in LANs at the physical (environmental characteristics) and channel (Etrhernet protocol) levels.

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

To assess the student's work during the semester, the final rating Qsem is calculated as the sum of grades for different types of classes and control measures. Each practical lesson is evaluated in 6 points (1 point for attendance and 5 points for work in the class). Each laboratory work is estimated at 6 points (1 point for attendance, 1 point for practice, 4 points for defense). 1 point is awarded for attending lectures. Classroom tests or tests - 19 points each (each). The maximum rating during the semester is 100 points.

The combined exam is used as a form of final control for the discipline. With this type of control, the final grade Pp is calculated by the formula:

$$Pp = 0.6 \times Q_{sem} + 0.4 \times Q_{isp},$$

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

Q_{isp} - grade for the exam in a 100-point system.

The ticket for the written exam consists of two theoretical questions and a practical task(s). The results of the answers to the ticket questions are evaluated on a 100-point system:

- first question - 30 points;
- the second question - 30 points;
- task - 40 points.

Type of lesson / control measure	Rating	Type of lesson / control measure	Rating
Lc № 1, 2, 3, 4, 5, 6, 7	1x7=7	Lc № 1, 2, 3	1x3=3
Lb № 1, 2, 3	6x3=18	Lb № 1,2	6x2=12
Pr № 1, 2	6x2=12	Pr № 1	6
Control test 1	19	Control test 3	29
Control point 1	**56**	**Control point 3**	**50**
Lc № 8, 9, 10, 11, 12, 13, 14, 15	1x8=8	Lc № 4, 5, 6, 7, 8, 9	1x6=6
Lb № 4, 5	6x2=12	Lb № 3, 4	6x2=12
Pr № 3, 4, 5	6x3=18	-	
Control test 2	16	Control test 4	32
Control point 2	**54**	**Control point 4**	**50**
Total for the semester	**100**	Total for the semester	**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. Criteria for assessing the knowledge and skills of the student in the combined exam.

Assessment scale: national and ECTS

<table>
<tr><td rowspan="2">The sum of points for all types of educational activities</td><td rowspan="2">ECTS assessment</td><td colspan="2">Score on a national scale</td></tr>
<tr><td>for exam, course project (work), practice</td><td>for offset</td></tr>
<tr><td>90 – 100</td><td>A</td><td>perfectly</td><td rowspan="5">credited</td></tr>
<tr><td>82-89</td><td>B</td><td rowspan="2">fine</td></tr>
<tr><td>74-81</td><td>C</td></tr>
<tr><td>64-73</td><td>D</td><td rowspan="2">satisfactorily</td></tr>
<tr><td>60-63</td><td>E</td></tr>
<tr><td>35-59</td><td>FX</td><td>unsatisfactory with the possibility of reassembly</td><td>not credited with the possibility of re-assembly</td></tr>
<tr><td>0-34</td><td>F</td><td>unsatisfactory with mandatory re-examination</td><td>not credited with compulsory re-study of the discipline</td></tr>
</table>

Methodical support

Basic literature

1. V.H. Olyfer, N.A. Olyfer. Kompiuternye sety. Pryntsypy, tekhnolohyy, protokoly. – Spb..: Pyter, 2004. – 863 s.
2. Novykov Yu. V., Kondratenko S. V. Osnovy lokalnykh setei. Kurs lektsyi.– M.: Ynternet-unyversytet ynformatsyonnykh tekhnolohyi, 2005. — ISBN 5- 9556- 0032-9.
3. Olyfer V.H., Olyfer N.A. Setevye operatsyonnye systemy. – Spb: BKhV- Peterburh, 2001. – 540 s.
4. A.P. Serheev. Ofysnye lokalnye sety. – M.: Dyalektyka, 2003. – 320 s.
5. Holdshtein A.B., Holdshtein B.S Tekhnolohyia y protokoly MPLS. — SPb.: BKhV – Sankt-Peterburh, 2005. — 304 s.

Supporting literature

6. A. Poliak-Brahynskyi. Lokalnye sety. Samoe neobkhodymoe. – Spb.: BKhV- Peterburh, 2009. – 592 s.
7. Aleksandr Poliak-Brahynskyi. Lokalnye sety. Modernyzatsyia y poysk neyspravnostei. – Spb: BKhV-Peterburh, 2007 – 640 s.
8. A.A. Borysenko. Lokalnaia set. Prosto kak dvazhdy dva. M.: Эksmo, 2008. – 192 s.
9. Vyvek Olvein. Struktura y realyzatsyia sovremennoi tekhnolohyy MPLS. Rukovodstvo Cisco = Advanced MPLS Design and Implementation. — M.: Vyliams, 2004. — 480 s.
10. Proletarskyi A. V., Baskakov Y. V., Chyrkov D. N. Besprovodnye sety Wi-Fi. – M.: Bynom, 2007. – 172 s.

Methodical instructions for different classes

11. Metodychni vkazivky do laboratornykh robit z dystsypliny „Lokalni merezhi zviazku" dlia studentiv napriamku 6.050903 «Telekomunikatsii» (v roboti).*
12. Metodychni vkazivky do praktychnykh zaniat z dystsypliny „Lokalni merezhi zviazku" dlia studentiv napriamku 6.050903 «Telekomunikatsii» (v roboti).*
13. Metodychni vkazivky do samostiinoi roboty z dystsypliny „Lokalni merezhi zviazku" dlia studentiv napriamku 6.050903 «Telekomunikatsii» (v roboti).*
14. Metodychni vkazivky do kursovoho proektuvannia z dystsypliny „Lokalni merezhi zviazku" dlia studentiv napriamku 6.050903 «Telekomunikatsii» (vydano).
15. Metodychni vkazivky do laboratornykh robit z doslidzhennia merezhnykh tekhnolohii za dopomohoiu prohramnykh zasobiv NetCracker dlia studentiv usikh form navchannia spetsialnostei napriamku «Telekomunikatsii» / Uporiad. Yu.M Bidnyi ta in.– Kharkiv: KhNURE, 2005.*

Information support

1. Prohramnyi paket Cisco Packet Tracer 6.2.
2. Prohramnyi paket Cisco Packet Tracer 4.1 (5.1).
3. Prohramnyi paket Wireshark.
4. Prohramnyi paket OpenSimMPLS.
5. Prohramnyi paket NetCracker.