

COMPUTER STUDIES

5–9 forms

Education program
for general education institutions ¹

¹ This program is ratified by the Order of Ministry of Education and Science of Ukraine as of 07.06.2017 No. 804

Learning outcomes and syllabus

5th form (35 hours)

Learning outcomes	Syllabus
Information processes and systems	
<p>Pupil Knowledge component <i>Explains</i> concept of information and information system. <i>Gives examples of</i> data and messages. <i>Gives examples of</i> information processes. <i>Names</i> computer parts and their purpose. <i>Explains</i> concept of operating system. <i>Gives examples of</i> computer programs</p> <p>Activity component <i>Identifies</i> types of information processes. <i>Differentiates</i> computer types. <i>Stick to the rules of</i> life safety while working with computer equipment. <i>Can perform</i> main operations with files and folders</p>	<p>Information, data, messages. Information processes and systems. Significance of information technologies in the life of modern human.</p> <p>Hardware and software of operating system.</p> <p>Computer as equipment for data processing. Computer types.</p> <p>Computer parts and their purpose.</p> <p>Operating system and its interface.</p> <p>Files, folders and operations with them.</p> <p>Life safety while working with computer equipment</p>
Network technologies and the Internet	
<p>Pupil Knowledge component <i>Understands</i> concept of computer network. <i>Explains</i> the different between local and global computer networks. <i>Gives examples of</i> search systems. <i>Gives examples of</i> learning web resources.</p> <p>Activity component <i>Uses</i> network folders for file exchange and saving. <i>Stick to the rules of</i> safety of surfing the Internet. <i>Searches, downloads and save</i> files from the World Wide Web.</p>	<p>Computer networks. Local network. Using network folders.</p> <p>Search of information in the Internet.</p> <p>Safe usage of the Internet.</p> <p>Downloading data from the Internet. Copyright</p> <p>Critical appraisal of the information from the Internet.</p> <p>The Internet for education</p>
Word processing	
<p>Pupil Knowledge component <i>Explains</i> concept of object and its properties. <i>Names</i> basic objects of text documents. <i>Names</i> peculiarities of symbols, paragraphs, pages, pictures and tables.</p>	<p>Objects and their properties. Work with objects. Basic objects of text document.</p> <p>Word processing software.</p> <p>Entering, editing and formatting symbols and</p>

<p>Activity component</p> <p><i>Can edit and format objects in text documents.</i></p> <p><i>Adds pictures from files and change their options.</i></p> <p><i>Adds tables and one-level lists, edit and format them.</i></p> <p><i>Set page settings (size, modes, page borders).</i></p> <p><i>Prepare document for print</i></p>	<p>paragraphs.</p> <p>Adding pictures from file and their formatting.</p> <p>Adding, editing and formatting tables.</p> <p>One-level lists.</p> <p>Document pages and their format.</p> <p>Prepare document for print. Printing</p>
<p>Algorithms and programs</p>	
<p>Pupil</p> <p>Knowledge component</p> <p><i>Explains concepts of algorithms and programs.</i></p> <p><i>Gives examples of responders and their commands.</i></p> <p><i>Explains essence of algorithmic structures.</i></p> <p>Activity component</p> <p><i>Executes simple algorithms.</i></p> <p><i>Differentiates algorithmic structures.</i></p> <p><i>Uses environment for describing and executing simple algorithms.</i></p> <p><i>Chooses algorithmic structures for problem solving.</i></p> <p><i>Corrects algorithms if necessary.</i></p> <p><i>Executes formal algorithms</i></p>	<p>Algorithm responders and their command systems.</p> <p>Ways of algorithm description. Program.</p> <p>Environment description and execution of algorithms.</p> <p>Linear algorithms.</p> <p>Branching algorithms.</p> <p>Repeating algorithms</p>

6th form (35 hours)

Computer graphics	
<p>Pupil Knowledge component</p> <p><i>Explains</i> concept of computer graphics. <i>Compares</i> encoding of bitmap and vector images. <i>Explains</i> purpose of bitmap and vector graphic editors. <i>Gives examples of</i> bitmap and vector graphic formats. <i>Explains</i> changes of objects after their grouping and degrouping.</p> <p>Activity component</p> <p><i>Creates and edits</i> bitmap and vector images. <i>Changes</i> format and <i>edit</i> image settings for certain purposes. <i>Groups and degroups, rotates, levels and scales</i> image objects. <i>Uses</i> layers for creating images. <i>Sets</i> instruments and environment of graphic editor for creating images.</p>	<p>Concept of computer graphics.</p> <p>Bitmap and vector images, their properties. Formats of bitmap and vector image files. Settings and change of image format.</p> <p>Peculiarities of composition and processing of vector images. Image composition from graphical primitives.</p> <p>Operations of objects and object groups.</p> <p>Multilayered images, allocation of objects in layers.</p> <p>Adding texts to graphic images and its formatting.</p>
Computer presentations	
<p>Pupil Knowledge component</p> <p><i>Names</i> hardware and software necessary for creating and viewing of presentations. <i>Gives examples of</i> presentation objects, their properties and types of slides. <i>Names</i> stages of presentations making and rules of objects compositing. <i>Knows</i> principles of aesthetic design of slides.</p> <p>Activity component</p> <p><i>Creates</i> presentation and sets its demonstration. <i>Uses</i> hyperlinks, slide effects and animation. <i>Plans</i> presentation and shows it to the public.</p>	<p>Software for creating and viewing computer presentations.</p> <p>Stages of presentations making and rules of objects compositing.</p> <p>Objects of presentation and its demonstration. Types of slides.</p> <p>Settings for demonstration of presentations.</p> <p>Animation effects, objects movement in presentations.</p> <p>Effects of slide changes.</p> <p>Planning of demonstration and showing presentation to the public.</p>
Algorithms and programs	
<p>Pupil Knowledge component</p> <p><i>Knows and understands</i> programming objects.</p>	<p>Concept of programming object. Object properties. Creation of programming objects.</p>

<p><i>Gives examples</i> of object properties and their meanings.</p> <p><i>Explains</i> concept of event and gives examples of events and their processing.</p> <p><i>Knows and understands</i> concepts of attached algorithmic structure, gives examples of their application.</p> <p>Activity component</p> <p><i>Divide</i> problems into subproblems and solve them (problem decomposition).</p> <p><i>Adds</i> objects to program project.</p> <p><i>Can</i> change object property settings, including programmatically.</p> <p><i>Can</i> check results of program execution against problem settings.</p> <p><i>Programs</i> events processing.</p> <p><i>Applies</i> attached algorithmic repetition and branching structures</p>	<p>Concept of event. Types of events. Program processing of event.</p> <p>Changing values of object properties in program.</p> <p>Attached algorithmic repetition and branching structures.</p> <p>Problem solving by decomposition into subproblems.</p>
---	---

7th form (35 hours)

Internet services	
<p>Pupil Knowledge component <i>Explains</i> principles of electronic mail services and shared access, concept of cloud services. <i>Explains</i> risks connected with using electronic mail. <i>Explains</i> basic principles of the Internet of things, concept of end device, intermediary network device, transmission medium, detector device, controller</p> <p>Activity component <i>Creates</i> e-mails and uses it. <i>Creates</i> and <i>uses</i> mailing lists. <i>Can</i> work in a team and organizes online cooperation. <i>Uses</i> online translators.</p>	<p>Electronic mail services. Creating e-mail. Sending, receiving, redirecting messages. Forwarding files. Using address books and mailing lists.</p> <p>Etiquette of electronic mailing. Rules of safe use of e-mail. Basic features of spam and phishing.</p> <p>Using Internet resources for cooperation. Levels and ways of resources access.</p> <p>Date storage and team document management; shared access. Cloud services.</p> <p>Online translators.</p> <p>Internet of Things.</p>
Table data processing	
<p>Pupil Knowledge component <i>Explains</i> usage of electronic tables particularly as a modeling tool. <i>Knows</i> principles of cell and range addressing. <i>Names</i> basic data types and explains their functions. <i>Names</i> and <i>explains</i> functions of basic objects of electronic tables. <i>Explains</i> concept of model.</p> <p>Activity component <i>Applies</i> processing means of electronic tables for solving education and life problems. <i>Analyzes</i> problem settings, finds connections between numbers. Realizes mathematical models by means of electronic tables <i>Uses</i> formulas in electronic tables. <i>Edits</i> and <i>formats</i> electronic tables. <i>Applies</i> means of autocompletion for quick data imputation.</p>	<p>Concept of electronic table. Table processors, their purpose. Environment of table processor. Objects of electronic tables – page, cell, cell range.</p> <p>Data types: numeric, monetary, date, text, percent. Input, edit and format of base data types.</p> <p>Addressing. Formulas.</p> <p>Editing and formatting of electronic tables.</p> <p>Copying and transferring of cell and cell ranges especially with the formulas.</p> <p>Autocompletion.</p> <p>Models. Stages of model structure. Realization of mathematical models.</p>

Algorithms and programs	
<p><i>Pupil</i> <i>Knowledge component</i> <i>Explains</i> concept of value, variable and assignment operation. <i>Knows</i> basic algorithms of organization of variables: exchanging values, determining high and low value of two values</p> <p><i>Activity component</i> <i>Uses</i> different algorithmic structures and variables for solving education and life problems. <i>Applies</i> programming tools for modeling.</p>	<p>Values. Variables. Assignment operation.</p> <p>Creating algorithms and programs by using variables and different algorithmic structures: linear, branching, repeating.</p> <p>Description of models in programming environment</p>

8th form (70 hours)

Data encoding and hardware	
<p>Pupil Knowledge component <i>Understands</i> concept of binary code, names measurement units of its length and explains their correlation. <i>Describes</i> general principle of tabulation of symbol codes. <i>Explains</i> some principles of graphic data encoding. . <i>Has notion about</i> cooperation of computer parts, describes their main properties. <i>Gives examples of</i> application of modern devices for different industries. <i>Describes</i> process of data encoding by computer devices.</p> <p>Activity component <i>Can</i> encode and decode messages according to certain rules. <i>Identifies</i> properties of personal computer depending on its purpose.</p>	<p>Data encoding as information process.</p> <p>Messages encoding and decoding. Binary encoding. Measurement units of length of binary code.</p> <p>Encoding of text and graphic data. Tables of symbol codes.</p> <p>Personal computer and its parts. Processor, memory devices, input and output of data, multimedia devices.</p> <p>Technical characteristics and purpose of main computer parts.</p> <p>History of computing devices and mechanisms. Types of modern computers and their usage.</p>
Word processing	
<p>Pupil Knowledge component <i>Has notion about</i> principles and possibilities of word processing. <i>Has notion about</i> document structure. <i>Explains</i> principles of document style and shared access.</p> <p>Activity component <i>Searches and replaces</i> symbols and symbol groups. <i>Creates and uses</i> hyperlinks in text documents. <i>Uses</i> styles for document formatting. <i>Structures</i> document and <i>creates</i> its content. <i>Creates and edits</i> header and footer</p>	<p>Search and replace text fragments.</p> <p>Formatting with styles. Document structure. Generating automated document content.</p> <p>Header and footer.</p> <p>Hyperlinks in text documents.</p> <p>Shared access to document.</p>
Creating and publishing web-recourses	
<p>Pupil Knowledge component <i>Gives examples of</i> means of automated creation of web-pages. <i>Understands</i> concept of HyperText markup language.</p>	<p>Automated tools for creating and publishing web-resources.</p> <p>Concept of HyperText markup language.</p> <p>Rules of ergonomic publishing of materials on web pages.</p>

<p>Activity component <i>Creates web-pages using automated tools and publish them online.</i> <i>Uses hypertextual, graphic and multimedia elements on web pages.</i></p>	
Media processing	
<p>Pupil Knowledge component <i>Explains principles of sound and video digitalization.</i> <i>Differentiates audio and video formats.</i> <i>Gives examples of software for multimedia objects and explains their usage.</i> <i>Gives examples of services for audio and video data.</i></p> <p>Activity component <i>Uses multimedia programs.</i> <i>Reformats audio and video files.</i> <i>Creates video sequence.</i> <i>Uses multimedia objects in presentations.</i></p>	<p>Concept of multimedia. Encoding audio and video data.</p> <p>Formats of audio and video files.</p> <p>Software for multimedia objects. Tools for reformatting audio and media files. Audio and video capture, creating audio and video fragments.</p> <p>Creating video and audio sequence. Using effects for clips.</p> <p>Setting timing parameters for video and audio sequence.</p> <p>Services for audio and video data and its publishing on the Internet</p>
Algorithms and programs	

<p>Pupil</p> <p>Knowledge component</p> <p><i>Understands</i> concept of programming language and its basic elements. Gives examples of modern programming languages.</p> <p><i>Knows</i> the difference between variables and constants.</p> <p><i>Compares</i> properties of different programming environments.</p> <p><i>Understands</i> concept of object in programming language, its properties and methods.</p> <p><i>Explains</i> program structure.</p> <p><i>Explains</i> functions of elements of graphical interface and uses them.</p> <p><i>Differentiates</i> control properties and methods</p> <p>Activity component</p> <p><i>Plans</i> process of problem solving using programming.</p> <p><i>Creates and sets</i> programs, particularly event-oriented and object-oriented.</p> <p><i>Uses</i> program statements, correctly chooses data types.</p> <p><i>Solve</i> problems using basic algorithmic structures, variables and constants.</p> <p><i>Gives reasons for</i> choosing data types for solving problems.</p>	<p>Modern programming languages.</p> <p>Concept of object in programming language, its properties and methods. Graphic interface, basic components of program with graphic interface. Concept of control element. Event handlers, connected to control elements. Control properties and methods.</p> <p>Type of data in programming. Program structure. Data input and output. Expressions statements. Logical statements and variables, operations with them.</p> <p>Conditional statements (long and short forms). Combined conditions. Repetitive statements. Nesting loops. Searching for high and low value of several values.</p>
--	---

9th form (70 hours)

Software and cyber security	
<p>Pupil Knowledge component <i>Names</i> types of software; <i>explains</i> their differences and give examples. <i>Classifies</i> operating systems; <i>explains</i> use of drivers. <i>Explains</i> software portability. <i>Names</i> different types of software license, <i>explains</i> differences between them. <i>Explains</i> principles of data compaction. <i>Names</i> types of archive files. <i>Names</i> basic types of malicious software and <i>explains</i> their functions. <i>understands</i> principles and knows methods for providing information security</p> <p>Activity component <i>Can</i> compress files and unzip files. <i>Applies</i> antivirus software to protect computer from information threats; <i>sets</i> properties of antivirus software. <i>Chooses</i> software for specific tasks.</p>	<p>Software classification. Operating systems and their types. Drivers.</p> <p>Software licenses, their types.</p> <p>Installation and uninstallation of software.</p> <p>Data compressing and archiving. Types of compressing. Archive programs. Types of archive files. Backup. Operation with archives.</p> <p>Malicious software and virus-protection program. Basic actions to protect personal computers from malicious software.</p> <p>Antivirus and antispymware programs, setting their basic properties.</p> <p>Information security</p>
3D graphics	
<p>Pupil Knowledge component <i>Explains</i> purpose of three-dimensional modeling of real-life objects. <i>Knows</i> basic principles of three-dimensional modeling. <i>Explains</i> principle of receiving three-dimensional animated picture.</p> <p>Activity component <i>Creates</i> special models using 3D primitives. <i>Edits</i> form and sight of three-dimensional objects, changing vertex, edges, borders and surfaces. <i>Creates</i> animation effects.</p>	<p>Three-dimensional graphics. Classification of programs for three-dimensional graphics.</p> <p>Principles of three-dimensional navigation. Adding three-dimensional primitives.</p> <p>Moving, scaling, grouping, balancing, rotating, copying and cloning of objects. Extruding object forms.</p> <p>Vertex, edges, borders. Graphic textures. Rendering of three-dimensional scene. Text objects and their editing. Framing. Timeline.</p> <p>Animation. Animation preview.</p> <p>Concept of 3D-print</p>
Table data processing	

<p>Pupil Knowledge component <i>Explains</i> differences between references of different types. <i>Names</i> basic logistic, mathematic and statistic functions and explains their purpose. <i>Interprets</i> some types of electronic tables as sets of information on single-type objects. <i>Explains</i> purpose of function and tools of spreadsheet to process single-type objects.</p> <p>Activity component <i>Chooses</i> and <i>applies</i> necessary function or tool to solve specific problem. <i>Uses</i> different references to process data series. <i>Chooses</i> types of diagrams most suitable for visual interpretation of data series. <i>Can</i> build and interpret different types of diagrams. <i>Applies</i> conditional formatting for visualization of data satisfying certain conditions. <i>Solve</i> problems, which demands sorting and evaluation of subtotal and grand total, <i>applies</i> simple and advanced filters to select objects. <i>Can</i> export and import of content of electronic tables.</p>	<p>Absolute and mixed references.</p> <p>Logical, mathematical and statistical functions.</p> <p>Diagrams. Type selection and diagram construction. Visual interpretation of data series.</p> <p>Electronic table as a tool of presenting information on single-type objects. Sorting. Simple and advanced filters.</p> <p>Conditional formatting</p> <p>Evaluation of totals.</p> <p>Solving Chemistry, Physics, Mathematics and other problems using table processor.</p> <p>Export and import of electronic tables.</p>
Data bases. Database management system	
<p>Pupil Knowledge component <i>Gives</i> definition of data base. <i>Explains</i> differences of data presentation in multitable data basis and electronic tables. <i>Explains</i> concepts of table, column in the database table, entries, key of the table. <i>Explains</i> purpose of database management system.</p> <p>Activity component <i>Enter data</i> in the table, realizing limits of data base structure. <i>Sorts data</i> in database tables by one or two columns. <i>Filters data</i> in tables. <i>Searches</i> for data in database according to special selection criteria, making simple enquiries in automated mode. <i>Edits</i> data in tables.</p>	<p>Concept and purpose of data bases. Table, column in the database table, entries, key of the table</p> <p>Adding, deleting, editing data in database.</p> <p>Data filtering and sorting in tables. Automated enquiries of data base.</p>
Algorithms and programs	

<p><i>Pupil</i> <i>Knowledge component</i> <i>Explains</i> principle of data organization by one-dimensional arrays. <i>Explains</i> concept of array, array elements, index and element value. <i>Describes</i> algorithms of array elements processing meeting certain conditions. <i>Describes</i> algorithms of searching for definitive values in array. <i>Describes</i> at least one of array sorting algorithm.</p> <p><i>Activity component</i> <i>Creates and describes</i> algorithms by programming language to process array elements, meeting certain conditions, searching for definitive values in array and its sorting.</p>	<p>One-dimensional array. Input and output of array element value.</p> <p>Algorithms of array prospecting: searching for definitive values for elements meeting certain structures, and search according to certain criteria in array.</p> <p>Algorithms of array sorting.</p> <p>Concept of algorithm complexity</p>
---	---