

The syllabus of the discipline

Converged service platforms of next generation networks

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Field name	Detailed content, comments
Name of the faculty	Faculty of Infocommunications
Level of higher education	Second (master's)
Code and name of the specialty	172 Telecommunications and radio engineering
Type and name of educational program	ESP, EPP "Information and Network Engineering", EPP "Mobile Networks"
Name of the discipline	Converged service platforms of next generation networks
Number of ECTS credits	5
Discipline structure (distribution by types and hours of study)	26 hours - 13 lectures, 8 hours - 4 practical classes, 16 hours - 4 laboratory classes, 10 hours - 5 consultations, 90 hours - independent work, type of control: comb. exam
Schedule (terms) of studying the discipline	1st year, II semester
Prerequisites for studying the discipline	Basic concepts of disciplines - Programming; - Basics of computer modeling and design of TCRT; - Information systems and Internet technologies; - Data processing technologies in IR; - Local communication networks; - Technologies of subscriber access networks; - Multiservice communication networks.
Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process	FC-2 Ability to assess the level of existing technologies in the field of professional activity, the effectiveness of technical solutions and the possibility of intellectual property rights, to find ways and opportunities to implement scientific ideas in profitable business projects and startups; FC-3 Ability to system thinking, solving problems of development, planning, optimization and modernization of communication networks; FC-4 Ability to use a foreign language for translation, generalization and use of foreign specialized scientific, technical and reference literature; FC-5 Ability to formulate the novelty and relevance of research work, conduct a scientific discussion and present the results of research on a given

	<p>topic in the field of telecommunications; FC-6 Ability to use information technology, methods of intellectualization and visualization, artificial intelligence, cloud computing for research and analysis of processes in information communication networks; FC-7 Ability to demonstrate and use fundamental knowledge of the principles of construction of modern information communication networks, information transformation and storage systems, promising areas of their development; FC-8 Ability to demonstrate and use knowledge of modern computer and information technologies and tools of engineering and scientific research, calculations, data processing and analysis, evaluation of systems efficiency and methods of quality assessment, modeling and optimization of communication information networks; FC-10 Ability to demonstrate, analyze and use knowledge of modern printed and electronic resources (including foreign languages) of scientific and technical, reference and scientific information on the status, trends and development of communication networks; FC-11 Ability to use standard and develop their own software products, focused on solving problems of design, calculation and ensuring the efficient operation of information networks and components of their infrastructure; FC-12 Ability to analyze, develop and improve scientific, design, technological, metrological and organizational and management documentation; FC-13 Ability to choose the best research methods, modify and adapt existing ones, develop new research methods in accordance with existing technical means and form a method of processing research results; FC-14 Ability to assess problem situations and shortcomings in the design, installation, configuration, operation and operation of information networks, to formulate proposals for solving problems and eliminating shortcomings.</p>
<p>The quality of the educational process</p>	<p>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.</p>

Description and content of the discipline

The course aims to provide students with knowledge, skills and abilities in the field of organization of new generation networks (NGN), which are the basic basis for the creation and implementation of converged service platforms, methods, models and platforms for infocommunication services, and ensure their quality.

Content

Content module 1. Definition, architectural representation and NGN services.

Topic 1. Features of the development of telecommunications networks, which led to a gradual transition to next generation networks.

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

Topic 2. Definition and main features of NGN as a basic basis for supporting converged networks.

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

Topic 3. Architectural representation and equipment of NGN.

Level of service management. Switching control level. Transport level. Access level.

Topic 4. Current state, prospects of development and features of next generation network services.

Classification of modern communication services. Technical features, properties, and principles of formation of infocommunication services within the concept of NGN. Features of providing services in traditional networks and NGN networks.

Content module 2. Architectural implementations of modern convergent service platforms (PCB).

Topic 1. Typical structures of IP-telephony networks in accordance with the standards H.323, SIP, MGCP, as the transport basis of the PCB.

Architectural features and protocols of IP-telephony. Construction of IP-telephony network in accordance with recommendation H.323 and based on SIP and MGCP protocols.

Topic 2. Architectural implementations of convergent service platforms within the convergence of TMZK, IP-networks and Internet.

Architecture of the converged service platform PINT / SPIRITS. EURESCOM P909 project. Combined Parlay / CORBA / PINT architecture. TIPHON project. Converged service platform IN, CTI and Internet based on the INF project.

Topic 3. Architectural concept of IMS.

Prerequisites for the transition to IMS. IMS functionality. IMS architecture and its elements.

Learning outcomes of higher education

As a result of studying the discipline, students must:

–**know:** generalized principles of building NGN networks and their elements and services; directions and technologies of convergence of networks and network technologies; technological features and principles of formation and provision of infocommunication services to users; features and architectural principles of the organization of convergent service platforms; general principles and concept of IMS platform organization.

- **be able to:** use the acquired knowledge in the process of creating and / or modeling new infocommunication services, their implementation in various multiservice networks within the concept of NGN.

- **to own:** PRN1. Ability to analyze the current state of networks in order to design, develop development scenarios or upgrade existing to the level of NGN; PRN 3. Ability to deploy NGN transport infrastructure based on modern technologies and protocols; PRN 7. Ability to select and effectively use information technology to support various service platforms; PRN 8. Use modern hardware and software to deploy, support the work of NGN; PRN 9. Ability to ensure reliable continuous operation of network infrastructure and software applications; PRN 11. Ability to develop and use different platforms for the provision of infocommunication services and converged service platforms.

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

To evaluate 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 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). Classroom blank test - 14 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	1x5=5
Lb № 1, 2	6x2=12
Pz № 1, 2	6x2=12
CD 1 / Test 1	14
Checkpoint 1	43
LC № 7, 8, 9, 10, 11,12, 13, 14	1x8=8
Lb № 3, 4	6x2=12
Pz № 3, 4	6x2=12
Individual homework	25
Checkpoint 2	57
Total for the semester	100

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

$$R_f = 0.6Q_{sem} + 0.4Q_{ex},$$

where Q_{sem} - grade for the semester on a 100-point system, Q_{ex} - grade for the exam on a 100-point system.

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

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

Good, 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	satisfactorily	
64-73	D		
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. Informacijni mrezihi zv'yazku: navch. posibnik. Ch.2. Telekomunikacijni tehnologiyi stacionarnih mrezh zv'yazku / V.M. Bezruka, Yu.M. Bidnij, Yu.M. Koltun ta in. – Harkiv: HNURE, 2011. – 492 s.
2. Telekommunikacionnye sistemy i seti: Multiservisnye seti, Tom 3 / V.V. Velichko, E.A. Subbotin, V.P. Shuvalov, A.F. Yaroslavcev. – M.: Goryachaya liniya – Telekom, 2005. – 592 s.
3. T.B. Denisova, B.Ya. Lihtcender, A.N. Nazarov, M.V. Simonov, S.M. Fomichev Multiservisnye ATM-seti. – M. Eko-Trendz, 2005. – 320
4. V.F.Mihajlov, V.S.Lyashevich Rozrobka koncepciyi konvergenciyi telefonnih mrezh i mrezh z paketnoyu komutaciyeyu v Ukrayini // Zvit pro rozrobku naukovo–tehnicnoyi produkciyi. – K.: Derzhavnij Komitet zv'yazku ta informatizaciyi Ukrayini – UNDIIZ, 2003s.
5. Goldshtejn A.B., Goldshtejn B.S. Softswitch. – SPb.: BHV – Sankt-Peterburg, 2006. – 368 s.
6. Ershov V.A., Kuznecov N.A. Multiservisnye telekommunikacionnye seti. – M.: Izdvo MGTU im. N.E. Baumana, 2003. – 432 s.

7. A.Yu. Grebeshkov Standarty i tehnologii upravleniya setyami svyazi. - M.: Eko-Trendz, 2003. - 288 s.
8. Nazarov A. N., Simonov M. V. ATM: tehnologiya vysokoskorostnyh setej. – M.: EKO-TRENDZ, 1999. – 252 s.
9. Goldshtejn A.B., Goldshtejn B.S. Tehnologiya i protokoly MPLS. S-Pb.: BHV - Sankt-Peterburg, 2005.
10. Internet-resurs: <http://www.intuit.ru/department/network/ndnets/> Gulevich D.S. Seti svyazi sleduyushogo pokoleniya // Uchebnyj Internet-kurs, 2007.
11. Internet-resurs: <http://www.intuit.ru/department/network/iptele/> Baskakov I.V., Proletarskij A.V., Fedotov R.A., S.A. IP-telefoniya v kompyuternyh setyah // Uchebnyj Internet-kurs, 2008.
12. SIEMENS. Podrobnoe opisanie protokola SIP [Elektronnyj resurs] / (c) OOO Siemens Enterprise Communications – Rezhim dostupa: [www/ URL: http://open-academy.ru/5/24/118](http://www.open-academy.ru/5/24/118) – 2008 g. – Zagl. s ekrana.
13. Pogrebennik, A. Vse, chto vy hoteli znat o protokole SIP [Tekst] / A. Pogreben nik. // Sistemnyj administrator. – 2007. - №3. – S. 78 – 86.
14. Biondich, N. Protokol iniciacii sessii [Tekst] / N. Biondich, M. Vukushich-Vasilevski, L. Medak, V. Bolt, V. Vrlika // Ericsson Nikola Tesla REVIJA. – 2005. - №18. – S. 4 – 40.
15. Asterisk-The Open Source Telephony Projects [Elektronnyj resurs] / Digium, Inc. – Rezhim dostupa: [www/ URL: http://www.asterisk.org](http://www.asterisk.org) - Copyright (c) 2010.

Supporting literature

1. Zaharov G. P., Simonov M. V., Yanovskij G. G. Sluzhby i arhitektura shirokopolosnyh cifrovyyh setej integralnogo obsluzhivaniya. – M.: Tehnologii elektronnyh kommunikacij, 1993.
2. Steklov V.K., Kilchickij Ye.V. Osnovi upravlinnya mrezhami ta poslugami telekomunikacij – K.: Tehnika, 2002. – 438 s.
3. Anan'ev A.N. Proektirovanie multiservisnyh korporativnyh setej regionalnyh operatorov svyazi. – M.: Radio i svyaz, 2002. – 92 s.
4. Kulgin M. Tehnologiya korporativnyh setej. Enciklopediya. SPb.: Piter, 1999 – 704 s.
5. Dzhejms Martin i dr. Asinhronnyj rezhim peredachi: arhitektura i realizaciya ATM. – M.: Lori, 2000.
6. Kolisnichenko, D.N. Linux-server svoimi rukami [Tekst] / D.N. Kolisnichenko. – SPb: Nauka i Tehnika, 2002. – 576 str.
7. Programmy dlya Asterisk [Elektronnyj resurs]. – Rezhim dostupa: [www/ URL: http://www.asterisk-pbx.ru/wiki/doku.php/soft](http://www.asterisk-pbx.ru/wiki/doku.php/soft) - 01.07.2010. - Zagl. s ekrana.

8. Asterisk Management Interface (AMI) [Elektronnyj resurs] / Powered by Trac 0.12.1 By Edgewall Software. – Rezhim dostupa: [www/ URL: http://asteriskpbx.ru/wiki/manager-interface-doc](http://asteriskpbx.ru/wiki/manager-interface-doc). - Zagl. s ekrana.
9. IP-ATS FreePBX, Rukovodstvo administratora [Elektronnyj resurs] / ZAO «Liniya 24». – Rezhim dostupa: [www/ URL: http://www.line24.ru](http://www.line24.ru) - 2010.

Methodical instructions for different types of classes

1. Metodichni vkazivki do samostijnoyi roboti ta praktichnih zanyat z disciplini «Integrovani servisni platformi» dlya studentiv specialnosti 172 «Telekomunikaciyi ta radiotekhnika» za osvithnimi programami pidgotovki magistriv: "Informacijno-merezhna inzheneriya", "Informacijni merezhi zv'yazku", "Mobilni merezhi zv'yazku" [Elektronnij dokument]/ Ukladachi: Yu.M. Koltun, N.A. Harchenko – Harkiv: HNURE, 2018. – 65 s.
2. Metodichni vkazivki do laboratornih robit z disciplini «Konvergentni servisni platformi merezh nastupnogo pokolinnya» dlya studentiv usih form navchannya specialnosti 172 «Telekomunikaciyi ta radiotekhnika» za osvithnimi programami pidgotovki magistriv: "Informacijno-merezhna inzheneriya", "Informacijni merezhi zv'yazku", "Mobilni merezhi zv'yazku" [Elektronnij dokument] / Uporyad.: Yu.M. Koltun, G.Ye. Lyashenko, V.V. Tomak – Harkiv: HNURE, 2019. – 44 s.*
3. Metodichni vkazivki do kursovogo proektuvannya z disciplini «Konvergentni servisni platformi merezh nastupnogo pokolinnya» dlya studentiv usih form navchannya specialnosti 172 Telekomunikaciyi ta radiotekhnika za osvithnimi programami "Informacijno-merezhna inzheneriya", "Informacijni merezhi zv'yazku", "Mobilni merezhi zv'yazku" / Uporyad.: Koltun Yu.M., Lyashenko G.Ye., Tomak V.V. – Harkiv: HNURE, 2020. – 40 s.

Information support

1. Software package "Simulation model B-ISDN v.1", developed by M. Kunderenko under the leadership of Koltun Yu.M.
2. TrixBOX v. 2.6 - a free distribution based on Linux. System requirements 350 MHz, Pentium II, 256 MB of RAM, 4 GB HDD, NetCard: 100 Mbps Fast Ethernet.
3. FreePBX - TrixBOX OS utility for optimal configuration of the Asterisk software switch
4. Asterisk v. Software package. 1.6 - performs the functions of Softswitch, is built into the TrixBOX OS.