The syllabus of the discipline
Technologies and subscriber access networks of transport 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	Technologies and subscriber access networks of transport networks
Number of ECTS credits	3
Discipline structure (distribution by types and hours of study)	20 hours - 10 lectures, 6 hours – 3 practical classes, 16 hours - 4 laboratory classes, 8 hours - 4 consultations, 54 hours - homework, **type of control**: exam
Schedule (terms) of studying the discipline	4th year, VIII semester
Prerequisites for studying the discipline	Disciplines should be studied earlier: Higher mathematics; Physics
Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process	Knowledge of the basic hardware and software parts of technologies of means of technologies of networks of subscriber access, their interrelation, possibilities and restrictions. Be able to use theoretical positions in the design and operation of equipment and software implementations.
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 provide students with knowledge, skills and abilities in the field of design and operation of subscriber access networks based on xDSL family technology.

Content

1. Introduction
2. Overview of subscriber access network technologies and their brief characteristics. General information about the communication channel, its characteristics.
3. Restrict the use of ADSL channels. Pulse variance and intersymbol interference. Causes and methods of combating them.
4. The main characteristics of the ADSL channel and interference in the ADSL communication channel. Transitional obstacles NEXT and FEXT, methods of overcoming them.
5. Own transitional obstacles, narrowband obstacles, broadband obstacles, methods of combating them.
6. Running resistance, inductance and capacitance, their impact on the quality of communication.
7. Types of channel separation used in ADSL, characteristics, advantages and disadvantages.
8. Structural schemes of equipment and principles of organization of communication channels
9. Block diagram of the ADSL transmitter, the purpose of the main nodes. DMT and QAM modulation methods.
10. Block diagram of the ADSL transmitter, the purpose of the main nodes. Noise-tolerant coding. Alternation of bits.

Learning outcomes of higher education

As a result of studying the discipline, students must:

KNOW: the main hardware and software technologies of subscriber access network technologies, their interconnection, capabilities and limitations.

BE ABLE TO: use theoretical positions in the design and operation of equipment and software implementations.

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

To evaluate the student's work during the semester, the final rating score of Qsem is calculated as the sum of grades for different types of classes and control activities.

Type of lesson / control measure	Rating
Pr № 1	6-15
Lb № 1	4-8
Test	8-11
Check point	**18-34**
Lb № 2	4-7
Pr № 2	6-15
Lb № 3	3-7
Test	3-4
Check point	**16-33**
Pr № 3	4-10
Lb № 4	4-8
Test	8-15
Check point	**16-33**
Total	**50-100**

Qualitative evaluation criteria in the national scale and ECTS

Criteria for evaluating student work during the semester.

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.

Criteria for assessing the knowledge and skills of the student in the combined exam.

Satisfactory, D, E (60-74). Show the required minimum of theoretical knowledge. Solve the problem.

Well, C (75-89). Know the main topics of theoretical material. Solve the problem.

Excellent, A, B (90-100). Show complete knowledge of theoretical material. Solve the problem correctly.

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	
82-89	**B**	fine	
74-81	**C**		credited
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. Zaichenko N., Saiko V. Sovremennye DSL-tekhnolohyy v Ukrayne // Sety y telekommunykatsyy. – 2002. – №1. – S. 33−37.
2. John A.C. Bingman. Multicarrier modulation for data transmission: an idea whose time has come // IEEE Communication Magazine. May, 1990. − 7−14 p.
3. Balashov V.A., Liakhovetskyi L.M. Alhorytmy optymyzatsyy spektra hruppovoho syhnala v mnohokanalnykh modemakh // Nauchnye trudy UHAS ym. A.S. Popova. – 1999. – №1. – S. 37–43.
4. Balashov V.A., Liakhovetskyi L.M. Modelyrovanye kharakterystyk tsyfrovykh abonentskykh lynyi // Zviazok. – 2003. – №2. – S. 19–23.
5. Liakhovetskyi L.M. ADSL: proverka hotovnosty // Telekommunykatsyy y sety. – 2002. – №9. – S. 38-42.
6. V.H. Olyfer, N.A Olyfer Setevye operatsyonnye systemy. – SPb.: Pyter, 2001. – 544 s.
7. V.H. Olyfer, N.A. Olyfer. Kompiuternye sety: pryntsypy, tekhnolohyy, protokoly. – SPb.: Pyter, 2003. – 864 s.
8. D. Bekon, T. Kharrys Operatsyonnye systemy. – SPb.: Pyter; Kyev, 2004.– 800 s.
10. Terry Ohltry Modernyzatsyia y remont setei. – M.: Yzdatelskyi dom «Vyliams», 2000. – 928 s.
11. Microsoft Corporation Kompiuternye sety. Uchebnyi kurs. – M.: Russkaia redaktsyia, 1997.
12. K. Zaker Kompiuternye sety. Modernyzatsyia y poysk neyspravnostei. SPb.: BKhV-Peterburh, 2001. – 1008 s.
13. Vyshnevskyi A. Setevye tekhnolohyy Windows 2000.- SPb.: «Pyter», 2000.

Supporting literature

1. Rekomendatsyia ITU-T G.995.1 Overview of Digital Subscriber Line (DSL) Recommendations (Obzor rekomendatsyi po tsyfrovym abonentskym lynyiam).
2. Rekomendatsyia ITU-T G.996.1 Test procedures for Digital Subscriber Line (DSL) transceivers (Protsedurы testyrovanyia dlia pryemoperedatchykov tsyfrovыkh abonentskykh lynyi (DSL)).
3. Rekomendatsyia ITU-T G.992.1 Asymmetrical digital subscriber line (ADSL) transceivers (Pryemoperedatchyky asymmetrychnoi tsyfrovoi abonentskoi lynyy (ADSL)).
4. Rekomendatsyia ITU-T G.992.2 Splitterless asymmetric digital subscriber line (ADSL) transceivers (Pryemoperedatchyky asymmetrychnoi tsyfrovoi abonentskoi lynyy bez splyttera).
5. Rekomendatsyia ITU-T G.992.3 Asymmetric digital subscriber line transceivers 2 (ADSL2) (Pryemoperedatchyky asymmetrychnoi tsyfrovoi abonentskoi lynyy 2).
6. Rekomendatsyia ITU-T G.992.4 Splitterless Asymmetric Digital Subscriber Line transceivers 2 (Pryemoperedatchyky asymmetrychnoi tsyfrovoi abonentskoi lynyy bez splyttera 2).
7. Rekomendatsyia ITU-T G.992.5 Asymmetrical Digital Subscriber Line (ADSL) transceivers - Extended bandwidth ADSL2 (ADSL2+) (Pryemoperedatchyky asymmetrychnoi tsyfrovoi abonentskoi lynyy – Rasshyrennaia polosa chastot ADSL2).

8. Rekomendatsyia ITU-T G.993.1 Very high speed Digital Subscriber Line transceivers (Pryemoperedatchyky sverkhvysokoskorostnoi tsyfrovoi abonentskoi lynyy).

9. Rekomendatsyia ITU-T G.994.1 Handshake procedures for Digital Subscriber Line (DSL) transceivers (Protsedury «rukopozhatyia» dlia pryemoperedatchykov tsyfrovykh abonentskykh lynyi).

10. Rekomendatsyia ITU-T G.997.1 Physical layer management for Digital Subscriber Line (DSL) transceivers (Upravlenye na fyzycheskom urovne dlia pryemoperedatchykov tsyfrovykh abonentskykh lynyi).