The syllabus of the discipline

Methods of multimedia information processing

V.V. Barannik,
Professor of INE dept, Doctor of Technical Sciences, Professor
E-mail: volodymyr.barannik@nure.ua

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	EPP "Information and Network Engineering"
Name of the discipline	Methods of multimedia information processing
Number of ECTS credits	5
Discipline structure (distribution by types and hours of study)	20 hours - 10 lectures, 4 hours - 2 practical classes, 16 hours - 8 laboratory classes, 10 hours - 5 consultations, 100 hours - independent work, **type of control:** comb. exam
Schedule (terms) of studying the discipline	2-nd year, II semester
Prerequisites for studying the discipline	Basic concepts of disciplines: Higher mathematics; Telecommunication theory; Telecommunication and information networks
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 encode images and video data; choose the compression algorithm and encoding method according to the type of images in the media stream.
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>

According to the qualification requirements for higher education in the specialty 172 "Telecommunications and Radio Engineering" the purpose of the discipline is to provide students with knowledge, skills and abilities in the field of delivery and processing of multimedia information in telecommunications systems.

<h1 style="text-align:center">Content</h1>

Introduction
Review of the formation of aspects that determine the development of video applications.
Provision of video information services. Informational security.
The main directions of using multimedia processing methods.

Image
Representation of images, their types and classification.
Colored models.
Criteria for evaluating compression algorithms.
Image compression methods.

Methods and technologies of coding without loss of information
Redundancy of images.
Information measure.
Information characteristics of message sources with independent elements
Information characteristics of dependent message sources.

Coding methods without loss of information. Element-by-element coding
Basics of coding.
Universal codes.
Monotonous codes.

Statistical coding methods. Block codes.
Uneven element coding
Huffman's code
Approaches to encoding memory codes
Arithmetic coding

Statistical coding methods. Structural codes.
Interval code
Uniform coding of series lengths
Structural coding of the LZ family

JPEG platform
Features of images as a data type
Requirements for applications to compression algorithms
General information about the JPEG compression algorithm
JPEG compression modes
The scheme of the algorithm

JFIF format
JPEG-2000
MPEG-4 standard
Video compression standards
General information of the MPEG-4 standard
Standard profiles
Protocol H 264
Comparison of standards
General characteristics of H 264
Algorithm of work H 264
Innovations in information compression methods. Their further development.

Learning outcomes of higher education

As a result of studying the discipline, students must:

know:
- basic concepts and definitions of the theory of coding and processing of multimedia information;
- types of images, formats and models of their presentation;
- basic coding methods - element and block;
- image compression methods;
- JPEG-platform, concept, methods, algorithm;
- MPEG-platform and protocols H 26x.

be able:
- encode images and video data;
- choose the compression algorithm and encoding method according to the type of images in the media stream.

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

To evaluate the student's work during the semester, the final rating is calculated as the sum of grades for different types of classes and for control activities. Each laboratory work is evaluated in 10 points (4 points for attendance, 2 points for performance, 2 points for report, 2 points for defense). Each test task has 10 points. The credit rating is defined as the ratio of the obtained points to the highest value, which is given in the table. The maximum rating during the semester - 100 points, is defined as the average for three credits.

Types of classes / control event	Rating
Pz № 1	3-5
Pz № 2	3-5
Lb № 1	3-5
Lb № 2	3-5
KR1	10-15
CT1	**6-15**
Lb № 3	3-5
Lb № 4	3-5
KR2	8-15
KR3	8-15
CT3	**21-25**
Rating	**50-100**

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.

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**		
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

1. Barannyk V.V. Kodyrovanye transformyrovannykh yzobrazhenyi v ynfokommunykatsyonnykh systemakh / V.V. Barannyk, V.P. Poliakov - Kh.: KhUPS, 2010. – 212 s.

2. R.Honsales, R. Vuds Tsyfrovaia obrabotka yzobrazhenyi. M.: Tekhnosfera, 2005 – 1072 s.

3. V.S. Skliarov Matematycheskye modely ynformatsyonnykh system. Kh.: 1989.

4. D. Vatolyn, A. Ratushniak, M. Smyrnov, V. Yukyn Metody szhatyia dannykh. Alhorytmy szhatyia yzobrazhenyi. – M.: DYALOH-MYFY, 2002.

5. Yan Rychardson. Vydeokodyrovanye. N.264 y MPEG-4 – standarty novoho pokolenyia. Moskva: Tekhnosfera, 2005. - 368 s.

6. Dzh. Myano Formaty y alhorytmy szhatyia yzobrazhenyi v deistvyy. M.: Tryumf, 2003 – 336 s.

7. Pratt U. Tsyfrovaia obrabotka yzobrazhenyi M.: Myr, 1982. – Kn. 2 – 480s.

8. D.Salomon Szhatye dannykh, yzobrazhenyi y zvuka. M.: Tekhnosfera, 2004. – 368 s.