Explanatory Note

The present teaching materials are a basic learning resource designed for the 2nd year students majoring in computer sciences. It applies the principles of professional-oriented and individualized learning and is developed to help students study according to their individual needs, interests and styles of learning. Thus, all the materials are unique in two respects: their content and procedure of learning.

The content of the materials is designed to suit the needs of professional development and covers topics related to the sphere of computer sciences. The materials consist of 3 Modules:

Module 1 "Computer Systems" deals with the basics of computer hardware and software, programming and expert systems.

Module 2 "Networking Systems" introduces the issues of computer networks, the Internet and World Wide Web.

Module 3 "Mathematical Systems" contains information on Arithmetic and Number Theory as well as Discrete Mathematics.

The materials apply a non-traditional procedure of learning, where there is a place for whole-class, differentiated and optional activity during the lesson (Unit). The workbook section also contains tasks developed as home assignment for individual learning.

➤ Whole-Class Activities

This section opens the Unit and contains the core material which builds up the basis for all other tasks. This section usually consists of a pre-assessment quiz with range of interests included, a core text, vocabulary tasks and language function tasks. It is recommended that students discuss the topic using pre-assessment questions (Think-Pair-Share mode) before reading and then proceed to read the text. After doing so, several vocabulary and language function exercises should be done.

➤ Differentiated Activities

This section of the book strives to make benefit of individual differences of students by proposing them variety of tasks designed to suit individual needs. This section is challenging for teacher because it needs a lot of effort and management skills to give assistance and control the activity of every student. The section usually consists of several multi-level tasks, group and pair activities.

Multi-level tasks are divided into three parts which appear in order of increasing difficulty. The teacher may assign students to do one part, let them choose which part they want to accomplish or give task to do all the parts. It will be most effective if a

student completes the task which slightly increases his or her level of competence. It is also advisable that students proceed to do tasks of higher level of difficulty in the course of learning.

Pair activities and *group activities* can also be organized in different ways so that students cooperate with each other and achieve mutual benefit.

Homogeneous grouping is the one where students are set together on the basis of approximately similar level of communicative competence. In this case teacher has the advantage of focusing instruction at the level of all students in the group and adjusting the pace and the amount of exercises done by every group.

 Heterogeneous grouping, that is gathering students of varying levels of communicative competence, is an effective strategy to promote learning development of students. Low-level students benefit from being at positive learning environment, where they strive to reach higher level and also from the assistance of more able peers. High-level students are provided with opportunities to give explanations to others revising the material they learned before.

➢ **Optional Activity**

This part is designed to meet the needs of students striving to reach higher competence in English and for those who need additional assistance. The tasks from this part may be used as extra exercises or as a replacement of some activities from the previous sections. Optional Activity contains two tasks: first one represents the simplified version of the basic text with practical exercises which can be used as individual tasks for low-level students. The second task includes original text borrowed from different resources and questions to the text designed for high-level students.

➢ **Workbook Activity**

Workbook Activity is developed as home assignments for students to prepare at home. Workbook section also has multilevel structure so that students can choose whatever level of difficulty they prefer. The section also contains Project work and Internet search tasks which should be carefully prepared at home.

We hope that the following strategies will help to use the materials:

Flexible grouping – purposeful reordering of students into working groups to ensure that all students work with a wide variety of groupmates and in a wide range of contexts during a relatively short span of classroom time. Flexible grouping enables

students to work with peers of both similar and dissimilar readiness levels, interests, and learning preferences.

Jigsaw – is a cooperative strategy aimed at involving large number of students into work on a topic. Students first meet in small groups, called *home-base groups.* Here, they review the task they must complete and clarify goals for individuals and the group. They then divide into specialty groups, or *work groups.* Each specialty group is responsible for one facet of the overall task. Every member of the specialty group works to develop a full understanding of the assigned subtopic or subtask. After an appropriate time, students reassemble in their home-base groups. Each member of the group shares the information about his or her specialty. All group members are responsible for asking questions and learning about all facets of the topic.

Peer critiques – is a means of helping students provide useful feedback on peer work in progress. Typically, partners read one another's work and then provide both positive and constructive feedback by following a critique guide developed by the teacher (often with student input). Goals of peer critiques include helping students succeed with work, helping students work at increasingly high levels of quality, developing collegial relationships among peers, and helping students develop their ability to evaluate the quality of work.

Scaffolding – refers to any support system that enables students to succeed with tasks they find genuinely challenging. Goals of scaffolding include helping students be clear about the task's purpose and directions and helping students stay focused, meet the expectations for quality of work, find and use appropriate sources of information, and work effectively and efficiently. The many types of scaffolding include study guides, step-by-step directions, and comprehension strategies.

Think-Pair-Share (T-P-S) – instructional strategy, used to engage all learners in thinking and talking about a question or issue important to a current area of study. Typically the teacher begins a T-P-S by posing an important thought question. Students are asked to write their ideas or think about the question, working silently until the teacher calls time (usually two to three minutes). This is the thinking phase of the process. In the second phase, pairing, students turn to a peer and exchange their thoughts about the question. In the final phase, sharing, the teacher states the question for the class as a whole and leads the class in a discussion of the question. The Think-Pair-Share strategy increases the likelihood that all students will engage with the question, will have something to contribute to the final discussion, and will be more invested in the outcome of the discussion than they would have been if the question had simply been posed once to the entire class and answered by the first student to raise a hand.

Tiering – a process of adjusting the degree of difficulty of a question, task, or product to match a student's current readiness level. To tier an assignment, a teacher 1) determines what students should know, understand, and be able to do as a result of the task; 2) considers the readiness range of students relative to these goals: 3) develops or selects an activity that is interesting, requires high-level thought, and causes students to work with the specified knowledge, undemanding, and skill; 4) determines the complexity level of the starting-point task compared with the range of student readiness; *5)* assigns students to the various versions of the task at levels likely to provide attainable challenge.

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Unit 1. Computer Hardware and Software

Lesson 1

Whole-Class Activity

Task 1. Pre-Assessment

You are going to read questions about computer hardware and software. Use your background knowledge to answer them. You have 5 minutes to complete this task.

RATIONAL CONCERN
1. Who invented the first computer and when?
2. How did computers develop through time?
3. What was the main important breakthrough in computer development?

Practical Concern
1. What can we use computer for?
2. What are the main parts of a computer?
3. What software is the most useful?

Analytical Concern
1. Why was the first computer invented?
2. What would have happened if a computer wasn't invented?
3. Who benefits most from the computer existence?

Creative Concern
1. Why the "mouse" is called that way?
2. How can computer help to create original things?
3. How can we use keyboard in an unusual way?

Task 2. Reading

Read the text about computer hardware and software. Explain the meaning of the key words in bold. You have 20 minutes for this activity.
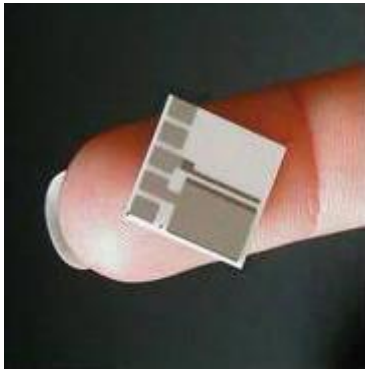
Computer and Its Components

It was probably the worst prediction in history. Back in the 1940s, Thomas Watson, boss of the giant IBM Corporation, forecast that the world would need no more than "about five computers". Six decades later and the global population of computers has now risen to something like one billion machines! To be fair to Watson, computers have changed enormously in that time. In the 1940s, they were giant scientific and

military devices and cost millions of dollars apiece; today, most computers can be found in everything from microwave ovens to <u>cellphones</u>.

A computer is an electronic machine that processes information – in other words, an information processor: it takes in raw information (or data), **stores** it until it's ready to work on it, processes it and then gives out the results. Different parts of a computer are designed to fulfil these functions.

A keyboard and a mouse are examples of **input units** – ways of getting information into your computer. A microphone and voice recognition software may also be used as another form of input. All the documents and files are stored on a **hard-drive** – a huge storage (memory) device. Smaller, computer-based devices like digital cameras and cellphones use other kinds of storage such as **flash memory cards**. Computer's processor (sometimes known as **the central processing unit** or CPU) is a microchip which works amazingly hard and gets incredibly hot in the process. That's why a computer has a fan to stop it from overheating. Finally, computer output devices may include **LCD screen** capable of displaying high-**resolution** graphics, stereo loudspeakers and an inkjet printer to make a more permanent form of output.

All the physical equipment used in a computer system together with **peripherals** you plug into it make up **computer hardware**. By contrast, computer programs are called software because ability **to run** different software is what makes a computer flexible.

The first computers were gigantic calculating machines made to deal with numbers and solve difficult mathematical problems. Today, computers work on a much wider variety of problems – but they are all still, essentially, **calculations**. Suppose you're looking at a digital photo in a **photo-editing program** and you decide you want a mirror image of it (in other words, flip it from left to right). The photo is made up of millions of **pixels** arranged in a grid pattern. The computer stores each pixel as a number, so to flip a digital photo it simply reverses the sequence of numbers so they run from right to left instead of left to right.

What makes a computer different from a calculator is that it can work all by itself. You just give it your **instructions** and it performs long and complex series of operations all by itself. Back in the 1970s and 1980s, if you wanted a home computer to do something, you had to write your own little program to do it. For example, before you could write a letter on a computer, you had to write a program that would read the letters you **typed** on the keyboard, store them in the memory, and display them on the screen. Writing the program usually took more time than doing whatever it was that you had originally wanted to do (writing the letter). Pretty soon, people started selling programs like word processors to save you the need to write programs yourself.

Today, most computer users buy, **download**, or share programs like Microsoft Word and Excel. Hardly anyone writes programs any more. Most people see their computers as tools that help them do jobs, rather than complex electronic machines they have to pre-program – and that's just as well, because most of us have better things to do than computer programming.

Task 3. Vocabulary Practice

Match the words with their definitions. You have 5 minutes for this task.

1. Computer	a. a peripheral device that accepts data and feeds it into a computer
2. Input device	b. the physical equipment used in a computer system
3. Output device	c. the programs that can be used with a particular computer system
4. CPU	d. a device that processes data according to a set of instructions
5. Hardware	e. devices or units that operate separately from the CPU but are connected to it
6. Software	f. any piece of computer hardware equipment used to communicate the results of data processing
7. Peripherals	g. the part of a computer that performs logical and arithmetical operations on the data

Task 4. Vocabulary Practice

Read the text and fill in the gaps with the words from the list. You should use the scheme below. You have 10 minutes to complete this task.

manufacturer	output	hardware	processing	BIOS
chips	computer	programs	operating system	
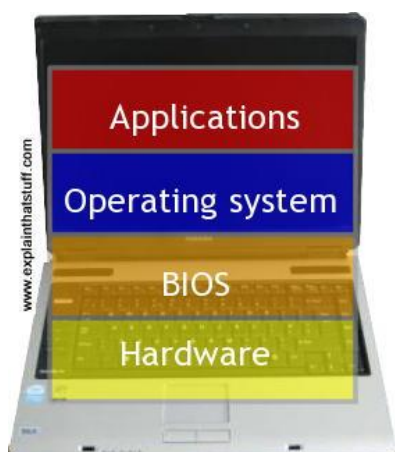
An (1) .... is the core software in a computer that controls the basic operations of input, (2)........., storage, and (3) .... You can think of an operating system as the "foundations" of the software in a computer: other (4) .... (called applications) are built on top of it. The operating system relies on an even more fundamental

piece of programming called the (5) ....(Basic Input Output System), which is the link between the operating system software and the (6) .... Unlike the operating system, which is the same from one (7) .... to another, the BIOS vary from machine to machine according to the precise hardware configuration and is usually written by the hardware (8) .... The BIOS is not, strictly speaking, software: it's a program semi-permanently stored into one of the computer's main (9) ....

Task 5. Language in Use

In your profession and everyday life you often feel the need to give instructions. Especially this skill is useful when writing manuals or user guides. Study the box explaining the ways of giving instructions. After that, match purposes of actions with the instructions using the information from the box. You have 10 minutes for this task.

Giving Instructions

1. We make simple instructions using the **infinitive:**
   e.g. Open the file.
2. We express the purpose of an action using **"To", "In order to":**
   e.g. To open the file, double-click the icon.
       Double click the icon in order to open the file.
3. We can explain how to perform an action using **"by + V":**
   e.g. Open the file by double-clicking the icon.
4. When we have several instructions, we can put them into order using "**First", "Then", "Finally":**
   e.g. First, open the file. Then, copy the text. Finally, insert the text into the address line.
5. We can show that one action follows another using **"Having done":**
   e.g. Having opened the file, copy the text.
6. We can express warnings by using **"Do not + Infinitive":**
   e.g. Do not open the file until the installation is over.

1.	Open a file	a)	double-click on the icon
2.	Select a file	b)	press TAB
3.	Drag an object	c)	click the Start button, then click Power

4.	Type all letters as uppercase	d)	point to the object on the screen, press and hold the primary button, move the object to a new location
5.	Move the cursor several spaces forward	e)	press F1
6.	Display Help for a program or Windows	f)	click its Maximize button or double-click the window's title bar
7.	Make a window fill the entire screen	g)	left-click the icon
8.	Turn off the computer	h)	press CAPS LOCK

Differentiated Activity

Task 6. Group activity

You are going to be divided into several groups to work out topical content of the text from Task 2. After that you will have to report your findings to the class. You have 10 minutes for this task.

Group 1. Your task is to track historical information in the text and fill in the gaps.

Back in 1940 … predicted that…
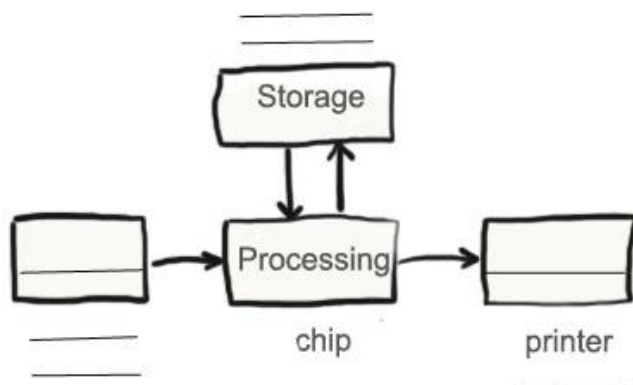In 1940^{ies} computers were …
The main task of the first computers was …
Back in 1970s and 1980s you had to …
Today, computers are …

Group 2. Your task is to complete a chart and give commentaries on it using the following expressions:

A computer works in such a way:
at first …
Then…
Finally…
An example of storage devices are…
Another examples are..

Group 3. Inside your group, discuss the following questions:

Why did Thomas Watson think that the world would need only five computers?
How have computers changed over time?
What is the difference between software and hardware?

Task 7. 🔊 Listening

You are going to watch a video about an operating system. Choose whatever part you feel confident to complete or do them all. You have 10 minutes for the task. Use the following link to watch the video: http://www.youtube.com/watch?v=76J0dNZ0MZc.

Part 1. Fill in the gaps:

An operating system is composed of (1) …… that is necessary to run your computer. Operating system software (2) ...... your computer`s hardware components and all other software being used on your computer.

Traditional operating systems were (3) ......, and usually consisted of (4) ...... and computer responses. Most modern operating systems, such as Windows Vista and Windows XP, have a (5) ...... graphical user interface, or GUI.

When you (6) ...... a piece of application software on your computer, it usually uses the element of the GUI. Elements of a GUI include such things as: windows, (7) ...... , buttons, scroll bars etc. GUIs are easier to use, faster, and accommodate better organization of your (8) ...... and files than traditional operating systems.

Part 2. Decide whether the following statements are true of false. Justify your answer.

1. Operating system software controls peripheral hardware.
2. Traditional operating systems, such as DOS, had graphical user interface.
3. When you install a piece of application software on your computer, it usually uses the element of the GUI.
4. Windows, menus, buttons and screen are the elements of a GUI.
5. GUI`s are easier to use.

Part 3. Retell the text giving as many details as possible. You may use the text from Part 1 or statements from Part 2 as scaffolds.

Task 8. Pair work

In pairs, give each other instructions on how to perform the following actions using the help box from Task 5:

Start your computer	Uninstall a program
Turn off your computer	View the list of all programs
Drag a file	Find a file
Copy a file	Create a System Image
Delete a folder	Restore files

You may refer to the following site for information:
http://windows.microsoft.com/en-us/windows-vista/windows-basics-all-topics.
You have 10 minutes for this task.

Task 9. Role-play. Pair Work

Student 1. Imagine that you are having one of the following problems with your computer:

- *PC is running slowly*
- *Internet is slow or not loading*

You have decided to telephone the support service and ask a specialist for help. Describe your problem, give details and answer the questions you may be asked.

Student 2. Imagine that you work in a technical support call centre. You have been asked to help with a particular PC problem. Ask questions about the problem and give instructions on how to solve it. The possible solutions are:

Check Task Manager
Uninstall unnecessary applications
Scan for Viruses
Clean up a PC
Disable and re-enable connection
Change wireless channel
Reset the settings of your browser
Install another browser

After you have done the task, switch the roles and act out the dialogue about the second problem. You have time until the end of the class.

Home Assignment

Do Tasks 1-4 from Workbook section.

WORKBOOK

Task 1. Tiered Task

Part 1. Insert the following words in the gaps. Translate the sentences into your native language.

Pixels	photo-editing program	stored	flash memory
Upload	word-processing program	LCD screens	unit

1. Data is ……. on the disk until it is ready to use.
2. Nowadays we use ……. instead of CDs.
3. Choose the photo which you want to ………
4. …… allows you to create and modify text documents.
5. You can make your photo brighter using ……..
6. The processing …… carries out arithmetic and logic operations.
7. …… are used in a wide range of applications.
8. Resolution is the number of distinct …… in each dimension that can be displayed.

Part 2. Fill in the gaps with one to three words from the unit.

The operating system is the most important program that (1) …… on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems (2) …… basic tasks, such as recognizing (3) …… from the keyboard, sending (4) …… to the display screen, keeping track of (5) …… and directories on the disk, and controlling (6) …… devices such as disk drives and printers.

As a user, you normally (7) …… with the operating system through a set of (7) … . For example, the DOS operating system contains commands such as COPY and RENAME. (8) …… allow you to enter commands by pointing and clicking at objects that appear on the (9) …… .

 (The text is borrowed and modified from http://www.webopedia.com/TERM/O/operating_system.html as of 28th December 2012)

Part 3. Imagine that you work in a technical support office. You have been asked to give written instructions on how to solve problems from Task 9 of Coursebook (PC is running slowly / Internet is slow or not loading). Write instructions for about 100 words.

Task 2. Tiered Task

Read the text about three most popular operating systems and complete any part of the task after reading.

Linux

The Linux operating system is developed on a kernel based on Unix. It is known as one of the most secure platforms, yet Linux is often viewed as more complex. Linux is the result of an open-source project, allowing users and developers to access the source code for free. Because it requires less hardware, Linux is capable of providing exceptional performance even on a smaller hard disk. Large communities of users exist for this system, constantly contributing to the code and making improvements. The server-based concept of Linux has resulted in fewer home users and a lack of multimedia support for the system.

Mac OS X

Mac OS X is Apple's trademark operating system software for their line of Macintosh computers. The system was based in part on Unix and mimics it's format with the administrative controls. Mac OS X software requires a low level of maintenance with fewer occurrences of computers worms, viruses and spyware. The Apple operating system does have some disadvantages, primarily in regard to software and hardware compatibility.

Windows

The Microsoft Windows operating system is the most popular choice and currently has a stronghold over the market. This platform has made significant advancements from version 1.0 all the way to the new Windows 8 system. The Windows system is highly compatible, feature-rich and has a much larger selection of software applications. Unlike the Linux kernel, Windows is proprietary software and tends to be more expensive than others. Despite widespread usage, Windows has been heavily associated with the term "insecure" as a number of security vulnerabilities have made it the most targeted system. Frequently exploited by hackers and malicious code writers, it is recommended that any Windows operating system with internet access be protected by some form of security software.

Part 1. Decide whether the following statements are true (T) or false (F). Justify your answer.

1. Linux and Mac OS X are both developed on the basis of Unix. □
2. Linux is free of charge. □
3. Everyone can make improvements to the Linux OS. □
4. Most programs are compatible with Mac OS X. □

5. Windows OS has the largest number of software applications. ☐
6. Windows OS is the most vulnerable system. ☐

Part 2. Fill in the table with the advantages and disadvantages of the systems.

	Advantages	Disadvantages
Linux	1. One of the most secure platforms 2. …	1. More complex OS 2. …
Mac OS X		
Windows		

Part 3. In writing, compare two of the operating systems in terms of:

- ➢ popularity;
- ➢ complexity;
- ➢ price;
- ➢ security;
- ➢ compatibility;
- ➢ software.

You may use the following expressions:
  On the one hand…
  On the other hand …
  In comparison with …
Unlike … ,
Similar to …,
What makes … different, …

Task 3. **Internet Search**

Using sites recommended by your teacher and sites that you can find yourself, try to find some additional information about computer systems in English. The search should be done in pairs. Be ready to report your findings to the class.