

The syllabus of the discipline  
***IP telephony and IP television***

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<b>Field name</b>	<b>Detailed content, comments</b>
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	IP telephony and IP television
Number of ECTS credits	3
Discipline structure (distribution by types and hours of study)	20 hours - 10 lectures, 16 hours - 4 laboratory classes, 6 hours - 3 consultations, 48 hours - homework, <b>type of control:</b> credit
Schedule (terms) of studying the discipline	4th year, VIII semester
Prerequisites for studying the discipline	Basic knowledge of disciplines that provide knowledge of routing in communication networks, protocols, types and design of network construction.
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: to make an informed choice of equipment when designing an IP-telephony network; increase capacity and make additional adjustments to network equipment required for IP telephony; 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 ( <a href="https://lib.nure.ua/plagiat">https://lib.nure.ua/plagiat</a> ). 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 is to acquaint students with the principles, technologies, protocols and methods of building IP-telephony and IP-television networks. Gaining skills in the design and operation of IP-telephony and IP-television networks.

### **Content**

#### **Content module 1. Basic standards and equipment of IP-telephony.**

Topic 1. Introduction. Conceptual foundations of IP telephony.

History of IP telephony development. Packet switching transport technologies. Establishing an IP telephony connection. Basic connection scenarios in IP telephony. Advantages and disadvantages of IP telephony.

Topic 2. Standards for building IP-telephony.

Construction of the network according to the H.323 standard. TIPHON network integration project. Building a network based on the SIP protocol. Building a network based on Asterisk technology. Building a network based on the MGCP gateway management protocol. P2P network construction (Skype technology). Comparison of construction standards.

Topic 3. Equipment of IP-telephony networks.

Terminals. Multimedia headsets for terminal equipment. Telephones: skype-phones, USB-phones, connection of standard phones. Voice gateways and their hardware and software. Routers with speech transmission support. Auxiliary devices: MCU, Gate-keeper.

Topic 4. Language transmission over IP networks.

Features of language transmission over an IP network. Factors affecting language quality. Basic language coding algorithms. Assessment of language quality. Subjective and objective criteria.

#### **Content module 2. Implementation of IPTV networks.**

Topic 1. Tariffing and security methods in IP-telephony.

Formats of calculations and billing issues in IP-telephony. Authorization, authentication and encryption when transmitting speech over an IP network.

Topic 2. General characteristics of IPTV networks.

Basic IPTV services. Requirements for network characteristics. Hierarchical structure of IPTV network. Principles of IPTV network deployment.

Topic 3. Basics of building IPTV networks.

Review of the MPEG standard. Video transmission methods. Basic IPTV equipment. The structure of the main and sub-head station. Elements of city, district and home networks.

Topic 4. Methods of quality assurance in the IP network.

QoS tools. IntServ and DiffServ algorithms. Real-time data transfer and resource reservation protocols (MPLS, RSVP, RTP). Group delivery protocols. Methods of priority processing and profiling of traffic.

## Learning outcomes of higher education

As a result of studying the discipline, students must:

know:

- basic components and principles of building IP-networks;
- mathematical models of signal processing in IP networks;
- protocols and standards for building IP-telephony and IP-television networks;
- aspects of implementation and hardware of IP-telephony networks and IP-television networks.

be able:

- make an informed choice of equipment when designing an IP-telephony network;
- increase capacity and perform additional configuration of network equipment required for IP-telephony;
- adjust load balancing mechanisms.

### 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  $Q_{\text{sem}}$  is calculated as the sum of grades for different types of classes and control activities.

Type of lesson / control measure	Rating
Lb № 1, 2	15x2=30
Pr № 1, 2	2x10=20
Test № 1	10
<i>Control point № 1</i>	60
Lb № 3, 4	15x2=30
Pr № 3	1x10=10
<i>Control point № 2</i>	40
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

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	<b>A</b>	perfectly	credited
82-89	<b>B</b>	fine	
74-81	<b>C</b>		
64-73	<b>D</b>	satisfactorily	
60-63	<b>E</b>		
35-59	<b>FX</b>	unsatisfactory with the possibility of reassembly	not credited with the possibility of re-assembly
0-34	<b>F</b>	unsatisfactory with mandatory re-examination	not credited with compulsory re-study of the discipline

## Methodical support

### Basic literature

1. Holdshstein B.S., Pynchuk A.V., Sukhovytskyi A.L. IP-telefonia. – M.: Radyo y sviaz, 2001. – 336 s.
2. Dəvydson D., Pyters D. y dr. Osnovy peredachy holosovykh dannykh po setiam IP, 2-e yzd.: Per. s anhl. – M.: Yzdat. dom «Vyliams», 2007. – 400 s.
3. Vehensha Sh. Kachestvo obsluzhyvaniya v setiakh IP: Per. s anhl. – M.: Yzdatelskyi dom «Vyliams», 2003. – 386 s.
4. Rosliakov A.V., Samsonov M.Iu., Shybaeva Y.V. IP-telefonia. – M.: Eko-Trendz, 2003, 252s.

### Supporting literature

5. Holdshstein A.B., Holdshstein B.S. SOFTSWITCH. – SPb.: BKhV, 2006. – 368 s.
6. Shelukhyn O.Y., Lukiantsev N.F. Tsyfrovaia obrabotka y peredacha rechy. – M.: Radyo y sviaz, 2001. – 452 s.
7. Tanenbaum Ə. Kompiuternye sety. – SPb.: Pyter, 2002. – 848 s.
8. Kornyshev Yu.N., Pshenychnykov A.P., Kharkevych A.D. Teoryia teletrafyka.– M.: Radyo y sviaz, 1996. – 270 s.

### Rekomendatsii ITU-T ta RFC

9. ITU Recommendation G.711. Pulse Code Modulation of Voice Frequencies, 1988.
10. ITU Recommendation G.114. One-way transmission time, March 1993.
11. ITU Recommendation G.723.1. Dual Rate Speech Coder for Multimedia Communications Transmitting at 5.3 & 6.3 kbit/s, March 1996.
12. ITU Recommendation G.726. 40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation, March 1991.
13. ITU Recommendation G.727. 5-,4-,3- and 2 bits Sample Embedded Adaptive Differential Pulse Code Modulation, November 1994.

14. ITU Recommendation G.728. Coding of Speech at 16 kbit/s Using Low- Delay Code Ex- cited Linear Prediction, November 1994.
15. ITU Recommendation G.729. Coding of Speech at 8kbit/s using Conjugate Structure - Algebraic Code Excited Linear Predictive Coding, March 1996.
16. ITU Recommendation G.764. Voice packetization – Packetized voice protocols, December 1990.
17. RFC 2212, "Specification of Guaranteed Quality of Service", Sept. 1997.
18. RFC 1789, "INETPhone: Telephone Services and Servers on Internet," April 1995.
19. RFC 2205, "Resource Reservation Protocol (RSVP) – Version 1 Functional Specification", September 1997.
20. RFC 1889, "RTP: A Transport Protocol for Real-Time Applications", January 1996.