The syllabus of the discipline
Multiservice 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	Multiservice communication networks
Number of ECTS credits	3
Discipline structure (distribution by types and hours of study)	22 hours - 11 lectures, 6 hours - 3 practical classes, 16 hours - 4 laboratory classes, 6 hours - 3 consultations, 50 hours - homework, **type of control**: exam
Schedule (terms) of studying the discipline	4th year, VIII semester
Prerequisites for studying the discipline	students must study the discipline "Local Area Networks" for a systematic understanding of the features of the configuration of network equipment.
Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process	The discipline is used for formation the following competencies: to solve problems related to the planning and organization of MMZ; apply the concept of IN and NGN platforms for the development and modernization of existing communication networks; to form at the level of algorithms creation the process of providing infocommunication services; perform calculations of traffic characteristics and parameters productivity of MMZ equipment.
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

<h1 style="text-align:center">Description and content of the discipline</h1>

The purpose of the discipline is to form basic knowledge in the field of multiservice communication networks (MMN), technological features of their conceptual platforms (IN and NGN), hardware and software solutions for the implementation of these platforms and algorithms and models of their services.

<h2 style="text-align:center">Content</h2>

Content module 1. Organization of MMZ on the basis of the IN platform

Topic 1. Stages and features of development of telecommunication networks, reasons and conditions of transition to multiservice communication networks.

Stages of development of telecommunication networks and services, reasons and conditions of transition to platforms of intelligent networks (IN) and next generation networks (NGN). Fundamental requirements for IN and NGN architecture.

Topic 2. General principles of organization of intelligent networks.

Simplified scheme of intelligent network and its features of functioning. Call service model in TMZK and intelligent network. Model and components of the basic call service process. Generalized model of call service process in interaction with service logic.

Topic 3. Architectural representation of the IN platform and its functions.

Architecture of intelligent networks platform, its functional units, their purpose and features. Functions of intelligent network nodes. The relationship between call management and services.

Topic 4. Representation of the intelligent network within its conceptual model.

Conceptual model of intelligent network, general characteristics of its planes, functional blocks and modules located on them, and their functionality.

Content module 2. MMZ organization based on NGN platform

Topic 1. Definitions and main features of next generation networks.

Basic definitions and characteristics of NGN, the concept of convergence of telecommunications networks and its aspects relating to different aspects of the organization NGN.

Topic 2. Conceptual model and equipment of NGN.

Generalized 3-level and 4-level architectures of the NGN conceptual model. The main types and functional features of the equipment used at their levels.

Topic 3. General features, architecture and technological solutions of SoftSwitch implementation.

Definitions, general characteristics and features of SoftSwitch. Reference architecture and its levels. Unified and distributed SoftSwitch structure.

<h2 style="text-align:center">Learning outcomes of higher education</h2>

As a result of studying the discipline students should:
KNOW:
- general principles of organization, architectural representation, conceptual models and functions of IN and NGN platforms;

- purpose and main functions of MMZ units and equipment on the base IN and NGN platforms (SSP, SCP, SDP, IP, SMP, gateway equipment, Softswitch, etc.);
- features of MMZ implementation on the basis of IN and NGN platforms in Ukraine and abroad.

BE ABLE:
- solve problems related to the planning and organization of MMZ;
- apply the concept of IN and NGN platforms for the development and modernization of existing communication networks;
- to form at the level of algorithms creation the process of providing infocommunication services;
- to calculate traffic characteristics and productivity parameters of MMZ equipment.

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

To assess the student's work during the semester, the final rating Q_{sem} is calculated as the sum of grades for different types of classes and control measures. Each lecture is evaluated in 1 point for attendance. Each practical lesson is evaluated in 6 points (1 point for attendance and 5 points for work in the class). Each laboratory work is evaluated in 6 points (1 point for presence, 1 point for practice, 5 points for defense). Auditory blank test - 18 points. Individual homework (ID) - 25 points. The maximum rating during the semester is 100 points.

Type of lesson / control measure	Rating
Lc № 1, 2, 3, 4, 5, 6	1x6=6
Lb № 1, 2	7x2=14
Pr № 1, 2	6x2=12
Control test 1	18
Control point 1	**50**
Lc № 7, 8, 9, 10, 11	1x5=5
Lb № 4, 5	7x2=14
Pr № 3	6x1=6
Control test	25
Control point 2	**50**
Total for the semester	**100**

The combined exam is used as a form of final control in the discipline. With this type of control, the final score of PP is calculated by the formula:

$$RP = 0{,}6Q_{sem} + 0{,}4Q_{isp},$$

where Q_{sem} is a grade for the semester on a 100-point system,
Q_{isp} is a score for the exam on 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: theoretical questions - 30 points each, the task - 40 points.

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

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	credited
74-81	**C**	fine	credited
64-73	**D**	satisfactorily	credited
60-63	**E**	satisfactorily	credited
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. Informatsiini merezhi zviazku: navch. posibnyk. Ch.2. Telekomunikatsiini tekhnolohii statsionarnykh merezh zviazku / V.M. Bezruka, Yu.M. Bidnyi, Yu.M. Koltun ta in. – Kharkiv: KhNURE, 2011. – 492 s.

2. B. Ya. Lykhttsynder, M. A. Kuziakyn, A. V. Rosliakov, S. M. Fomychev Yntellektualnye sety sviazy. – M.: Эко-Trendz, 2000.

3. B. S. Holdshtein, Y. M. Ekhryel, R. D. Rerle Yntellektualnye sety. – M.: Radyo y sviaz, 2000.

4. S. V. Krestianynov, E. Y. Polkanov, M. A. Shneps-Shneppe Yntellektualnye sety y kompiuternaia telefonyia. – M.: Radyo y sviaz, 2001. – 204 s.

5. Steklov V. K., Berkman L. N. Telekomunikatsiini merezhi — K.: Tekhnika, 2001 –392s.

6. Ershov V.A., Kuznetsov N.A. Multyservysnыe telekommunykatsyonnye sety. – M.: MHTU ym. N.Э. Baumana, 2003. – 432 s.

7. Telekommunykatsyonnye systemy y sety: Multyservysnye sety, Tom 3 / V.V. Velychko, E.A. Subbotyn, V.P. Shuvalov, A.F. Yaroslavtsev. – M.: Horiachaia lynyia – Telekom, 2005. – 592 s.

8. V.F.Mykhailov, V.S.Liashevych Rozrobka kontseptsii konverhentsii telefonnykh merezh i merezh z paketnoiu komutatsiieiu v Ukraini // Zvit pro rozrobku naukovo–tekhnichnoi produktsii. – K.: Derzhavnyi Komitet zviazku ta informatyzatsii Ukrainy – UNDIZ, 2003s.

9. Holdshtein A.B., Holdshtein B.S. Softswitch. – SPb.: BKhV – Sankt- Peterburh, 2006. – 368 s.

10. Internet-resurs: http://www.intuit.ru/department/network/ndnets/ Hulevych D.S. Sety sviazy sleduiushcheho pokolenyia // Uchebnыi Internet-kurs, 2007.

Supporting literature

1. A. V Rosliakov Obshchekanalnaia syhnalyzatsyia №7. – M.: Эko-Trendz, 1999.

2. B. S. Holdshtein Syhnalyzatsyia v setiakh sviazy. Tom 1. – M.: Radyo y sviaz, 1998.

3. B. S. Holdshtein, A.V. Pynchuk, A.L Sukhovytskyi IP-telefonyia. – M.: Radyo y sviaz, 2001. – 336 s.

4. Yvanova T.Y. Abonentskye termynalы y kompiuternaia telefonyia. – M.:Eko- Trendz, 1999. – 288 s.

5. A.Iu. Hrebeshkov Standartы y tekhnolohyy upravlenyia setiamy sviazy. – M.: Eko-Trendz, 2003. – 288 s.

6. Telekommunykatsyonnye systemy y sety: Uchebnoe posobye. Tom 1 – Sovremennye tekhnolohyy / B.Y. Kruk, V.N. Popantonopulo, V.P. Shuvalov. – M.: Horiachaia lynyia – Telekom, 2004. – 647 s.

7. Steklov V.K., Kilchytskyi Ye.V. Osnovy upravlinnia merezhamy ta posluhamy telekomunikatsii – K.: Tekhnika, 2002. – 438 s.

8. Steklov V.K., Berkman L.N. Proektuvannia telekomunikatsiinykh merezh. – K.: Tekhnika, 2002. – 792 s.

9. T.B. Denysova, B.Ia. Lykhttsender, A.N. Nazarov, M.V. Symonov, S.M. Fomychev Multyservysnye ATM-sety. – M. Eko-Trendz, 2005. – 320

10. Holdshtein A.B., Holdshtein B.S. Tekhnolohyia y protokoly MPLS. S- Pb.: BKhV - Sankt-Peterburh, 2005.

Methical instructions for different classes

1. Metodychni vkazivky do samostiinoi roboty ta praktychnykh zaniat z dystsypliny «Intelektualni merezhi» dlia studentiv usikh form navchannia napriamu 6.050903 - Telekomunikatsii / Uporiad. Yu.M. Koltun, N.A. Kharchenko, I.V. Filipenko. – Kharkiv: KhNURE, 2010. – 40 s.;

2. Metodychni vkazivky do laboratornykh robit z dystsypliny «Intelektualny merezhi» dlia studentiv usikh form navchannia napriamu 6.050903 - Telekomunikatsii / Uporiad. Yu.M. Koltun, N.A. Kharchenko, S.O. Kapusta – Kharkiv: KhNURE,2013.– 48 s

3. Bydnyi Yu.M. Rukovodstvo polzovatelia po prohrammnomu paketu CINDERELLA SDL. – Kharkov: KhTURЭ, 1999*.

4. Metodychni vkazivky do samostiinoi roboty ta praktychnykh zaniat z dystsypliny «Multyservisni merezhi zviazku» dlia studentiv usikh form navchannia spetsialnosti 7.050903 «Informatsiini merezhi zviazku». / Uporiadnyky Iu.M. Koltun, N.A. Kharchenko – Kharkiv: KhNURE, 2012. – 56 s.

5. Metodychni vkazivky do samostiinoi roboty ta praktychnykh zaniat z dystsypliny «Multyservisni merezhi zviazku» dlia studentiv usikh form navchannia spetsialnosti 7.050903 «Informatsiini merezhi zviazku». / Uporiadnyky Iu.M. Koltun, N.A. Kharchenko – Kharkiv: KhNURE, 2012. – 56 s.

Information support

1. CINDERELLA SDL v.1.0 - 1.4 software package. Requires: 32 RAM, 16-32 MB of disk space.

2. Software package "Intelligent Services" v.1.0, developed dept. "Communication Networks", KNURE.

3. Software package "NGN Pro" v.1.0, developed. dept. Communication Networks, KNURE, 2015