

Educational Establishment  
“Belarusian State University of Culture and Arts”

**APPROVED**

Vice-rector for research of Educational  
Establishment «Belarusian State University  
of Culture and Arts »

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Registration № УД-86 /эуч.

**FUNDAMENTALS OF INFORMATION TECHNOLOGY**

*The syllabus of the academic discipline for all specialities of the II stage  
of higher education*

The syllabus is compiled in accordance with educational standards of the II stage of higher education and on the basis of the program-minimum of the candidate examination in General education discipline «Fundamentals of Information Technology», approved by the resolution of the Ministry of education of the Republic of Belarus of 13.08.2012, № 97

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**RECOMMENDED TO APPROVAL:**

*the Department* of Information Technology in Culture of the Educational Establishment "Belarusian State University of Culture and Arts" (minutes № 9 of 29.05.2019);

*the Presidium* of the Scientific and Methodological Council of the Educational Establishment "Belarusian State University of Culture and Arts" (minutes № 5 of 12.06.2019)

Responsible for the issue: D. Papova

## EXPLANATORY NOTE

The syllabus of the academic discipline «Fundamentals of Information Technology» is intended for foreign Master and PhD students who get education in English and assimilate the curriculum of the second stage of higher education or PhD course. The discipline provides students with knowledge, skills and abilities for doing research work to get the Master degree or the Researcher qualification and for passing successfully the candidate exam.

According to the educational standards of higher education 2019 in the process of studying the academic discipline «Fundamentals of Information Technology» a master-student is to develop the following universal competence: UC-4 Have the skills to use modern information technologies to solve research and innovation problems.

High-speed development of information technology today presupposes specialists studying the basic concepts of information technology and the up-to-date achievements in the area. The purpose of the academic discipline «Fundamentals of Information Technology» is to prepare students for the use of modern information technologies as a tool for solving high-level scientific and practical problems in their academic field.

The following objectives are to be realized to achieve the purpose:

- to overview the current state of information technology;
- to systemize the basic concepts of information technology;
- to gain knowledge, skills and abilities to work with text, graphic and spreadsheet programs, database management systems, presentation tools, tools for supporting mathematical calculations, Internet services, tools for creating web servers and websites.

As a result of the discipline study students should know:

- means for protecting information in computers and computer networks;
- methods of creating, storing and processing text, graphic, tabular, video and audio information;
- database management systems;
- the basics of programming and tools for creating websites;
- the structure of the Internet;
- modeling and optimization methods for solving applied problems of culture, education and science;

be able:

- to work with modern operating systems;
- to create, to store and to process text, graphic, tabular, video and audio information;

- to find the information in the Internet;
- to use Internet services;
- to use dictionaries, translators and archivers;
- to create information resources using tools and scripting programming languages;
- have skills
  - for using software products and information technology to solve practical problems;
  - for creating Internet information resources;
  - for applying multimedia technologies in the professional sphere.

According to the syllabus of the course «Fundamentals of Information Technology», which includes 108 hours, 72 academic hours are planned for lectures and practical training and 36 hours for self-learning. At the end of the course students should prepare a final project, which obligatory includes a research paper and presentation of the results, and take the candidate exam.

РЕПОЗИТОРИЙ БГУИМ

# CONTENT OF EDUCATIONAL MATERIAL

## Topic 1. Modern Information Technology

**Keywords:** computing technology, operational systems, languages and technologies of programming

History, current and prospective states of the computing technology development. Unit base, architecture, network layout, performance. The concept of information. Classification and types of information technology. Operational Systems. Purpose, classification, current state, acquaintance with the possibilities and work with the modern operational system. The history of the programming languages development. Features of modern languages (Java, Javascript, Python, Ruby, PHP, C #, C ++ and Objective-C.). Programming technologies: procedural, object-oriented and visual.

## Topic 2. Basic Information Technology Software

**Keywords:** text editors, graphic editors, sound editors, presentation preparation systems

Text editors and publishing systems, their capabilities and purpose. Dictionaries and translators. Archivers. Graphic editor. Ways to store and process graphic information. Raster and vector graphics editors and their capabilities. Sound editors. Ways to represent and process audio information. Codecs. Video editing systems. Presentation systems. Appointments, facilities, operation. Multimedia technologies in museums, theatrical and stage activities. Computing technology in music and film. Multimedia installations and augmented reality.

## Topic 3. Network technology and the Internet

**Keywords:** computer networks, Internet, Internet services, websites

Open systems communication model. The seven-level model of the structure of communication protocols. The link layers: application, presentation, session, transport, network, link and physical.

Types of computer networks: local, global and regional. Computer network topologies: fully connected, bus, star and ring.

Organizational structure of the Internet. Internet protocols (TCP and UDP). Basic Internet services (E-mail, Usenet, FTP, Telnet, WWW, DNS, IRC).

Scripting programming languages (Java, Perl, HTML, XML).

Tools for creating web servers and websites (PHP, ASP NET, Delphi, Python, NeoBook). Basics of web design.

Cloud-based technology. Main characteristic. Deployment models (private, public, public, and hybrid cloud). Service models (infrastructure, platform,

software). Cloud technologies in the field of culture: advantages and features of use.

Information and communication technologies in the socio-cultural sphere. The virtual social space. Virtual museums and libraries.

Information resources in the field of culture: features of information and opportunities. Copyright.

#### **Topic 4. Database management systems**

**Keywords:** database, database management system, logical data model, tables, queries, forms, reports, SQL language

Concepts of database and database management system (DBMS). The General logical model of databases (hierarchical, network, relational, entity-relationship model, object, star schema). Normalization of relations in the relational model. Capabilities of Microsoft Access, Oracle, MySQL, FoxPro, dBase and SQL Server.

Create a data schema, tables, queries, forms, and reports in Microsoft Access. Types of queries in Microsoft Access. Cross request requirements. The main SQL statements (SELECT, INSERT, DELETE, UPDATE). Building SQL queries.

#### **Topic 5. Information protection**

**Keywords:** information encoding, information decoding, anti-virus protection, digital signature, information security

Methods and means of information protection. Antivirus protection. Coding and decoding of information. Protection against unauthorized access to data. Security classes of computer systems. Digital signature. Organizational and legal aspects of information protection and copyright.

Methods of information security in information systems (barrier, access control, encryption mechanisms, and resistance to malicious software attacks, regulation, coercion, inducement).

Security technology. Technology virus protection (incoming inspection, segmentation of the hard disk, the systematic use of TSRs auditors and filters, archiving).

Functions of the electronic digital signature (document integrity, protect against changes, the impossibility of repudiation, evidence-based confirmation of authorship).

#### **Topic 6. Research Planning and Research Data Processing**

**Keywords:** modeling, scientific experiment planning and optimization, computing systems.

Computing systems: Purpose, capacities, applications.  
Spreadsheets. Using for planning and processing research results.  
Methods of scientific experiment planning. Programs for experimental data processing.

Optimization as the final stage of the computational experiment.  
Optimization problems and optimization models in various subject areas.

### **Topic 7. Decision-making Systems and Automated Management Systems in Education, Science and Culture**

**Keywords:** decision-making system, automated management system, project management, e-government.

Decision-making systems. Classification. Structure. Knowledge-based systems. Expert systems.

Software for planning, controlling managing projects. Schedule problems communications and cooperation problems, configuration management and risk analysis problems solving.

Automated management systems for libraries, museums, research activities and educational processes.

E-government. History of creation. Development prospects in the Republic of Belarus. Automated information system used in Belarus.

РЕПОЗИТОРИЙ БГУИМ

# **METHODICAL INSTRUCTIONS FOR THE PREPARATION, FORMALIZATION AND DEFENSE OF THE FINAL WORK**

## **General requirements**

Individual graduate work of a student must be an original, independently performed work performed by means of information technology.

The purpose of the work is to acquire knowledge and skills for the use of information technology tool in their professional activities in accordance with the chosen scientific specialty.

The topic of the work should correspond with the field of professional activity, scientific specialty or the topic of scientific research.

Recommendations on preparation of final works on the use of information technology tools are:

- in certain areas of culture and types (genres) of art;
- during the research process;
- during multimedia databases creation;
- in the development of research or education methods;
- during search and analysis of information in the automated systems and global information networks;
- during development of methods or systems for software and technical research support;
- to organize the search and processing of information;
- during the development of personal, creative, scientific works or in the educational technologies.

## **The structure of the final work**

Graduation work should include the following sections:

1. The title page, which contains the university and the department sigils, the full name of the work, the place and the year of performance, the surname, name and patronymic of the author, the surname, name and patronymic of the supervisor, marks of registration and admission to the defense.

2. The content, which should include the names of all structural units of work with the indication of page numbers.

3. List of abbreviations and designations (if necessary), the abbreviations are given in the left column, the full name (or interpretation) in the right column.

4. Introduction, which should contain:

- justification of the relevance (novelty) of the topic of work;
- formulation of the purpose and objectives of the work;



- definition of the subject and the object of the work;
- description of methods and tools used.

5. The main part, which should contain information about the design and implementation of the work, the use of methods and tools, a description of methods of tools use, a description of the carried research or design and the relevant argumentation, as well as a general description of the results of the work (research) and analytical materials.

6. Conclusion, which contains brief analysis of the work (study), conclusions, recommendations and generalizations.

7. The list of references should correspond to the Patterns of bibliographic description in the list of sources cited in the thesis and abstract, approved by the Order of the Higher Attestation Commission of the Republic of Belarus of June 25, 2014 No. 159 (as amended by the Order of the Higher Attestation Commission of the Republic of Belarus of September 08, 2016 No. 206).

8. Appendix should contain printouts of the performed work, information on the implementation of the work (study) in creative or production processes of cultural institutions, art groups, educational institutions, scientific research, etc. In the appendix, you should also submit electronic carriers with the materials: electronic copies of the works, source texts of developed programs (systems), databases, presentations, charts and graphs, electronic publications of the results of work (research).

### **The scope and the design of the final work**

The text of the final paper needs to be 25-28 pages (the title page, outline and works cited are not included in the total number of pages) of a computer printout with the Times New Roman font with the font size of 14 points, line spacing - 18 points.

Pages should be numbered continuously, starting from the second page (the title page is not numbered). The sizes of the margins are as follows: left - 2.5 cm; top - 2 cm; right - 1 cm; lower - 2 cm. Paragraph indent - 1.25 cm.

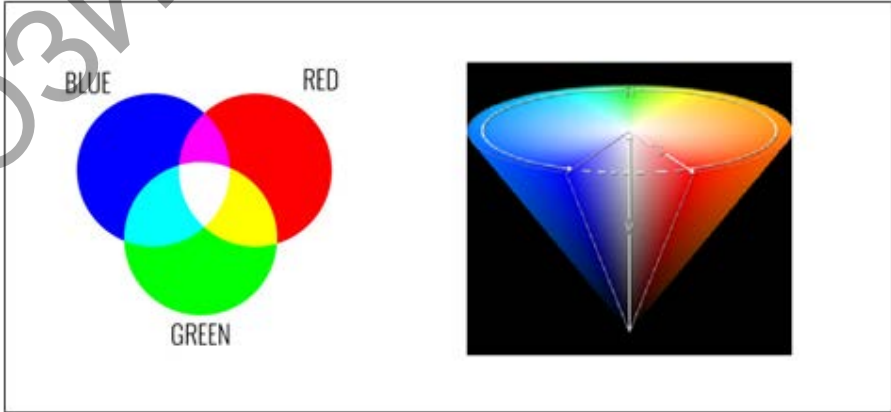
It is necessary to strictly adhere to the principle of unity of the categorical-conceptual apparatus and academic style of presentation. All special concepts should be indicated and clarified. Abbreviations should be decrypted, with the exception of generally accepted ones. References to literary sources must be enclosed in square brackets, where the source number is indicated.

Detailed rules for the design of the final paper are presented in the Table 1.

Table 1. –Paper preparation instructions

<b>Category</b>	<b>Rules</b>
Volume	Paper volume without appendix should be at least 24 pages
Page setup	left - 2.5 cm; top - 2 cm; right - 1 cm; lower - 2 cm
Body	Times New Roman, font size of 14 points, line spacing - 18 points, paragraph indent - 1.25 cm
Table of Contents	<p style="text-align: center;"><b>CONTENTS</b></p> <ul style="list-style-type: none"> <li>– begins on a new page;</li> <li>– word <b>CONTENTS</b> is printed out with font size of 16 points, bold, in ALL-CAPITALS, aligned to the center;</li> <li>– three intervals (48 points) after the word «<b>CONTENTS</b>»;</li> <li>– a content should contain:               <ol style="list-style-type: none"> <li>1) headings and subheadings that appear in the text;</li> <li>2) page number of these headings;</li> </ol> </li> <li>– table of contents should be generated automatically.</li> </ul>
Introduction	<p style="text-align: center;"><b>INTRODUCRION</b></p> <ul style="list-style-type: none"> <li>– begins on a new page;</li> <li>– word <b>INTRODUCRION</b> is printed out with font size of 16 points, bold, in ALL-CAPITALS, aligned to the center;</li> <li>– three intervals after the word «<b>INTRODUCRION</b>» (48 points);</li> <li>– an introduction should contain:               <ol style="list-style-type: none"> <li>1) justification of the relevance of the paper topic;</li> <li>2) aim, objectives, subject and object definition;</li> <li>4) description of the methods and means used.</li> </ol> </li> </ul>
Section	<p style="text-align: center;"><b>SECTION1</b> <b>HEADINGS OF SECTION TITLE</b></p> <ul style="list-style-type: none"> <li>– section should have at least two subsections;</li> <li>– section begins on a new page;</li> <li>– three intervals (48 points) after the heading of section title;</li> <li>– section title heading is aligned to the center, font size 16 points, <b>bold</b>, in ALL-CAPITALS;</li> <li>– heading of the section title should start on a new line below the word «<b>SECTION</b>»;</li> <li>– section numbering is as follows «<b>SECTION 1</b>», «<b>SECTION 2</b>» etc.</li> </ul>

Subsection	<p style="text-align: center;"><b>1.1 Headings of Subsection Title</b></p> <ul style="list-style-type: none"> <li>– heading of subsection title begins on a new line (one interval after the previous text if there is) ;</li> <li>– subsection body text begins in two intervals (36 points) after the heading of subsection title;</li> <li>– subsection title is aligned to the left with paragraph indent - 1.25 cm, font size 15 points, <b>bold</b>;</li> <li>– heading of the subsection title should start with a spacing after the subsection number, First Letters of the Words are Capitalized;</li> <li>– subsections numbering is as follows «1.1», «1.2», «2.1», «2.2» etc., according to the section, which contains a corresponding subsection.</li> </ul>
Conclusion	<p style="text-align: center;"><b>CONCLUSION</b></p> <ul style="list-style-type: none"> <li>– begins on a new page;</li> <li>– word <b>CONCLUSION</b> is printed out with font size of 16 points, bold, in ALL-CAPITALS, aligned to the center;</li> <li>– three intervals after the word «<b>CONCLUSION</b>» (48 points);</li> <li>– a conclusion should contain a brief analysis of the research, conclusions, recommendations and generalizations.</li> </ul>
Bibliography	<p style="text-align: center;"><b>BIBLIOGRAPHY</b></p> <ul style="list-style-type: none"> <li>– begins on a new page;</li> <li>– word <b>BIBLIOGRAPHY</b> is printed out with font size of 16 points, bold, in ALL-CAPITALS, aligned to the center;</li> <li>– three intervals after the word «<b>BIBLIOGRAPHY</b>» (48 points);</li> <li>– a bibliography should contain at least 7 cited sources.</li> <li>– examples of record sources: <ol style="list-style-type: none"> <li>1. Rips, L. J. Lines of thought: central concepts in cognitive psychology / L. J. Rips. – New York ; Oxford : Oxford Univ. Press, 2011. – XXII, 441 p.</li> <li>2. Language, society and power: an introduction / L. Thomas [et al.] ; ed.: I. Singh, J. S. Peccei. – 2nd ed. – London : Routledge, 2004. – XXIV, 239 p.</li> <li>3. Encyclopedia of social work : in 4 vol. / ed.: L. E. Davis, T. Mizrahi. – Oxford : Oxford Univ. Press, 2011. – Vol. 4. – 564 p.</li> <li>4. Personal papers in history : papers from the 3rd Intern. conf. on the history of rec. a. arch., Boston, 27–29 Sept. 2007 / Univ. of Texas ; ed.: B. L. Craig [et al.]. – Austin : Univ. of Texas, 2009. –</li> </ol> </li> </ul>

	<p>155 p.</p> <p>5. UNBISnet [Electronic resource]: UN Bibliogr. Inform. System. – Mode of access: <a href="http://unbisnet.un.org">http://unbisnet.un.org</a>. – Date of access: 24.06.2016.</p> <p>6. Steger, D. P. The future of the WTO: the case for institutional reform / D. P. Steger // J. of the Intern. Econ. Law. – 2009. – Vol. 12, iss. 4. – P. 803–833.</p> <p>7. Political philosophy in the twenty-first century : essential essays / ed.: S. M. Cahn, R. B. Talisse. – Boulder : Westview Press, 2013. – VII, 291 p.</p>
<p>Appendix</p>	<p style="text-align: right;"><b>APPENDIX A</b></p> <p style="text-align: center;"><b>Data for Research Results Illustration</b></p> <ul style="list-style-type: none"> <li>–begins on a new page;</li> <li>–word <b>APPENDIX</b> is printed out with font size of 16 points, bold, in ALL-CAPITALS, aligned to the right, numbering with Latin letters «<b>APPENDIX A</b>», «<b>APPENDIX B</b>» etc;</li> <li>–an appendix title starts on a new line after the word <b>APPENDIX</b>, First Letters of the Words are Capitalized, font size of 16 points;</li> <li>–two intervals after the appendix title (36 points); <ul style="list-style-type: none"> <li>– appendix should contain the data used to illustrate the research results or other information not cited in the text.</li> </ul> </li> </ul>
<p>Figures</p>	<div style="text-align: center;">  </div> <p style="text-align: center;"><b>Figure 1. –Color models</b></p> <ul style="list-style-type: none"> <li>– figure heading is aligned to the center, with font size of 12 points, <b>bold</b>;</li> <li>– figures are numbered continuously throughout the text;</li> <li>– in the text figure is referenced as (figure 1);</li> <li>– figure is wrapped by the text top and bottom;</li> </ul>

	<ul style="list-style-type: none"> <li>– before the figure and after the figure heading there is empty line (18points).</li> </ul>
Tables	<p>Table 1. –Table heading</p> <ul style="list-style-type: none"> <li>– table heading is aligned to the left, with font size of 14 points, <b>bold</b>;</li> <li>– tables are numbered continuously throughout the text;</li> <li>– table is wrapped by the text top and bottom;</li> <li>– in the text table is referenced as (table 1);</li> <li>– before the table heading and after the table there is empty line (18points).</li> </ul>

### **Research Paper Presentation Requirements**

Presentation should contain:

1. A Title Page
  - the paper title;
  - the name of the author.
2. A Table of Contents with navigation system.
3. A Body of 25-28 slides divided on sections according to the presentation structure.
4. Animation elements, audio and video files.
5. Internet References on the topic of the presentation with hyperlinks.
6. The last slide of the presentation should contain small resume of the author with his/her photo.

## INFORMATION-METHODICAL PART

### BIBLIOGRAPHY

1. Web Application Obfuscation / M. Heiderich [et al.]. – United States : Elsevier Inc., 2010. – 296 p.
2. Digital Disruption and Electronic Resource Management in Libraries [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780081020456/digital-disruption-and-electronic-resource-management-in-libraries>. – Date of access: 12.04.2019.
3. Computer and Information Security Handbook [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780128038437/computer-and-information-security-handbook>. – Date of access: 29.04.2019.
4. Perspectives on Data Science for Software Engineering [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780128042069/perspectives-on-data-science-for-software-engineering>. – Date of access: 18.04.2019.
5. Emerging Technologies for Librarians : A Practical Guide to Innovation [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9781843347880/emerging-technologies-for-librarians>. – Date of access: 29.04.2019.
6. Coding for Penetration Testers : Building Better Tools [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780128054727/coding-for-penetration-testers>. – Date of access: 28.04.2019.
7. Multi-Tier Application Programming with PHP: Practical Guide for Architects and Programmers [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780127323503/multi-tier-application-programming-with-php>. – Date of access: 12.04.2019.
8. SQL Clearly Explained [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9781558608764/sql-clearly-explained>. – Date of access: 15.04.2019.
9. MATLAB : A Practical Introduction to Programming and Problem Solving [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780128154793/matlab>. – Date of access: 18.04.2019.
10. Electronics Simplified [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780080970639/electronics-simplified>. – Date of access: 29.04.2019.

11. Software Defined Networks : A Comprehensive Approach. – Mode of access: <https://www.sciencedirect.com/book/9780128045558/software-defined-networks>. – Date of access: 25.04.2019.

12. Enterprise Content Management, Records Management and Information Culture Amidst e-Government Development [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780081008744/enterprise-content-management-records-management-and-information-culture-amidst-e-government-development>. – Date of access: 29.04.2019.

13. The Basics of Information Security : Understanding the Fundamentals of Infosec in Theory and Practice [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780128007440/the-basics-of-information-security>. – Date of access: 25.04.2019.

14. Simple Steps to Data Encryption : A Practical Guide to Secure Computing [Electronic resource]. – Mode of access: <https://www.sciencedirect.com/book/9780124114838/simple-steps-to-data-encryption>. – Date of access: 06.04.2019.

## **THE LIST OF AVAILABLE DIAGNOSTIC TOOLS LEARNING OUTCOMES OF**

Diagnosis of the results of educational activity of students is carried out by comparing the projects obtained during the laboratory work with the samples developed in the tasks. Discovered discrepancies shall be specified by the teacher to correct.

Significant attention to identify the level of educational achievements of the student should be given to criterion-oriented tests. They are a set of closed form tests with one or more variants of the correct answers; tasks to establish a correspondence between the elements of two sets with one or more relations and equal or different number of elements in the sets; tasks of the open form with a formalized answer; tasks to establish the correct sequence.

To measure the degree of compliance of educational achievements of the student with the requirements of the educational standard, it is also recommended to use problematic, creative tasks involving heuristic activities and an unformalized response.

### **EXAM QUESTIONS**

1. Concepts of Information and Information Technology
2. Computer Organization. Processing components. Primary storage. Peripherals.

3. Data representation. Binary system. Units of measurement. Coding systems. Graphic and Multimedia data.
4. Information System Concepts. Types of Information Systems
5. Systems Software. Operating systems. Utilities. User interfaces
6. Application Software.
7. Databases. Levels of hierarchy. Database models. Data mining/analytics
8. Computer graphics basics. Color Models. Graphic file formats
9. The concept of vector graphics. Processing methods.
10. Raster graphics. Image Processing
11. Three-dimensional computer graphics. 3D Modeling.
12. Computer animation. 2D and 3D animation.
13. Using computer graphics in different spheres of human activity
14. History of computer Graphics
15. Networks. Network access. Network architectures.
16. Data communications. Infrastructure. Protocol.
17. Safety and security. Antivirus software.
18. Software Licensing. Shareware, freeware, enterprise, open source, software as a service. Digital signature
19. History of the computer development. Computer classification.
20. Word processing and desktop publishing.
21. Spreadsheets
22. Presentation software
23. Multimedia
24. Computer animation. 2D and 3D animation.
25. Basics of Web Design. Website builders.
26. Internet resources. Access to Internet resources. Navigating the Internet.
27. Audio Processing. Audio editors.
28. Computer music. Music production software.
29. Musical sound effects (reverb, delay, vibrato, flanger, vocoder, etc.) Analog and digital sound processing.
30. Microsoft Access: creating database. Tables and relationships. Data integrity.
31. Microsoft Access: mining data in tables. Design a database query. Query types.
32. World Value Survey Database. Tools of on-line analysis. Design a database queries.
33. Using MS Excel for statistical analysis.
34. Internet resources for culture and art.
35. Information system. Types of information system. Computer information system.



36. Information technology: using in culture.
37. Information technology: using in education
38. Internet services: e-mail, WWW, teleconference service, etc.
39. Cloud technologies. Using CT in culture
40. Communications access methods. Addressing scheme in the Internet.

РЕПОЗИТОРИЙ БГУКИ