**LAURA SASU**

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**And computer science**

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**PREFAŢĂ**

**“English for Electrical Engineering and Computer Science”- Electronics and Telecommunications** este un modul de curs realizat în dorinţa de a veni în întâmpinarea studenţilor, respectiv a specialiştilor implicaţi în două dintre domeniile de activitate fundamentale ale ingineriei electrice şi ştiinţei calculatoarelor, şi anume electronică aplicată şi telecomunicaţii.

Menirea acestui curs este aceea de a oferi studenţilor Facultăţii de Inginerie Electrică şi Ştiinţa Calculatoarelor cu specializările Electronică şi Telecomunicaţii, precum şi inginerilor implicaţi în aceste arii de activitate posibilitatea dobândirii, respective completării cunoştinţelor de limbă engleză şi a terminologiei de specialitate.

În vederea atingerii scopului propus, la selectarea textelor s-a acordat atenţie deosebită acoperirii corespunzătoare a subdomeniilor de importanţă majoră din cadrul acestei arii de activitate. Pe de altă parte, pentru ca acest curs să nu rămână la nivelul unui curs introductive, s-a încercat deasemenea includerea unui număr cât mai mare de particularităţi de mai mică importanţă teoretică, însă de maximă relevanţă în ceea ce priveşte diversele arii de aplicaţie practică din domeniile mai sus menţionate.

Astfel, în acest curs pot fi găsite atât elemente teoretice fundamentale ale ingineriei electrice şi ştiinţei calculatoarelor, cât şi informaţii punctuale detaliate conexe aplicaţiilor practice ale acestor ştiinţe. În fapt, sunt abordate atât noţiuni de bază legate de electricitate şi magnetism, componente electronice,fizica semiconductoarelor, fibra optică, algebră Booleană, sisteme de operare etc. cât şi particularităţi legate de aplicaţii practice precum transmisia şi procesarea datelor, reţele de calculatoare, multimedia, aplicaţii laser, limbaje de programare, baze de date, etc..

Lucrarea conţine 28 de capitole cu caracter tehnic de specialitate. Fiecare dintre capitole este structurat astfel încât să includă două segmente fundamentale: pe de o parte un text de specialitate care evidenţiază structura şi sintetizează concomitent informaţiile cele mai relevante din cadrul respectivului domeniu; pe de altă parte un set de exerciţii menite să dezvolte abilităţile lingvistice ale cursantului: abilităţi de citire (exerciţiile de tip A), de îmbogăţire şi folosire a vocabularului (exerciţiile de tip B), de înţelegere a limbii, terminologiei şi structurilor gramaticale (exerciţiile de tip C), de traducere (ex, de îmbogăţire şi utilare a vocabularului (exerciţiile de tip B), de înţelegere a limbii, terminologiei şi structurilor gramaticale (exerciţiile de tip C), de traducere (exerciţiile de tip D) şi de vorbire (exerciţiile de tip E). Toate aplicaţiile au fost concepute pornind de la situaţii profesionale frecvente, în care cursantul ar fi nevoit să apeleze la cunoştinţele sale de limbă engleză în general şi la terminologia de specialitate în mod special. Cursul propriu-zis este completat de o prezentare generală a domeniului ingineriei electrice şi ştiinţei calculatoarelor, un glosar de termeni pentru electronică, un glosar de termeni pentru telecomunicaţii, un glosar tehnic de specialitate, cuprinzând cei mai frecvent utilizaţi termeni, definiţiile, traducerea şi-după caz- abrevierile acestora.

Autoarea doreşte să adreseze mulţumiri coordonatorului de lucrare lect.univ. Andrei Barna, cât şi referentului ştiinţific prof.univ.dr.ing. Mihai Romanca pentru contribuţia la realizarea acestui curs. În speranţa că acest curs se va dovedi util autoarea vă urează mult succes la completarea cunoştinţelor de limbă engleză cu ajutorul **“English for Electrical Engineering and Computer Science”- Electronics and Telecommunications.** Autoarea

**Au colaborat la:**

**Identificarea, structurarea domeniilor pentru textele de specialitate:**

**Prof. univ.dr.ing. ROMANCA**

**Coordonarea lucrării:**

**Lect. univ. ANDREI BARNA**

**Corectura a fost efectuată de:**

**Prep.univ. LAURA SASU**

**FOREWORD**

**“English for Electrical Engineering and Computer Science“- Electronics and Telecommunications** is a textbook produced with the aim of meeting the demands of students and professionals involved in two of the main areas of Electrical Engineering and Computer Science, namely in Electronics and Telecommunications.

The aim of this textbook is that of providing students of the Faculty of Electrical Engineering and Computer Science specialising in the fields of Electronics and Telecommunications, as well as engineers in this field with the opportunity to acquire and further improve their English language knowledge and to become familiar with specific field-related technical terminology.

For the achieving the intended aim, when selecting the technical texts and structuring the separate units, special attention was granted to covering adequately all sub-domains of major importance to this field. On the other hand, for devising a complex and comprehensive course, it was obviously necessary to include a number of concrete details of less theoretical value, but of utmost relevance with regard to the range of practical applications of the above- mentioned fields of electrical engineering and computer science.

Hence, this textbook comprises both fundamental theoretical elements of Electrical Engineering and Computer Science, and detailed information related to the application of these fields of science. It includes basic information related to key-areas such as: electricity and magnetism, semiconductors, electronic components, laser technology, fibre optics, Boolean algebra etc. as well as specific details related to aspects of practical applications such as: programming languages, laser applications, computer networks, data processing and transmission, multimedia etc..

There are 28 units covering major technical areas related to two specific sub-domains of electrical engineering and computer science, electronics and telecommunications. Each unit includes two main segments: on one hand, a technical text describing the structure and synthesising the most relevant information of that particular field; on the other hand, a set of exercises aiming to develop the student’s skills in terms of extensive and intensive reading (section A), introducing and practicing high-frequency vocabulary items (section B), language awareness (section C), translation (section D), and oral practice (section E). All activities were devised taking into account the most frequent professional situations in which the learners may use their English language knowledge in general and technical field-related terminology in particular.

The textbook is supplemented by a comprehensive overview of the field (Appendix1), a glossary of terms for the field of electronics (Appendix2), a glossary of terms for the field of telecommunications (Appendix3), technical glossaries comprising the most frequently used terms, their definitions, translations and in some cases their abbreviations.

The author would like to express special thanks to Mr. Andrei Barna- project the coordinator, as well as to Mr. Mihai Romanca- scientific supervisor, for their significant contribution to this textbook.

Hoping that you will find this textbook useful, the author wishes you good luck in improving your English language knowledge with **“English for Electrical Engineering and Computer Science“- Electronics and Telecommunications.**

The Author

**In collaboration with:**

**Identifying and structuring the most relevant fields of Electronics and Telecommunications for the technical texts:**

**MIHAI ROMANCA**

**Project management and coordination:**

**ANDREI BARNA**

**The texts have been corrected by:**

**LAURA SASU**

**Unit 1**

**ELECTRICAL AND ELECTRONICS ENGINEERING**

**AIM:**

To recognize the English technical terms related to electrical and electronics engineering;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms describing the branches of electrical and electronics engineering;
* recognise the specific terms related to electronic devices;
* characterise the main areas related to electronics;
* identify the types of electronic devices used in the past and at present in electronics;
* describe the evolution of the main domains: electric power and machinery, electronics, communications and control and computers;
* assimilate at least 30 terms specific of electric power and machinery, electronics, communications and control and computers;

**KEY TERMS:**

*electric power and machinery, electronic circuits, control systems, computer design, superconductors, solid-state electronics, medical imaging systems, robotics, lasers, radar, consumer electronics, fibre optics, direct current (DC) mode, alternating current (AC) mode, circuit, device, to amplify electronic signals, to add binary numbers, to demodulate radio signals, waveforms, digital information, resistors, capacitors, inductors, vacuum tubes, semi conductive material, electron-beam lithography, micro-manipulator, ion-beam implantation, chip of silicon, Fourier analysis, linear systems theory, linear algebra, complex variables, differential equations, probability theory, automated manufacturing, electrical noise, interference, Very Large Scale Integration (VLSI), microminiaturization, superconducting material.*

**ELECTRICAL AND ELECTRONICS ENGINEERING**

**1.1. INTRODUCTION**

The largest and most diverse field of engineering, it is concerned with the development and design, application, and manufacture of systems and devices that use electric power and signals. Among the most important subjects in the field in the late 1980s are electric power and machinery, electronic circuits, control systems, computer design, superconductors, solid-state electronics, medical imaging systems, robotics, lasers, radar, consumer electronics, and fibre optics.

Despite its diversity, electrical engineering can be divided into four main branches: electric power and machinery, electronics, communications and control, and computers.

**1.2. ELECTRIC POWER AND MACHINERY**

The field of electric power is concerned with the design and operation of systems for generating, transmitting, and distributing electric power. Engineers in this field have brought about several important developments since the late 1970s. One of these is the ability to transmit power at extremely high voltages in both the direct current (DC) and alternating current (AC) modes, reducing power losses proportionately. Another is the real-time control of power generation, transmission, and distribution, using computers to analyze the data fed back from the power system to a central station and thereby optimizing the efficiency of the system while it is in operation.

A significant advance in the engineering of electric machinery has been the introduction of electronic controls that enable AC motors to run at variable speeds by adjusting the frequency of the current fed into them. DC motors have also been made to run more efficiently this way.

**1.3. ELECTRONICS**

Electronic engineering deals with the research, design, integration, and application of circuits and devices used in the transmission and processing of information. Information is now generated, transmitted, received, and stored electronically on a scale unprecedented in history, and there is every indication that the explosive rate of growth in this field will continue unabated.

Electronic engineers design circuits to perform specific tasks, such as amplifying electronic signals, adding binary numbers, and demodulating radio signals to recover the information they carry. Circuits are also used to generate waveforms useful for synchronization and timing, as in television, and for correcting errors in digital information, as in telecommunications.

Prior to the 1960s, circuits consisted of separate electronic devices—resistors, capacitors, inductors, and vacuum tubes—assembled on a chassis and connected by wires to form a bulky package. Since then, there has been a revolutionary trend toward integrating electronic devices on a single tiny chip of silicon or some other semi conductive material. The complex task of manufacturing these chips uses the most advanced technology, including computers, electron-beam lithography, micro-manipulators, ion-beam implantation, and ultra clean environments. Much of the research in electronics is directed toward creating even smaller chips, faster switching of components, and three-dimensional integrated circuits.

**1.4. COMMUNICATIONS AND CONTROL**

Engineers in this field are concerned with all aspects of electrical communications, from fundamental questions such as “What is information?” to the highly practical, such as design of telephone systems. In designing communication systems, engineers rely heavily on various branches of advanced mathematics, such as Fourier analysis, linear systems theory, linear algebra, complex variables, differential equations, and probability theory.

Engineers work on control systems ranging from the everyday, passenger-actuated, as those that run an elevator, to the exotic, as systems for keeping spacecraft on course. Control systems are used extensively in aircraft and ships, in military fire-control systems, in power transmission and distribution, in automated manufacturing, and in robotics.

Engineers have been working to bring about two revolutionary changes in the field of communications and control: Digital systems are replacing analogue ones at the same time that fibre optics are superseding copper cables. Digital systems offer far greater immunity to electrical noise. Fibre optics are likewise immune to interference; they also have tremendous carrying capacity, and are extremely light and inexpensive to manufacture.

**1.5. COMPUTERS**

Virtually unknown just a few decades ago, computer engineering is now among the most rapidly growing fields. The electronics of computers involve engineers in design and manufacture of memory systems, of central processing units, and of peripheral devices. Foremost among the avenues now being pursued are the design of Very Large Scale Integration (VLSI) and new computer architectures. The field of computer science is closely related to computer engineering; however, the task of making computers more “intelligent” (artificial intelligence,), through creation of sophisticated programs or development of higher level machine languages or other means, is generally regarded as being in the realm of computer science.

One current trend in computer engineering is microminiaturization. Using VLSI, engineers continue to work to squeeze greater and greater numbers of circuit elements onto smaller and smaller chips. Another trend is toward increasing the speed of computer operations through use of parallel processors, superconducting materials, and the like.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, answer the following questions (the specifications in brackets refer to the section in the text where the answer can be found):**

1. What is electrical and electronics engineering concerned with? (1.1)

2. What is the most revolutionary change brought about by electronic engineering? (1.3.)

3. What are the specific tasks performed by modern electronic circuits? (1.3.)

4. What were circuits like before the 1960s and what is the current trend? (1.3.)

5. What are the two revolutionary changes in the field of communications and control? (1.4)

6. What is the current trend in computer engineering? (1.5.)

**A.2. Fill in the following table with information about electrical and electronics engineering given in the text. Some of the spaces may remain blank, as the information is not given.**

**Table 1.1.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Related areas** |  |  |  |  |  |
| **Current modes** |  |  |  |  |  |
| **Types of electric motors** |  |  |  |  |  |
| **Specific tasks of circuits** |  |  |  |  |  |
| **Technology used for manufacturing silicon chips** |  |  |  |  |  |
| **Control systems** |  |  |  |  |  |

1. **VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Enter in the following table information related to modern electronics :**

|  |  |
| --- | --- |
| **Chips of silicon** |  |
| **Integrating electronic circuits** |  |
| **VLSI** |  |
| **Carrying capacity** |  |
| **Fibre optics** |  |

**B.1. Enter the following terms under the appropriate heading in the table below:**

**List1.1.**

|  |  |  |
| --- | --- | --- |
| **Main branches of electrical engineering** | **Uses of control systems** | **Branches of advanced mathematics** |
|  |  |  |
|  |  |  |

**C. LANGUAGE FOCUS: DEFINING PATTERNS**

**The purpose of the following exercises is to develop language awareness in terms of producing accurate definitions.**

**C.1. The following paragraph defines the term: electrical and electronics engineering. Read it and try to identify the appropriate elements of the defining pattern below:**

**[ Thing to be defined - verb + general class word + wh-word +particular characteristics ]**

ELECTRICAL AND ELECTRONICS ENGINEERING is the largest and most diverse field of engineering that is concerned with the development and design, application, and manufacture of systems and devices that use electric power and signals.

**C.2. Identify which of the mistakes listed below are to be found in the following definitions. Try to correct them.**

1. This is rather an example than a definition.

2. The word to be defined, or another form of it, is used in the definition itself.

3. The general class is omitted from the definition, making it hereby incomplete.

4. The particular characteristics are omitted from the definition, making it hereby incomplete.

A. ELECTRICAL AND ELECTRONICS ENGINEERING is concerned with the development and design, application, and manufacture of systems and devices that use electric power and signals.

B. ELECTRICAL AND ELECTRONICS ENGINEERING is the largest and most diverse field of engineering.

C. ELECTRICAL AND ELECTRONICS ENGINEERING is something like electric machinery engineering.

D. ELECTRICAL AND ELECTRONICS ENGINEERING is engineering.

**C.3. Choose one of the key terms given at the beginning of this unit. Write its definition without naming the term. Read your definition to you colleague and ask him/her to identify the word that definition refers to. Ask him/her to identify any possible mistakes in your definition.**

**C.4. Rephrase the definition above using a reduced relative clause:**

**(Identify the changes and do the same with your own definition from the previous exercise)**

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following sentences into English:**

1. Înaintea anilor 1960, circuitele erau alcătuite din dispozitive electronice separate - rezistoare, condensatoare, bobine, tuburi vidate însă tendinţa revoluţionară a ultimelor decenii constă în integrarea dispozitivelor electronice pe un chip minuscul din siliciu sau alt material semiconductor.

2. Circuitele electronice sunt utilizate la sincronizare şi temporizare şi deasemenea la corectarea informaţiilor digitale.

3. Fibra optică este imuna la orice tip de interferenţă, deţinând deasemenea o capacitate enorma de transmisie, acestea fiind principalele motive pentru care fibra optică este preferată cablurilor din cupru.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on electrical and electronics engineering.**

**E.1. Talk with one of your colleagues and name at least three electronic devices that you are familiar with. Describe them and explain how they are used. You can also choose from the following:**

Resistor

Capacitor

Vacuum tube

Inductor

**E.2. Describe the most important domains of electrical and electronics engineering. Speak about:**

1. The major applications.

2. Name the three most interesting of all and give reasons.

3. Think of any background information you have on those particular areas of electronics and share it with your colleagues.

**Unit 2**

**CAREERS IN ELECTRONICS**

**AIM:**

To recognize the English technical terms related to areas of employment in the field of electronics;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining main areas of employment in the field of electronics;
* recognise the specific terms related to the tasks performed by electronics engineers;
* characterise the various career opportunities in electronics and analyse each in points of advantages, disadvantages and other implications;
* identify the types of devices used in each branch of electronics;
* describe the recent developments in this field and the immediate repercussions on the number of career opportunities;
* assimilate at least 30 terms specific of main areas of employment, and specific activities performed by engineers in the field of electronics;

**KEY TERMS:**

*career opportunities, design, to plan, to manufacture, to install, avionics, service engineer, radio, radar, automatic flight path plotting equipment, local area networks (LANs), maintenance, software support, defence industry, early warning system, detection system, weapons guidance, industrial electronics, transducer, automation, control panels, leisure electronic items, hi-fi equipment, television sets, compact disc players, video recorders, satellite receivers, circuit boards, assembly line, trouble-shooters, communications networks, microwave towers, exchange, maximum switching capability, maintenance technician, medical equipment, industrial robot, testing and fault-finding equipment, diagnostic tests, service technician, R&D department.*

**CAREERS IN ELECTRONICS**

**2.1. INTRODUCTION**

We are now in the midst of the technical revolution which started with the introduction of the microchip in the 1970s. More and more electronic goods are being sold, especially computers, radio telephones, and leisure products. At the present time, new applications for electronics are being found. Most domestic appliances now have some form of electronic control. Petrol at the filling station and cash at the bank is dispensed by electronic means.

Electronically-controlled pumps measure out drugs for the chronically ill. Electronic ignition and fuel management become standard on cars.

All of this means that career opportunities in electronics are growing. More engineers are necessary to design, plan, manufacture and install. For today’s college and university graduates in electronics, the future is bright.

**2.2. AREAS OF EMPLOYMENT**

**2.2.1. Avionics**

Aircraft electronic equipment has to be maintained to a very high standard with rigorous checks at set intervals. Service engineers are required to maintain on-board equipment such as radio, radar, and automatic flight path plotting equipment. Air traffic control equipment is maintained on the ground.

**2.2.2. Computing**

This is an area where competition between companies is considerable and technology is moving quickly. With increasing numbers of computers used in the office, the home, and as part of industrial and communications equipment, there is a growing need for engineers to design these as well as service them. On the software side, there is always a demand for programmers to design software for business use and leisure. Almost every large business organization, like banks and insurance companies, runs several local area networks (LANs). These require network managers and maintenance and software support.

**2.2.3. Defence**

The reduction in political tension in recent years has meant cuts in the defence industry. Nevertheless, many countries are still developing sophisticated defence systems both for home use and for export. These systems require not only engineers to design them, but highly-skilled operators to man them and maintain them. Thus the armed services recruit and train numbers of electronics technicians and engineers. The major fields of defence electronics are: early warning systems, e.g. radar; detection systems; ranging, using radar and computers; weapons guidance, using computers; and communications.

**2.2.4. Industrial electronics**

Industrial electronics started with transducers which allowed remote monitoring of processes, especially which involved high temperatures or dangerous substances. Further developments allowed processes in a whole range of industries -from food and drink production to garbage recycling- to be fully automated.

The development of robotics has led to widespread application in the car industry in particular. Everything from assembling to spraying the completed car can now be done without human assistance. Tedious and unpleasant jobs have disappeared. Automation has led to savings for the manufacturer but has also contributed to unemployment. Electronics engineers are required to design and service industrial circuits, including control panels.

**2.2.5. Leisure products**

Society expects a wide range of leisure electronic items. This can be gauged by sales of radio, hi-fi equipment, television sets, compact disc players, video recorders, satellite receivers, etc. engineers and technicians are required not only to design and manufacture these, but also to maintain them.

**2.2.6. Telecommunications and broadcasting**

People today expect to be able to get in touch with each other at any time and in any place. The communication of speech, text, and other data by cable and radio is a growing field of employment. Cell phones are an area of recent expansion. Engineers are employed to manufacture, plan, install, commission, and maintain telecommunication equipment. National and local radio and television stations employ broadcasting and sound engineers.

**2.2.7. Medical equipment**

Recent years have seen a sharp increase in equipment for patient care. This ranges from body scanners to electronic stethoscopes. While the operation of this equipment is the responsibility of the medical team, engineers are often required to work with medical experts in the design of such equipment, in the installation of larger equipment, and in maintenance.

**2.3. MANUFACTURING**

Manufacturing includes making anything from individual components or printed circuit boards to complete pieces of equipment such as televisions. In the case of the latter, it is usual to break down the equipment into modules and manufacture these separately. For instance, television sets are manufactured in this way with each set consisting of up to seven individual modules. When the modules come off the assembly line, they are passed to groups of testers and trouble-shooters to check for faults. The various modules are then assembled to produce the complete unit. The disadvantage of this kind of work is the monotony and the time pressure of assembly line work.

**2.4. PLANNING**

Firms with large communications networks require planners. For instance, telecommunications network providers need to know where to place exchanges for maximum switching capability, and microwave towers for minimum interference. They also need to know the sizes of cables to handle traffic growth. Rapidly springing up everywhere from a number of different suppliers are the radio mobile, cellular, and paging networks. All these require careful planning and field surveys to prevent mutual interference. Job opportunities will grow in this sector.

**2.5. INSTALLATION**

There is a wide range of installation work required, for example, installing exchanges, LANs, and medical equipment. Such work involves cabling and may require some knowledge of mechanical engineering if special racks and even entire rooms have to be constructed to accommodate equipment. Installation work usually involves travel which can be overseas depending on the product involved.

**2.6. COMMISSIONING**

Once equipment is installed, it needs to be commissioned, i.e. put into operation. Problems often emerge at this stage, which have to be ironed out. This work is usually done by engineers with long experience in the type of equipment being commissioned.

**2.7. MAINTENANCE**

As electronic equipment has become more complex, so maintenance technicians have become more specialized. For instance, technicians who used to service both radio and television may now specialize in either radio and audio equipment or television sets and video recorders. Similarly, technicians now specialize in servicing computers, telecommunications equipment, medical equipment, industrial robots, and so on. Testing and fault-finding equipment has become more sophisticated. Oscilloscopes are commonplace on workbenches, and programmable analysers are available for carrying out a full range of diagnostic tests on particular types of equipment. These save a great deal of time and they can make the work of the service technician less challenging. Service technicians are always in demand.

**2.8. SALES**

Sales staff too require specialist knowledge- not so much of how the equipment works, but what it is capable of and the differences between similar types of equipment. They also have to know the advantages of their company’s products over those of their rivals. Although selling ability is more important than technical expertise, it is not unusual for service technicians to transfer to sales. Most salespeople work on a commission basis in addition they usually have use of a company car. They can earn high salaries and are crucial to the success of a company. Selling usually involves a great deal of travel and can be stressful.

**2.9. TEACHING**

Colleges and universities employ substantial numbers of graduates in electronics. Colleges prefer teaching staff that also have experience in industry or business. Universities look for teaching staff with research experience. Salaries in education tend to be lower than in industry. Technicians are also employed in educational institutes in laboratories and workshops to assist with research and to provide maintenance.

**2.10. RESEARCH AND DEVELOPMENT**

Large companies run their own R&D departments. Exciting opportunities exist for creative engineers in the design and testing of new products. Such opportunities are limited. Most R&D work is carried out at the company’s headquarters. Many companies are multinationals, so the R&D work may not be done in the country where the product is assembled.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the job descriptions above, discuss each area of employment with your partner using the information provided in the text.**

**Table 2.1.**

|  |  |  |
| --- | --- | --- |
| **Type of employment** | **Advantages** | **Disadvantages** |
| Manufacturing |  |  |
| Planning |  |  |
| Installation |  |  |
| Commissioning |  |  |
| Maintenance |  |  |
| Sales |  |  |
| Teaching |  |  |
| Research & Development |  |  |

**A.2. Name the areas of employment in the field of engineering and describe each in one sentence, making reference to the particular segments of electronics related to each.**

**A.3. Fill in the following table with information about the areas of employment given in the text. Some of the spaces may remain blank, as the information is not given.**

**Table 2.2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Domain** |  |  |  |  |  |
| **Activities of electronics engineers** |  |  |  |  |  |
| **Equipment** |  |  |  |  |  |
| **Development** |  |  |  |  |  |
| **Applications** |  |  |  |  |  |

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Match each of the terms in column A with a word in column B:**

**A B**

|  |  |
| --- | --- |
| design  manufacture  to install  avionics  radio  Radar  automatic flight path plotting equipment  maintenance  software support  defence industry  early warning systems  detection systems  weapons guidance  industrial electronics  transducer  automation  control panels | proiectare  fabricare  a instala  echipament de ghidaj automat  aparatura de radiolocaţie  suport soft  întreţinere  ghidaj al rachetelor  aparatură radar  sisteme de monitorizare  dispozitive electronice industriale  panou de control  traductoare  automatizare  sisteme de detectare rapidă  aeronautica  industria de apărare |

**B.2. Enter the following terms under the appropriate heading in the table below:**

**List 2.1.**

radar, automatic flight path plotting equipment, local area networks (LANs), maintenance, software support, early warning systems, detection systems, weapons guidance, industrial electronics, transducers, automation, control panels, hi-fi equipment, television sets, compact disc players, video recorders, satellite receivers, circuit boards, trouble-shooters, , microwave towers, exchanges, maximum switching capability, maintenance technician, medical equipment, industrial robots, testing and fault-finding equipment, diagnostic tests, service technician.

**Table 2.3.**

|  |  |  |
| --- | --- | --- |
| Electronics for the defence industry | Leisure electronic items | Communications networks |
|  |  |  |
|  |  |  |

**C. LANGUAGE FOCUS: DESCRIBING**

**The purpose of the following exercises is to develop language awareness in terms of describing a process, procedure, or producing a general description of a device.**

**C.1.Choose two of the areas of employment in the text and describe the recent developments in that specific domain.**

**C.2.Identify the tenses of the verbs used in the descriptions in the text and explain why those tenses are primarily used when describing.**

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following sentences into English:**

1. Diminuarea tensiunilor de ordin politic înregistrată în ultimii ani a însemnat o scădere drastică a investiţiilor in industria de apărare.

2. Domeniul acesta înregistrează o concurenţă pronunţată între companiile producătoare fapt care a condus la dezvoltarea rapidă a tehnologiei specifice.

3. Echipamentul electronic al aeronavelor necesită verificări riguroase la intervale scurte şi presupune deasemenea un standard excepţional din punctul de vedere al calităţii.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on areas of employment in the field of engineering.**

**E.1. Write a short description of your career plans, using information of your own and from this text. Present it to the class.**

**Unit 3**

**ELECTRONICS**

**AIM:**

To recognize the English technical terms related to the development in the field of electronics;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining the main domains related to electronics;
* recognise the specific terms related to the basic electronic devices;
* describe the evolution and advances in the field of electronics;
* identify the types of devices used to provide each function;
* describe each revolutionary step in the history of electronics;
* assimilate at least 30 terms specific of electronic devices;

**KEY TERMS:**

*applied physics, electronic circuits, flow of electrons, generation, transmission, reception, and storage of information, audio signals, radio receiver, amplification of weak signals, generation of radio waves, extraction of information, demodulation, modulation, transmitter, superimposition, semiconductor materials, electrical contacts, the transistor, power consumption, reliability, integrated circuit, microcomputer, audio and video equipment, communications satellite, direct-recording methods digitalization of audio signals, amplitude, digital storage, medical electronics, ultrahigh definition television, very-high-speed computer, superconducting circuit, Josephson junction.*

**ELECTRONICS**

**3.1. INTRODUCTION**

Electronics, field of engineering and applied physics dealing with the design and application of devices, usually electronic circuits, the operation of which depends on the flow of electrons for the generation, transmission, reception, and storage of information. The information can consist of voice or music (audio signals) in a radio receiver, a picture on a television screen, or numbers and other data in a computer.

Electronic circuits provide different functions to process this information, including amplification of weak signals to a usable level; generation of radio waves; extraction of information, such as the recovery of an audio signal from a radio wave (demodulation); control, such as the superimposition of an audio signal onto radio waves (modulation); and logic operations, such as the electronic processes taking place in computers.

**3.2. Historical Background**

The introduction of vacuum tubes at the beginning of the 20th century was the starting point of the rapid growth of modern electronics. With vacuum tubes the manipulation of signals became possible, which could not be done with the early telegraph and telephone circuit or with the early transmitters using high-voltage sparks to create radio waves. For example, with vacuum tubes weak radio and audio signals could be amplified, and audio signals, such as music or voice, could be superimposed on radio waves. The development of a large variety of tubes designed for specialized functions made possible the swift progress of radio communication technology before World War II and the development of early computers during and shortly after the war.

The transistor, invented in 1948, has now almost completely replaced the vacuum tube in most of its applications. Incorporating an arrangement of semiconductor materials and electrical contacts, the transistor provides the same functions as the vacuum tube but at reduced cost, weight, and power consumption and with higher reliability. Subsequent advances in semiconductor technology, in part attributable to the intensity of research associated with the space-exploration effort, led to the development of the integrated circuit. Integrated circuits may contain hundreds of thousands of transistors on a small piece of material and allow the construction of complex electronic circuits, such as those in microcomputers, audio and video equipment, and communications satellites.

**3.3. Recent Developments**

The development of integrated circuits has revolutionized the fields of communications, information handling, and computing. Integrated circuits reduce the size of devices and lower manufacturing and system costs, while at the same time providing high speed and increased reliability. Digital watches, hand-held computers, and electronic games are systems based on microprocessors. Other developments include the digitalization of audio signals, where the frequency and amplitude of an audio signal are coded digitally by appropriate sampling techniques, that is, techniques for measuring the amplitude of the signal at very short intervals. Digitally recorded music shows fidelity that is not possible using direct-recording methods. Digital playback devices of this nature have already entered the home market. Digital storage could also form the basis of home video systems and may significantly alter library storage systems, because much more information can be stored on a disk for replay on a television screen than can be contained in a book.

Medical electronics has progressed from computerized axial tomography, or the use of CAT or CT scanners to systems that can discriminate more and more of the organs of the human body. Devices that can view blood vessels and the respiratory system have been developed as well. Ultrahigh definition television also promises to substitute for many photographic processes, because it eliminates the need for silver.

Today's research to increase the speed and capacity of computers concentrates mainly on the improvement of integrated circuit technology and the development of even faster switching components. Very-large-scale integrated (VLSI) circuits that contain several hundred thousand components on a single chip have been developed. Very-high-speed computers are being developed in which semiconductors may be replaced by superconducting circuits using Josephson junctions (Josephson Effect) and operating at temperatures near absolute zero.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.2. Re-read paragraph 3.1.and fill in the missing information in the table below. Some cells will remain empty, as the information is not given in the text.**

**Table 3.1.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Information manipulation** |  |  |  |  |  |
| **Types of information** |  |  |  |  |  |
| **Information processing** |  |  |  |  |  |
| **Electronic devices** |  |  |  |  |  |

**A.2. Having read the text, answer the following questions (the specifications in brackets refer to the section in the text where the answer can be found):**

1. What was the starting point of the rapid growth of modern electronics? (3.2)

2. By what means could audio signals be superimposed on radio waves? (3.2)

3. What electronic device has almost completely replaced the vacuum tube? (3.2)

4. What has the development of integrated circuits brought about? (3.3)

5. What has recently happened in the field of medical electronics? (3.3)

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Match each of the terms in column A with the terms in column B:**

**A B**

|  |  |
| --- | --- |
| modulation  logic operations  very-high-speed computers  vacuum tubes  demodulation  advanced semiconductor technology  digitalization  transistor  computerized axial tomography  a single chip | electronic processes  superimposition  medical electronics  recovery  reduced cost, weight, power consumption  manipulation of signals  integrated circuits  VLSI  sampling techniques  superconducting circuits |

**B.2. Fill in the following table with the missing information:**

**Table 3.2.**

|  |  |  |
| --- | --- | --- |
| **Type of electronic device** | **Function** | **Application** |
|  |  |  |
|  |  |  |
|  |  |  |

**C. LANGUAGE FOCUS: PRESENT PERFECT VS: PAST SIMPLE**

**The purpose of the following exercises is to develop language awareness in terms of present perfect vs. past simple.**

**C.1. Identify which of the two tenses mentioned above are used in the following sentences.**

1. Medical electronics has progressed from computerized axial tomography, or the use of CAT or CT scanners to systems that can discriminate more and more of the organs of the human body.

2. Subsequent advances in semiconductor technology, in part attributable to the intensity of research associated with the space-exploration effort, led to the development of the integrated circuit.

3. The introduction of vacuum tubes at the beginning of the 20th century was the starting point of the rapid growth of modern electronics.

4. The development of integrated circuits has revolutionized the fields of communications, information handling, and computing.

5. The transistor, invented in 1948, has now almost completely replaced the vacuum tube in most of its applications.

**C.2. Write each verb phrase in the under the appropriate heading:**

**Table 3.3.**

|  |  |
| --- | --- |
| **PRESENT PERFECT**  **( aux.vb. HAVE/S + lex.vb. V3 )** | **PAST SIMPLE**  **( lex.vb. V2 )** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**C.4. Group the following adverbs according to their inherent meaning (moment in the past vs. time span) and write them under the appropriate heading:**

**List 3.1.**

yesterday, recently, two decades ago, for two decades, in the 19th century, lately, ever, never, 10 years ago, since 1987, already, by now, on August 3rd 1995, last year, last September, for a long time.

**Table 3.4.**

|  |  |
| --- | --- |
| **PRESENT PERFECT** | **PAST SIMPLE** |
|  |  |
|  |  |
|  |  |

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

1. Stocarea, receptarea, transmisia şi generarea de informaţie este realizată prin intermediul circuitelor electronice.

2. Circuitele electronice îndeplinesc funcţii diferite precum amplificarea semnalelor slabe, recuperarea semnalelor audio de pe o undă radio sau suprapunerea unui semnal audio pe o undă radio.

3. Progresele ulterioare în tehnologia semiconductoarelor au condus la fabricarea circuitelor integrate, dispozitive ce conţin sute de mii de tranzistori.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on the major steps in the development of electronics and applications of electronics technology.**

**E.1. Present to your colleagues the major steps in the development of electronics.**

**E.2. Talk with one of your colleagues and name at least three of the latest developments in this field that you are familiar with. Provide information about the changes they brought about in the field of electronics. Try to remember when each of them took place.**

**Unit 4**

**ELECTRONIC COMPONENTS**

**AIM:**

To recognize the English technical terms related to active and passive electronic components;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining the two main categories of electronic components;
* recognise the specific terms related to distinction criteria between active and passive electronic components;
* identify the applications, operation principles, and component parts of each electronic device under study;
* identify the internal structure and manufacturing techniques used for the construction of each electronic component;
* describe in detail each component;
* assimilate at least 30 terms specific of active and passive electronic components;

**KEY TERMS:**

*active electronic circuit, passive electronic circuit, resistor, capacitor, inductor, battery, generator, vacuum tube, transistor, diode, cathode, filament, anode, plate, positive terminal, power supply, voltage, positive half-cycles, rectifier tubes, grid, spiral of metal wire, amplifier, flow of electrons, doped, silicon, germanium, lack of free electrons, n-type and p-type material, bipolar transistor, p-n (bipolar) junction, forward bias, reverse bias, field-effect transistor (FET), repulsion or attraction of charges, photolithography, complex special-purpose circuit, monolithic resistance, carbon mixtures, metal film, resistance wire, variable resistor, output, amplifier stage, input, intensity, coil, mechanical, thermal, electrical, and chemical quantities, transducer, sensor, thermocouple, mechanical movement, photocell.*

**Electronic Components**

**4.1. INTRODUCTION**

Electronic circuits consist of interconnections of electronic components. Components are classified into two categories—active or passive. Passive elements never supply more energy than they absorb; active elements can supply more energy than they absorb. Passive components include resistors, capacitors, and inductors. Components considered active include batteries, generators, vacuum tubes, and transistors.

**4.2. VACUUM TUBES**

A vacuum tube consists of an air-evacuated glass envelope that contains several metal electrodes. A simple, two-element tube (diode) consists of a cathode and an anode that is connected to the positive terminal of a power supply. The cathode—a small metal tube heated by a filament—frees electrons , which migrate to the anode—a metal cylinder around the cathode (also called the plate). If an alternating voltage is applied to the anode, electrons will only flow to the anode during the positive half-cycle; during the negative cycle of the alternating voltage, the anode repels the electrons, and no current passes through the tube. Diodes connected in such a way that only the positive half-cycles of an alternating current (AC) are permitted to pass are called rectifier tubes; these are used in the conversion of alternating current to direct current (DC). By inserting a grid, consisting of a spiral of metal wire, between the cathode and the anode and applying a negative voltage to the grid, the flow of electrons can be controlled. When the grid is negative, it repels electrons, and only a fraction of the electrons emitted by the cathode can reach the anode. Such a tube, called a triode, can be used as an amplifier. Small variations in voltage at the grid, such as can be produced by a radio or audio signal, will cause large variations in the flow of electrons from the cathode to the anode and, hence, in the circuitry connected to the anode.

**4.3. TRANSISTORS**

Transistors are made from semiconductors. These are materials, such as silicon or germanium, that are “doped” (have minute amounts of foreign elements added) so that either an abundance or a lack of free electrons exists. In the former case, the semiconductor is called n-type, and in the latter case, p-type. By combining n-type and p-type materials, a diode can be produced. When this diode is connected to a battery so that the p-type material is positive and the n-type negative, electrons are repelled from the negative battery terminal and pass unimpeded to the p-region, which lacks electrons. With battery reversed, the electrons arriving in the p-material can pass only with difficulty to the n-material, which is already filled with free electrons, and the current is almost zero.

The bipolar transistor was invented in 1948 as a replacement for the triode vacuum tube. It consists of three layers of doped material, forming two p-n (bipolar) junctions with configurations of p-n-p or n-p-n. One junction is connected to a battery so as to allow current flow (forward bias), and the other junction has a battery connected in the opposite direction (reverse bias). If the current in the forward-biased junction is varied by the addition of a signal, the current in the reverse-biased junction of the transistor will vary accordingly. The principle can be used to construct amplifiers in which a small signal applied to the forward-biased junction causes a large change in current in the reverse-biased junction.

Another type of transistor is the field-effect transistor (FET). Such a transistor operates on the principle of repulsion or attraction of charges due to a superimposed electric field. Amplification of current is accomplished in a manner similar to the grid control of a vacuum tube. Field-effect transistors operate more efficiently than bipolar types, because a large signal can be controlled by a very small amount of energy.

**4.4. INTEGRATED CIRCUITS**

Most integrated circuits are small pieces, or “chips,” of silicon, perhaps 2 to 4 sq mm (0.08 to 0.15 sq in) long, in which transistors are fabricated. Photolithography enables the designer to create tens of thousands of transistors on a single chip by proper placement of the many n-type and p-type regions. These are interconnected with very small conducting paths during fabrication to produce complex special-purpose circuits. Such integrated circuits are called monolithic because they are fabricated on a single crystal of silicon. Chips require much less space and power and are cheaper to manufacture than an equivalent circuit built by employing individual transistors.

**4.5. RESISTORS**

If a battery is connected across a conducting material, a certain amount of current will flow through the material. This current is dependent on the voltage of the battery, on the dimensions of the sample, and on the conductivity of the material itself. Resistors with known resistance are used for current control in electronic circuits. The resistors are made from carbon mixtures, metal films, or resistance wire and have two connecting wires attached. Variable resistors, with an adjustable sliding contact arm, are often used to control volume on radios and television sets.

**4.6. CAPACITORS**

Capacitors consist of two metal plates that are separated by an insulating material. If a battery is connected to both plates, an electric charge will flow for a short time and accumulate on each plate. If the battery is disconnected, the capacitor retains the charge and the voltage associated with it. Rapidly changing voltages, such as caused by an audio or radio signal, produce larger current flows to and from the plates; the capacitor then functions as a conductor for the changing current. This effect can be used, for example, to separate an audio or radio signal from a direct current in order to connect the output of one amplifier stage to the input of the next amplifier stage.

**4.7. INDUCTORS**

Inductors consist of a conducting wire wound into the form of a coil. When a current passes through the coil, a magnetic field is set up around it that tends to oppose rapid changes in current intensity (Induction). As a capacitor, an inductor can be used to distinguish between rapidly and slowly changing signals. When an inductor is used in conjunction with a capacitor, the voltage in the inductor reaches a maximal value for a specific frequency. This principle is used in a radio receiver, where a specific frequency is selected by a variable capacitor.

**4.8. SENSING DEVICES AND TRANSDUCERS**

Measurements of mechanical, thermal, electrical, and chemical quantities are made by devices called sensors and transducers. The sensor is responsive to changes in the quantity to be measured, for example, temperature, position, or chemical concentration. The transducer converts such measurements into electrical signals, which, usually amplified, can be fed to instruments for the readout, recording, or control of the measured quantities. Sensors and transducers can operate at locations remote from the observer and in environments unsuitable or impractical for humans.

Some devices act as both sensor and transducer. A thermocouple has two junctions of wires of different metals; these generate a small electric voltage that depends on the temperature difference between the two junctions. A thermistor is a special resistor, the resistance of which varies with temperature. A variable resistor can convert mechanical movement into an electrical signal. Specially designed capacitors are used to measure distance, and photocells are used to detect light (Photoelectric Cells). Other devices are used to measure velocity, acceleration, or fluid flow. In most instances, the electric signal is weak and must be amplified by an electronic circuit.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, decide whether the information given in the statements below is true (T) or false (F). Correct the false statements (the specifications in brackets refer o the section in the text where the answer can be found):**

1. Components are classified into two categories—active or passive. (4.1)

2. A vacuum tube consists of an air-evacuated glass envelope that contains a single metal electrode. (4.1)

3. Passive components include batteries, resistors, capacitors, generators, vacuum tubes, and transistors. (4.1)

4. By inserting a grid, consisting of a spiral of metal wire, between the cathode and the anode and applying a negative voltage to the grid, the flow of electrons can be controlled. (4.2.)

5. When the grid is negative, it attracts electrons, and only a fraction of the electrons emitted by the cathode can reach the anode. (4.2.)

6. With battery reversed, the electrons arriving in the p-material can pass only with difficulty to the n-material, which is already filled with free electrons, and the current is almost zero. (4.3.)

7. Field-effect transistors operate less efficiently than bipolar types, because a large signal can be controlled by a very small amount of energy. (4.3.)

8. Integrated circuits are called monolithic because they are fabricated on a single crystal of silicon. (4.4.)

9. Capacitors consist of several metal plates that are separated by a conducting material. (4.6.)

10. Inductors consist of a conducting wire wound into the form of a coil. (4.7.)

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Enter the following terms under the appropriate heading in the table below:**

**List 4.1.**

supply more energy than they absorb, capacitors, never supply more energy than they absorb, resistors, batteries, generators, vacuum tubes, transistors, inductors.

**Table 4.1.**

|  |  |  |
| --- | --- | --- |
| **Active electronic components** | **Passive electronic components** | **Relevant characteristics** |
|  |  |  |
|  |  |  |
|  |  |  |

**B.2. Match each of the terms in column A with as many terms as possible in column B:**

**A B**

|  |  |
| --- | --- |
| vacuum tube  resistor  capacitor  inductor  battery  generator  transistor  sensors  transducers | cathode  metal electrode  metal cylinder  doped  responsive  thermocouple  thermistor  FET  metal plates  chip of silicon  semiconductors  bipolar  coil  forward bias  resistance  photocells  carbon mixtures |

**C. LANGUAGE FOCUS: PASSIVE FORMS**

**The purpose of the following exercises is to develop language awareness in terms of passive forms of verbs in English and teach the passive voice.**

**C.1. Read the text and identify verb phrases in three sentences having the following pattern. Identify the tense and voice for each case.**

**[aux.vb. BE + lex.vb. V3]**

**C.2. Change the following sentences into active/passive voice preserving the tense, and pay attention to the shift of focus taking place with each transformation.**

1. Measurements of mechanical, thermal, electrical, and chemical quantities are made by devices called sensors and transducers.

2. When an inductor is used in conjunction with a capacitor, the voltage in the inductor reaches a maximal value for a specific frequency.

3. If a battery is connected to both plates, an electric charge will flow for a short time and accumulate on each plate.

4. If the battery is disconnected, the capacitor retains the charge and the voltage associated with it.

5. Resistors with known resistance are used for current control in electronic circuits.

6. Such a transistor operates on the principle of repulsion or attraction of charges due to a superimposed electric field.

7. Amplification of current is accomplished in a manner similar to the grid control of a vacuum tube.

8. The bipolar transistor was invented in 1948 as a replacement for the triode vacuum tube.

9. Transistors are made from semiconductors.

10. If an alternating voltage is applied to the anode, electrons will only flow to the anode during the positive half-cycle.

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following sentences into English:**

1. Diodele conectate astfel încât să permită trecerea unui curent alternativ doar în semialternanţa pozitivă sunt numite redresoare.

2. Tranzistorul bipolar inventat în 1948 este alcătuit din trei straturi de material dopat, formând două joncţiuni bipolare de tip p-n de configuraţie p-n-p respective n-p-n.

3. Atunci când o bobină este utilizată în combinaţie cu un condensator, tensiunea din bobină atinge o valoare maximă pentru o frecvenţă dată.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on electronic components, their operation principle and application.**

**E.1. Talk with one of your colleagues and name at least one active and one passive electronic component that you are familiar with. Describe their component parts and how they are used.**

**Unit 5**

**ANALOG AND DIGITAL ELECTRONIC CIRCUITS**

**AIM:**

To recognize the English technical terms related to analogue and digital circuits;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining the different types of digital and analogue circuits;
* recognise the specific terms related to amplifier circuits, oscillators, switching and timing circuits;
* describe the possible applications for each type of circuit;
* identify the types of circuits and the function they provide;
* describe the operation of all types of analogue and digital circuits;
* assimilate at least 30 terms specific of circuit structure, operation, function and application;

**KEY TERMS:**

*DC voltage, internal power supply, outlet, regulated DC voltage, transformer, to step up, to step down, input voltage, electrical ground insulation, power line, rectifier, diode, vacuum diode, germanium crystal, cadmium sulphide, low-power rectifier, silicon rectifier, fluctuation, ripple, to superimpose, rectified DC voltage, voltage regulator, zener diode, solid-state p-n-junction diode, excess voltage, analogue circuit, amplifier circuit, signal amplification, distortion, nonlinear amplifier, waveform of the signal, linear amplifier, audio signal, video signal, oscillator, power electronics, modulator, mixer, logic circuit, amplitude cut-off, discrete transistor circuit, integrated circuit, operational amplifier (op-amp), DC-coupled, multistage, linear amplifier, frequency spectrum range, band, radio frequency amplifier, video amplifier, tuned inductance-capacitance circuit, vibrating crystal, crystal-controlled oscillator, high-frequency oscillator, switching and timing circuit, logic circuit, digital logic, Boolean algebra, true-false decision, solid-state transducer, transistor-transistor logic (TTL), metal oxide semiconductor logic (CMOS), resistor-transistor logic (RTL), emitter coupled logic (ELC), flip-flop (binary switch), counter, comparator, adder, digital logic gate.*

**ANALOG AND DIGITAL ELECTRONIC CIRCUITS**

**5.1. Power-Supply Circuits**

Most electronic equipment requires DC voltages for its operation. These can be provided by batteries or by internal power supplies that convert alternating current as available at the home electric outlet, into regulated DC voltages. The first element in an internal DC power supply is a transformer, which steps up or steps down the input voltage to a level suitable for the operation of the equipment. A secondary function of the transformer is to provide electrical ground insulation of the device from the power line to reduce potential shock hazards. The transformer is then followed by a rectifier, normally a diode. In the past, vacuum diodes and a wide variety of different materials such as germanium crystals or cadmium sulphide were employed in the low-power rectifiers used in electronic equipment. Today silicon rectifiers are used almost exclusively because of their low cost and their high reliability.

Fluctuations and ripples superimposed on the rectified DC voltage (noticeable as a hum in a malfunctioning audio amplifier) can be filtered out by a capacitor; the larger the capacitor, the smaller is the amount of ripple in the voltage. More precise control over voltage levels and ripples can be achieved by a voltage regulator, which also makes the internal voltages independent of fluctuations that may be encountered at an outlet. A simple, often-used voltage regulator is the zener diode. It consists of a solid-state p-n-junction diode, which acts as an insulator up to a predetermined voltage; above that voltage it becomes a conductor that bypasses excess voltages. More sophisticated voltage regulators are usually constructed as integrated circuits.

**5.2. ANALOG CIRCUITS**

**5.2.1. Amplifier Circuits**

Electronic amplifiers are used mainly to increase the voltage, current, or power of a signal. A linear amplifier provides signal amplification with little or no distortion, so that the output is proportional to the input. A nonlinear amplifier may produce a considerable change in the waveform of the signal. Linear amplifiers are used for audio and video signals, whereas nonlinear amplifiers find use in oscillators, power electronics, modulators, mixers, logic circuits, and other applications where an amplitude cut-off is desired. Although vacuum tubes played a major role in amplifiers in the past, today either discrete transistor circuits or integrated circuits are mostly used.

**5.2.1.1. Audio Amplifiers**

Audio amplifiers, such as are found in radios, television sets, citizens band (CB) radios, and cassette recorders, are generally operated at frequencies below 20 kilohertz (1 kHz = 1000 cycles/sec). They amplify the electrical signal, which then is converted to sound in a loudspeaker. Operational amplifiers (op-amps), built with integrated circuits and consisting of DC-coupled, multistage, linear amplifiers are popular for audio amplifiers.

**5.2.1.2. Video Amplifiers**

Video amplifiers are used mainly for signals with a frequency spectrum range up to 6 megahertz (1 MHz = 1 million cycles/sec). The signal handled by the amplifier becomes the visual information presented on the television screen, with the signal amplitude regulating the brightness of the spot forming the image on the screen. To achieve its function, a video amplifier must operate over a wide band and amplify all frequencies equally and with low distortion.

**5.2.1.3. Radio Frequency Amplifiers**

These amplifiers boost the signal level of radio or television communication systems. Their frequencies generally range from 100 kHz to 1 GHz (1 billion cycles/sec = 1 gigahertz) and can extend well into the microwave frequency range.

**5.2.2. Oscillators**

Oscillators generally consist of an amplifier and some type of feedback: The output signal is fed back to the input of the amplifier. The frequency-determining elements may be a tuned inductance-capacitance circuit or a vibrating crystal. Crystal-controlled oscillators offer the highest precision and stability. Oscillators are used to produce audio and radio signals for a wide variety of purposes. For example, simple audio-frequency oscillators are used in modern push-button telephones to transmit data to the central telephone station for dialling. Audio tones generated by oscillators are also found in alarm clocks, radios, electronic organs, computers, and warning systems. High-frequency oscillators are used in communications equipment to provide tuning and signal-detection functions. Radio and television stations use precise high-frequency oscillators to produce transmitting frequencies.

**5.3. DIGITAL LOGIC CIRCUITS**

Switching and timing circuits, or logic circuits, form the heart of any device where signals must be selected or combined in a controlled manner. Applications of these circuits include telephone switching, satellite transmissions, and digital computer operations.

**5.3.1. Switching and Timing Circuits**

Digital logic is a rational process for making simple “true” or “false” decisions based on the rules of Boolean algebra. “True” can be represented by a 1 and “false” by a 0, and in logic circuits the numerals appear as signals of two different voltages. Logic circuits are used to make specific true-false decisions based on the presence of multiple true-false signals at the inputs. The signals may be generated by mechanical switches or by solid-state transducers. Once the input signal has been accepted and conditioned (to remove unwanted electrical signals, or “noise”), it is processed by the digital logic circuits. The various families of digital logic devices, usually integrated circuits, perform a variety of logic functions through logic gates, including “OR,””AND,” and “NOT,” and combinations of these (such as “NOR,” which includes both OR and NOT). One widely used logic family is the transistor-transistor logic (TTL). Another family is the complementary metal oxide semiconductor logic (CMOS), which performs similar functions at very low power levels but at slightly lower operating speeds. Several other, less popular families of logic circuits exist, including the currently obsolete resistor-transistor logic (RTL) and the emitter coupled logic (ELC), the latter used for very-high-speed systems.

**5.3.2. DIGITAL LOGIC**

The elemental blocks in a logic device are called digital logic gates. An AND gate has two or more inputs and a single output. The output of an AND gate is true only if all the inputs are true. An OR gate has two or more inputs and a single output. The output of an OR gate is true if any one of the inputs is true and is false if all of the inputs are false. An INVERTER has a single input and a single output terminal and can change a true signal to a false signal, thus performing the NOT function. More complicated logic circuits are built up from elementary gates. They include flip-flops (binary switches), counters, comparators, adders, and more complex combinations.

To perform a desired overall function, large numbers of logic elements may be connected in complex circuits. In some cases microprocessors are utilized to perform many of the switching and timing functions of the individual logic elements. The processors are specifically programmed with individual instructions to perform a given task or tasks. An advantage of microprocessors is that they make possible the performance of different logic functions, depending on the program instructions that are stored. A disadvantage of microprocessors is that normally they operate in a sequential mode, which may be too slow for some applications. In these cases specifically designed logic circuits are used.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Re-read section 5.1. and 5.2. And decide on the uses of these types of analogue circuits:**

**1. Power-supply circuits**

**2. Amplifier circuits**

**3. Oscillators**

**A.2. In section 5.3. of the text the characteristics of logic circuits, logic gates and logic families are described. Explain the applications that these properties would be most suitable for and name each type of logic circuit.**

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Fill in the following diagrams with the missing terms:**

**Diagram 5.1.**

LOGIC GATES

**Diagram 5.2.**

DIGITAL LOGIC CIRCUITS

**Diagram 5.3.**

LOGIC FAMILIES

**B.1. Enter in the following table information related to amplifier circuits (5.2.):**

**Table 5.1.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of amplifier circuit** | **Frequency spectrum**  **range** | **Type of signal amplification** | **Applications** | **Particular characteristics** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**C. LANGUAGE FOCUS: WORD FORMATION**

**The purpose of the following exercises is to develop language awareness in terms of word formation by means of building word families, using prefixes and suffixes, and spelling of compounds.**

**C.1. Find at least four terms belonging to the same word family as the following terms and identify the word formation pattern in each case.**

1.to amplify

2. to supply

3. to oscillate

**C.2. Enter the terms that can be used as nouns under the appropriate heading in the table below and use them in sentences:**

**Table 5.2.**

|  |  |  |
| --- | --- | --- |
| **NOUN** | **Word formation pattern**  **( V1+ing) or (V1+/-suffix)** | **Meaning**  **( DEVICE) or (ACTION)** |
|  |  |  |
|  |  |  |
|  |  |  |

**C.3. Merge the terms or prefixes in column A with the terms or suffixes in column B paying attention to spelling (no hyphen, with a hyphen, one word, two terms).**

**A B**

|  |  |
| --- | --- |
| equip  second  transform  low  electron  super  by  dis  cut  op  DC  Multi  in  non  bright  micro  inductance  crystal  high  signal  telephone  Boolean  true  solid  trans  re  transistor  semi  resistor  emitter  very  flip  bi  micro | ment  ary  er  power  ic  impose  pass  tortion  off  amps  coupled  stage  put  linear  ness  wave  capacitance  controlled  frequency  detection  switching  algebra  false  state  ducers  move  transistor logic  conductor  transistor logic  coupled logic  high speed system  flop  nary  processors |

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following terms into English:**

Priză, sursă de alimentare, curent continuu, curent alternativ, transformator, dispozitiv, izolaţie, redresor, siliciu, ondulaţie, fluctuaţie, disfuncţional, a filtra, condensator, dioda zener, stabilizator de tensiune, circuit amplificator, semnal, circuit discret, microprocesor, oscilator, algebra Booleană, poartă logică, inversor, contor, comparator, sumator.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on**

**E.1. Talk with one of your colleagues and name at least two logic gates that you are familiar with. Describe them and identify the function each of them performs.**

**Unit 6**

**TELECOMMUNICATIONS**

**AIM:**

To recognize the English technical terms related to telecommunications and the development of this field;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining telecommunications devices and systems;
* recognise the specific terms related to telegraph-, telephone- and broadcasting systems;
* characterise the operation principles of each branch of telecommunications;
* identify the types of equipment used for transmitting and receiving the various types of signals;
* describe the applications made possible by each telecommunications system;
* assimilate at least 30 terms specific of sending, receiving, and converting signals;

**KEY TERMS:**

*electronic signal, optical signal, sender, recipient, telephone system, medium, radio wave, strand of glass fibre, point-to-point, point-to-multipoint, facsimile (fax) message, broadcast, telegraph, intercity message, transcontinental message, transoceanic message, electromagnetism, prototype, decipher, switching technology, , long-distance telephone service, public communications, Morse-code telegraph signal, wireless telegraphy, mass-communication*

**TELECOMMUNICATIONS**

**6.1. Introduction**

Telecommunications, devices and systems that transmit electronic or optical signals across long distances. Telecommunications enables people around the world to contact one another, to access information instantly, and to communicate from remote areas. Telecommunications usually involves a sender of information and one or more recipients linked by a technology, such as a telephone system, that transmits information from one place to another. Telecommunications enables people to send and receive personal messages across town, between countries, and to and from outer space. It also provides the key medium for delivering news, data, information, and entertainment.

Telecommunications devices convert different types of information, such as sound and video, into electronic or optical signals. Electronic signals typically travel along a medium such as copper wire or are carried over the air as radio waves. Optical signals typically travel along a medium such as strands of glass fibres. When a signal reaches its destination, the device on the receiving end converts the signal back into an understandable message, such as sound over a telephone, moving images on a television, or terms and pictures on a computer screen.

Telecommunications messages can be sent in a variety of ways and by a wide range of devices. The messages can be sent from one sender to a single receiver (point-to-point) or from one sender to many receivers (point-to-multipoint). Personal communications, such as a telephone conversation between two people or a facsimile (fax) message, usually involve point-to-point transmission. Point-to-multipoint telecommunications, often called broadcasts, provide the basis for commercial radio and television programming.

**6.2. History**

Communicating over long distances has been a challenge throughout history. Modern telecommunications began in the 1800s with the discovery that electricity can be used to transmit a signal. For the first time, a signal could be sent faster than any other mode of transportation. The first practical telecommunications device to make use of this discovery was the telegraph.

**6.2.1. The Telegraph**

Beginning in the mid-1800s, the telegraph delivered the first intercity, transcontinental, and transoceanic messages in the world. The telegraph revolutionized the way people communicated by providing messages faster than any other means provided at the time. American art professor Samuel F. B. Morse pursued an interest in electromagnetism to create a practical electromagnetic telegraph in 1837. Morse partnered with Alfred Vail and was able to commercialize the technology with financial support from the U.S. government. In 1843 Morse built a demonstration telegraph link between Washington, D.C., and Baltimore, Maryland. On May 24, 1844, the network was inaugurated for commercial use with the message, "What hath God wrought!"

Telegraph use quickly spread; the first transcontinental link was completed in 1861 between San Francisco, California, and Washington, D.C. Railroad companies and newspapers were the first major telegraphy users. Telegraph lines were constructed parallel to railroad beds. Telegraphy helped the railroads manage traffic and allowed news organizations to distribute stories quickly to local newspapers. Within a few years, several telegraph companies were in operation, each with its own network of telegraph wires. Consolidation occurred in the telegraph industry (as it has in numerous telecommunications industries), and by the 1870s the Western Union Telegraph Company emerged as the dominant operator.

**6.2.2. Commercial Growth of the Telephone**

In 1876 American inventor Alexander Graham Bell ushered in a new era of voice and sound telecommunication when he uttered to his assistant the terms, "Mr. Watson, come here; I want you," using a prototype telephone. Bell received the patent for the first telephone, but he had to fight numerous legal challenges to his patent from other inventors with similar devices. Bell was able to make his prototype telephone work, and this enabled him to attract financial backers, and his company grew. The telephone was a vast improvement over the telegraph system, which could only transmit coded terms and numbers, not the sound of a human voice. Telegraph messages had to be deciphered by trained operators, written down, and then delivered by hand to the receiving party, all of which took time. The telephone transmitted actual sound messages and made telecommunication immediate. Improved switching technology (used to transfer calls from one local network to another) meant individual telephones could be connected for personal conversations.

The first commercial telephone line was installed in Boston, Massachusetts, in 1877. Early telephones required direct connections to other telephones, but this problem was solved with telephone exchange switches, the first of which was installed in New Haven, Connecticut, in 1878. A telephone exchange linked telephones in a given area together, so a connection between the telephone and the exchange was all that was needed. Telephones were much more convenient and personal than telegrams, and their use quickly spread. By 1913 telephone lines from New York City to San Francisco had been established, and by 1930 radio signals could transmit telephone calls between New York and London, England. Eventually, long-distance telephone service in the United States was consolidated into one company, the American Telephone and Telegraph Company (now known as AT&T Corp.), which was a regulated monopoly.

**6.3. RECENT DEVELOPMENTS**

**6.3.1. The Emergence of Broadcasting**

Telephones and telegraphs are primarily private means of communications, sending signals from one point to another, but with the invention of the radio, public communications, or point-to-multipoint signals, could be sent through a central transmitter to be received by anyone possessing a receiver. Italian inventor and electrical engineer Guillermo Marconi transmitted a Morse-code telegraph signal by radio in 1895. This began a revolution in wireless telegraphy that would later result in broadcast radios that could transmit actual voice and music. Radio and wireless telegraph communication played an important role during World War I (1914-1918), allowing military personnel to communicate instantly with troops in remote locations. United States president Woodrow Wilson was impressed with the ability of radio, but he was fearful of its potential for espionage use. He banned non-military radio use in the United States as the nation entered World War I in 1917, and this stifled commercial development of the medium. After the war, however, commercial radio stations began to broadcast. By the mid-1920s, millions of radio listeners tuned in to music, news, and entertainment programming. Television got its start as a mass-communication medium shortly after World War II (1939-1945). The expense of television transmission prevented its use as a two-way medium, but radio broadcasters quickly saw the potential for television to provide a new way of bringing news and entertainment programming to people.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, decide whether the information given in the statements below is true (T) or false (F). Correct the false statements (the specifications in brackets refer o the section in the text where the answer can be found):**

1. Telecommunications, devices and systems that transmit electronic or optical signals across long distances.

2. Telecommunications usually involves a sender of information and a single recipients linked by a technology, such as a telephone system, that transmits information from one place to another.

3. Telecommunications devices convert different types of information, such as sound and video, into electronic or optical signals.

4. The messages can be sent from one sender to a single receiver(point-to-multipoint)or from one sender to many receivers (point-to-point).

5. Consolidation occurred in the telegraph industry (as it has in numerous telecommunications industries), and by the 1970s the Western Union Telegraph Company emerged as the dominant operator.

6. Early telephones required direct connections to other telephones, but this problem was solved with telephone exchange switches, the first of which was installed in New Haven, Connecticut, in 1878.

7. Telephones and telegraphs are primarily private means of communications, sending signals from one point to another, but with the invention of the radio, public communications, or point-to-point signals, could be sent through a central transmitter to be received by anyone possessing a receiver.

8. Radio and wireless telegraph communication played an important role during World War I (1914-1918), allowing military personnel to communicate instantly with troops in remote locations.

9. Television got its start as a mass-communication medium shortly before World War II (1939-1945).

10. Point-to-multipoint telecommunications, often called broadcasts, provide the basis for commercial radio and television programming.

**A.2. Fill in the gaps following sentences with information about telecommunication systems given in the text.**

1. Telecommunications usually involves a\_\_\_\_\_\_\_\_of information and one or more \_\_\_\_\_\_linked by a \_\_\_\_\_\_\_\_\_, such as a telephone system, that \_\_\_\_\_\_\_\_information from one place to another.

2. Telecommunications \_\_\_\_\_\_\_\_convert different types of information, such as sound and video, into electronic or optical\_\_\_\_\_\_\_.

3. When a signal reaches its\_\_\_\_\_\_\_\_, the device on the receiving end \_\_\_\_\_\_the signal back into an understandable message, such as sound over a\_\_\_\_\_\_\_\_, moving images on a\_\_\_\_\_\_\_, or terms and \_\_\_\_\_\_on a \_\_\_\_\_\_screen.

4. Personal communications, such as a telephone conversation between two people or a \_\_\_\_\_\_\_\_\_\_(fax) message, usually involve \_\_\_\_\_\_\_\_\_\_\_transmission.

5. The first practical telecommunications \_\_\_\_\_\_\_to make use of this discovery was the telegraph.

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Enter in the following table information related to telecommunications devices (see 6.1):**

**Table 6.1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of device** | **Type of**  **message** | **Medium of transmission** | **Application** | **Number of recipients** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**C. LANGUAGE FOCUS: ADVERBS USED FOR PRESENTING THE SEQUENCE OF EVENTS**

**The purpose of the following exercises is to develop language awareness in terms of use of adverbs when presenting the sequence of events or actions.**

**C.1. Select the suitable adverbs from the list below and use them to link two sentences, in accordance with the information provided by section 6.2 of the text.**

**List 6.1.**

**THEN, HEREAFTER, THEREAFTER, AFTERWARDS, BEFORE, SOON AFTER (THAT), SUBSEQUENTLY, PRIOR, AT THE SAME TIME, MEANWHILE, LATER, FIRST(LY), SECOND(LY), SIMULTANEOUSLY.**

**\* some pairs of sentences can be linked by several of the adverbs in the list.**

1. American art professor Samuel F. B. Morse pursued an interest in electromagnetism to create a practical electromagnetic telegraph in 1837. In 1843 Morse built a demonstration telegraph link between Washington, D.C., and Baltimore, Maryland.

2. Telegraph use quickly spread; the first transcontinental link was completed in 1861. Beginning in the mid-1800s, the telegraph delivered the first intercity, transcontinental, and transoceanic messages in the world.

3. In 1876 American inventor Alexander Graham Bell ushered in a new era of voice and sound telecommunication when he uttered to his assistant the terms, "Mr. Watson, come here; I want you," using a prototype telephone. Bell received the patent for the first telephone, but he had to fight numerous legal challenges to his patent from other inventors with similar devices.

4. Radio and wireless telegraph communication played an important role during World War I (1914-1918), allowing military personnel to communicate instantly with troops in remote locations. By the mid-1920s, millions of radio listeners tuned in to music, news, and entertainment programming.

5. Television got its start as a mass-communication medium shortly after World War II (1939-1945). Radio broadcasters quickly saw the potential for television to provide a new way of bringing news and entertainment programming to people.

**C.2. Read section 6.2. again and complete the list of adverbs with time reference below:**

**List 6.2.**

throughout, in, the1800s, in the mid-1800s, on May 24, 1844…

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following sentences into English:**

1. Telecomunicaţiile au ca obiect transmisia de semnale optice sau electronice pe distanţe mari.

2. Dispozitivele utilizate în domeniul telecomunicaţiilor transformă diferite tipuri de date, precum cele audio sau video, în semnale electronice sau optice.

3. La destinaţie, dispozitivul de receptare, transformă semnalul din nou în mesaj.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on presenting the chronological order of events.**

**E.1. Taking turns, describe the evolution of telephone systems each of you presenting the one important stage. Emphasize the chronological order of the stages.**

**Unit 7**

**TELECOMMUNICATIONS OPERATION PRINCIPLES**

**AIM:**

To recognize the English technical terms related to the operation of telecommunication systems and devices;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms describing signal creating-, receiving-, transmitting processes;
* recognise the specific terms related to signal encoding and decoding procedures and the corresponding devices;
* describe the separate stages in the operation of telegraph-, telephone-, radio-, television-, and internet communications and identify similarities and differences;
* identify the types of equipment used for each type of signal creation, transmission and reception and compare them;
* describe the function performed by each device;
* assimilate at least 30 terms specific of signal creating-, receiving-, transmitting processes and equipment;

**KEY TERMS:**

*convert, digital format, mathematical format, transmission, decode, modulated electrical impulses, via, modulation, contact, telegraph key, metal conductor, electrical impulse, burst of sound, dots and dashes, diaphragm, wire coil, analogue waveform, electrical waveform, speaker, cellular radio telephones, broadcast radio, electromagnetic radiation, microwave, wavelength, frequency, encode, amplitude, tuner, picture tube, electron gun, photo-sensitive display screen, analogue transmission, series of binary numbers, digits, network, broadband networks, cable television company, modem, modulator/demodulator, transmission media, copper wires, fibre-optic cable, communication satellite, microwave radio, wire-based (or wire line) telecommunications, wireless communications, cordless telephone, pager, satellite, high-speed Internet access.*

**How Telecommunications Works**

**7.1. iNTRODUCTION**

Telecommunications begin with messages that are converted into electronic or optical signals. Some signals, such as those that carry voice or music, are created in an analogue or wave format, but may be converted into a digital or mathematical format for faster and more efficient transmission. The signals are then sent over a medium to a receiver, where they are decoded back into a form that the person receiving the message can understand. There are a variety of ways to create and decode signals, and many different ways to transmit signals.

**7.2. CREATING AND RECEIVING THE SIGNAL**

**7.2.1. Telegraph**

Devices such as the telegraph and telephone relay messages by creating modulated electrical impulses, or impulses that change in a systematic way. These impulses are then sent along wires, through the air as radio waves, or via other media to a receiver that decodes the modulation. The telegraph, the earliest method of delivering telecommunications, works by converting the *contacts* (connections between two conductors that permit a flow of current) between a telegraph key and a metal conductor into electrical impulses. These impulses are sent along a wire to a receiver, which converts the impulses into short and long bursts of sound or into dots and dashes on a simple printing device. Specific sequences of dots and dashes represent letters of the alphabet. In the early days of the telegraph, these sequences were decoded by telegraph operators. In this way, telegraph operators could transmit and receive letters that spelled terms. Later versions of the telegraph could decipher letters and numbers automatically. Telegraphs have been largely replaced by other forms of telecommunications, such as electronic mail (e-mail), but they are still used in some parts of the world to send messages.

**7.2.2. Telephone**

The telephone uses a *diaphragm* (small membrane) connected to a magnet and a wire coil to convert sound into an analogue or electrical waveform representation of the sound. When a person speaks into the telephone’s microphone, sound waves created by the voice vibrate the diaphragm, which in turn creates electrical impulses that are sent along a telephone wire. The receiver’s wire is connected to a speaker, which converts the modulated electrical impulses back into sound.

**7.2.3. Radio**

Broadcast radio and cellular radio telephones are examples of devices that create signals by modulating radio waves. A radio wave is one type of electromagnetic radiation, a form of energy that travels in waves. Microwaves are also electromagnetic waves, but with shorter wavelengths and higher frequencies. In telecommunications, a transmitter creates and emits radio waves. The transmitter electronically modulates or encodes sound or other information onto the radio waves by varying either the amplitude (height) of the radio waves, or by varying the frequency (number) of the waves within an established range. A receiver (tuner) tuned to a specific frequency or range of frequencies will pick up the modulation added to the radio waves. A speaker connected to the tuner converts the modulation back into sound.

**7.2.4. Television**

Broadcast television works in a similar fashion. A television camera takes the light reflected from a scene and converts it into an electronic signal, which is transmitted over high-frequency radio waves. A television set contains a tuner that receives the signal and uses that signal to modulate the images seen on the picture tube. The picture tube contains an electron gun that shoots electrons onto a photo-sensitive display screen. The electrons illuminate the screen wherever they fall, thus creating moving pictures.

Telegraphs, telephones, radio, and television all work by modifying electronic signals, making the signals imitate, or reproduce, the original message. This form of transmission is known as analoguetransmission. Computers and other types of electronic equipment, however, transmit digital information. Digital technologies convert a message into an electronic or optical form first by measuring different qualities of the message, such as the pitch and volume of a voice, many times. These measurements are then encoded into multiple series of binary numbers, or 1s and 0s. Finally, digital technologies create and send impulses that correspond to the series of 1s and 0s. Digital information can be transmitted faster and more clearly than analogue signals, because the impulses only need to correspond to two digits and not to the full range of qualities that compose the original message, such as the pitch and volume of a human voice. While digital transmissions can be sent over wires, cables or radio waves, they must be decoded by a digital receiver. New digital telephones and televisions are being developed to make telecommunications more efficient.

**7.2.5. Computers**

Personal computers primarily communicate with each other and with larger networks, such as the Internet, by using the ordinary telephone network. Increasing numbers of computers rely on broadband networks provided by telephone and cable television companies to send text, music, and video over the Internet at high speeds. Since the telephone network functions by converting sound into electronic signals, the computer must first convert its digital data into sound. Computers do this with a device called a modem, which is short for *mo*dulator/*dem*odulator. A modem converts the stream of 1s and 0s from a computer into an analogue signal that can then be transmitted over the telephone network, as a speaker’s voice would. The modem of the receiving computer demodulates the analogue sound signal back into a digital form that the computer can understand.

**7.3. TRANSMITTING THE SIGNAL**

Telecommunications systems deliver messages using a number of different transmission media, including copper wires, fibre-optic cables, communication satellites, and microwave radio. One way to categorize telecommunications media is to consider whether or not the media uses wires. Wire-based (or wire line) telecommunications provide the initial link between most telephones and the telephone network and are a reliable means for transmitting messages. Telecommunications without wires, commonly referred to as wireless communications, use technologies such as cordless telephones, cellular radio telephones, pagers, and satellites. Wireless communications offer increased mobility and flexibility. In the future some experts believe that wireless devices will also offer high-speed Internet access.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, answer the following questions (the specifications in brackets refer to the section in the text where the answer can be found):**

1. What is the means of creating a signal in telegraph communications?

2. What is the means of creating a signal in telephone communications?

3. What is the means of creating a signal in radio communications?

4. What is the means of creating a signal in television?

5. What is the means of creating a signal in computer-based?

**A.2. Fill in the following table with information about signal manipulation given in the text.**

**Table 7.1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type of telecom. system** | **Devices used in signal creation** | **Devices used for signal**  **reception** | **Transmission speed** | **Transmission media** | **Type of system (wireless/**  **wire-based)** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Match the operation principles described below with the type of telecommunication system in the list.**

1. The earliest method of delivering telecommunications, works by converting the *contacts* (connections between two conductors that permit a flow of current) between a telegraph key and a metal conductor into electrical impulses. These impulses are sent along a wire to a receiver, which converts the impulses into short and long bursts of sound or into dots and dashes on a simple printing device. Specific sequences of dots and dashes represent letters of the alphabet.

2. The transmitter electronically modulates or encodes sound or other information onto the radio waves by varying either the amplitude (height) of the radio waves, or by varying the frequency (number) of the waves within an established range. A receiver (tuner) tuned to a specific frequency or range of frequencies will pick up the modulation added to the radio waves. A speaker connected to the tuner converts the modulation back into sound.

3. A modem converts the stream of 1s and 0s from a computer into an analogue signal that can then be transmitted over the telephone network, as a speaker’s voice would. The modem of the receiver demodulates the analogue sound signal back into a digital form.

a. telephone

b. telegraph

c. computer

d. television

e. radio

**B.2. In each series of four terms given below there is one term that does not belong in the series. Underline the ‘odd’ word and justify your decision, as shown in the following example:**

**e.g.:** digital format, mathematical format, transmission,dots and dashes*.*

1. diaphragm, wire coil, cable television companies, cordless telephones.

2. high-speed Internet access, wavelength, frequency, encode.

3. photo-sensitive display screen, analogue transmission, series of binary numbers, contacts.

4.communication satellites,, contacts, telegraph key, metal conductor, electrical impulses.

5. modem, encode, microwave radio, fibre-optic cable.

**C. LANGUAGE FOCUS: COMPARISON AND CONTRAST**

**The purpose of the following exercises is to develop language awareness in terms of expressing comparison and teach contrastive conjunctions.**

**C.1. Read the sentences below and identify similarities and differences of the things described.**

1. Microwaves are also electromagnetic waves, but with shorter wavelengths and higher frequencies.

2. This form of transmission is known as analoguetransmission. Computers and other types of electronic equipment, however, transmit digital information.

3. Digital information can be transmitted faster and more clearly than analogue signals, because the impulses only need to correspond to two digits and not to the full range of qualities that compose the original message, such as the pitch and volume of a human voice.

4. While digital transmissions can be sent over wires, cables or radio waves, they must be decoded by a digital receiver.

5. Broadcast television works in a similar fashion as radio.

**C.2. Identify the terms that render contrastive meaning.**

**C.3. Complete the list below with other terms with similar meaning.**

**However, nevertheless, but, on the other hand, despite of, in spite of, regardless of, yet, although, even though, even if, etc.**

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following terms into English:**

1. semnal optic

2. demodulare

3. modulare

4. undă radio

5. lungime de undă

6. impuls electric

7. undă electromagnetică

8. microundă

9. medii de transmisie

10. fibră optică

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on**

**E.1. Choose one of the telecommunications systems described in the text. Work in pairs, comparing the two chosen telecommunications systems using the following patterns.**

X is considerably cheaper/ more efficient THAN Y

very much

quite a lot

rather

somewhat

slightly

scarcely

hardly

only just

X is exactly the same as Y

precisely

just

virtually

practically

more or less

almost

nearly

approximately

X is totally different from Y

completely

entirely

quite

X and Y are dissimilar in every respect

different way

**Unit 8**

**COMMUNICATION NETWORKS**

**AIM:**

To recognize the English technical terms related to communication networks;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining all types of transmission media;
* recognise the specific terms related to cable networks, radio waves and communications satellites;
* describe the components of communications networks;
* identify the types of equipment used for obtaining reliable signal transmission;
* describe the operation principle of each type of communication network;
* assimilate at least 30 terms specific of signal transmission;

**KEY TERMS:**

*wire, cable, telecommunications services, to connect, telephone switching facility, coaxial cable, video channel, subscriber, head-end, amplifier, process, retransmit, fibre-optic cable, pulsed beams of laser light, pulses of light, "backbone" link, Internet traffic, antenna, AM and FM radio, beam, dish-shaped antenna, high-capacity link, ionosphere, orbit, geostationary or geosynchronous orbit, Earth’s rotation, coverage area, relay function, "bent pipes".*

**COMMUNICATION NETWORKS**

**8.1. WIRES AND CABLES**

Wires and cables were the original medium for telecommunications and are still the primary means for telephone connections. Wire line transmission evolved from telegraph to telephone service and continues to provide the majority of telecommunications services. Wires connect telephones together within a home or business and also connect these telephones to the nearest telephone switching facility.

Other wire line services employ coaxial cable, which is used by cable television to provide hundreds of video channels to subscribers. Much of the content transmitted by the coaxial cable of cable television systems is sent by satellite to a central location known as the head end. Coaxial cables flow from the head end throughout a community and onward to individual residences and, finally, to individual television sets. Because signals weaken as distance from the head end increases, the coaxial cable network includes amplifiers that process and retransmit the television signals.

**8.2. FIBRE OPTICS CABLE**

Fibre-optic cables use specially treated glass that can transmit signals in the form of pulsed beams of laser light. Fibre-optic cables carry many times more information than copper wires can, and they can transmit several television channels or thousands of telephone conversations at the same time. Fibre-optic technology has replaced copper wires for most transoceanic routes and in areas where large amounts of data are sent.  This technology uses laser transmitters to send pulses of light via hair-thin strands of specially prepared glass fibres. New improvements promise cables that can transmit millions of telephone calls over a single fibre. Already fibre optic cables provide the high capacity, “backbone" links necessary to carry the enormous and growing volume of telecommunications and Internet traffic.

**8.3. RADIO WAVES**

Wireless telecommunications use radio waves, sent through space from one antenna to another, as the medium for communication. Radio waves are used for receiving AM and FM radio and for receiving television. Cordless telephones and wireless radio telephone services, such as cellular radio telephones and pagers, also use radio waves. Telephone companies use microwaves to send signals over long distances. Microwaves use higher frequencies than the radio waves used for AM, FM, or cellular telephone transmissions, and they can transmit larger amounts of data more efficiently. Microwaves have characteristics similar to those of visible light waves and transmit pencil-thin beams that can be received using dish-shaped antennas. Such narrow beams can be focused to a particular destination and provide reliable transmissions over short distances on Earth. Even higher and narrower beams provide the high-capacity links to and from satellites. The high frequencies easily penetrate the ionosphere (a layer of Earth’s atmosphere that blocks low-frequency waves) and provide a high-quality signal.

**8.4. COMMUNICATIONS SATTELITES**

Communications satellites provide a means of transmitting telecommunications all over the globe, without the need for a network of wires and cables. They orbit Earth at a speed that enables them to stay above the same place on Earth at all times. This type of orbit is called geostationary or geosynchronous orbit because the satellite’s orbital speed operates in synchronicity with Earth’s rotation. The satellites receive transmissions from Earth and transmit them back to numerous Earth station receivers scattered within the receiving coverage area of the satellite. This relay function makes it possible for satellites to operate as "bent pipes"—that is, wireless transfer stations for point-to-point and point-to-multipoint transmissions. Communications satellites are used by telephone and television companies to transmit signals across great distances. Ship, airplane, and land navigators also receive signals from satellites to determine geographic positions.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Look through the text and answer the following questions:**

1. Which is the original medium for telecommunications and the primary means for telephone connections?

2. Which type of cable is used by cable television to provide hundreds of video channels to subscribers?

3. Why is it necessary for the coaxial cable network to include amplifiers that process and retransmit the television signals?

4. What kind of transmission medium is used for cordless telephones and wireless radio telephone services, such as cellular radio telephones and pagers?

5. What is the name of communications satellites that provide a means of transmitting telecommunications all over the globe, without need for a network of wires and cables by orbiting Earth at a speed that enables them to stay above the same place on Earth at all times.

**A.2. Re-read the text and decide on the uses, advantages and disadvantages of the types of communication networks listed below:**

**List 8.1**

1. Coaxial cable networks

2. Fibre-optic cable networks

3. Radio waves

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Enter the following terms under the appropriate heading in the table below:**

**List 8.2.**

wireless transfer stations, microwaves, wireless radio telephone services, laser transmitters, to determine geographic positions, geostationary or geosynchronous orbit, satellite’s orbital speed, high-quality signal, wire line services, head end, coaxial cable;

**Table 8.1.**

|  |  |  |
| --- | --- | --- |
| **Coaxial cable networks and fibre-optic cable networks** | **Radio waves** | **Communications satellites** |
|  |  |  |
|  |  |  |

**C. LANGUAGE FOCUS: ABILITY/CAPACITY**

**The purpose of the following exercises is to develop language awareness in terms of expressing ability/capacity.**

**C.1. Rephrase the following statements using the /phrases in brackets.**

1. Fibre-optic cables use specially treated glass that can transmit signals in the form of pulsed beams of laser light. (HAS THE ABILITY OF)

2. Fibre-optic cables carry many times more information than copper wires can, and they can transmit several television channels or thousands of telephone conversations at the same time. (HAVE THE CAPACITY)

3. New improvements promise cables that can transmit millions of telephone calls over a single fibre. ( ARE ABLE TO)

4. Microwaves use higher frequencies than the radio waves used for AM, FM, or cellular telephone transmissions and they can transmit larger amounts of data more efficiently. (ARE SUITABLE FOR)

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following sentences into English:**

1. Sateliţii de telecomunicaţii asigură mijloacele de transmisie necesare în telecomunicaţiile de pe întregul glob, fără a necesita o reţea de cabluri.

2. Acest tip de orbită este cunoscută sub denumirea de orbită geostaţionară sau geosincronă deoarece viteza de deplasare orbitală a satelitului este sincronă cu viteza mişcării de revoluţie a pământului.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on describing the four main signal transmission media.**

**E.2. Role play:**

**Group A: You are sales manager of a large coaxial cable manufacturing company.**

**Group B: You are sales manager of a large fibre-optic cable manufacturing company.**

**Group C: You are sales manager of a large antennae manufacturing company.**

**Imagine you are in a conference regarding the consolidation of the telecommunications system of Romania and you must convince the contracting party of the advantages of the company you represent.**

**Unit 9**

**TELECOMMUNICATIONS SYSTEMS**

**AIM:**

To recognize the English technical terms related to telecommunications systems;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining all types of telecommunications systems;
* recognise the specific terms related to the telecommunications devices used in each system;
* describe the main components of each system;
* identify the types of equipment used for different types of transmission;
* describe the processes that underlie the operation of each type of device;
* assimilate at least 30 terms specific of telegraph-, telephone-, teletype-, telex-, and facsimile transmission;

**KEY TERMS:**

*switching station, technology, high-speed broadband connections, multimedia information, telegram, receiving party, wireless telegraphy, land-based station, voice communications, data communications, low-voltage direct current, network switches, microwave relay station, text delivery system, teletype system, telex system, facsimile machine (fax machine), terminal, telex keyboard, graphics, optical scanner, coded information, printer.*

**Telecommunications Systems**

**9.1. INTRODUCTION**

Individual people, businesses, and governments use many different types of telecommunications systems. Some systems, such as the telephone system, use a network of cables, wires, and switching stations for point-to-point communication. Other systems, such as radio and television, broadcast radio signals over the air that can be received by anyone who has a device to receive them. Some systems make use of several types of media to complete a transmission. For example, a telephone call may travel by means of copper wire, fibre-optic cable, and radio waves as the call is sent from sender to receiver. All telecommunications systems are constantly evolving as telecommunications technology improves. Many recent improvements, for example, offer high-speed broadband connections that are needed to send multimedia information over the Internet.

**9.2. TELEGRAPH**

Telegraph services use both wire line and wireless media for transmissions. Soon after the introduction of the telegraph in 1844, telegraph wires spanned the country. Telegraph companies maintained a system of wires and offices located in numerous cities. A message sent by telegraph was called a telegram. Telegrams were printed on paper and delivered to the receiving party by the telegraph company. With the invention of the radio in the early 1900s, telegraph signals could also be sent by radio waves. Wireless telegraphy made it practical for ocean-going ships as well as aircraft to stay in constant contact with land-based stations.

**9.3. TELEPHONE**

The telephone network also uses both wire line and wireless methods to deliver voice communications between people, and data communications between computers and people or other computers. The part of the telephone network that currently serves individual residences and many businesses operates in an analogue mode, uses copper wires, and relays electronic signals that are continuous, such as the human voice. Digital transmission via fibre-optic cables is now used in some sections of the telephone network that send large amounts of calls over long distances. However, since the rest of the telephone system is still analogue, these digital signals must be converted back to analogue before they reach users. The telephone network is stable and reliable, because it uses its own wire system that is powered by low-voltage direct current from the telephone company. Telephone networks modulate voice communications over these wires. A complex system of network switches maintains the telephone links between callers. Telephone networks also use microwave relay stations to send calls from place to place on the ground. Satellites are used by telephone networks to transmit telephone calls across countries and oceans.

**9.4. TELETYPE, TELETEXT AND FACSIMILE TRANSMISSION**

Teletype, telex, and facsimile transmission are all methods for transmitting text rather than sounds. These text delivery systems evolved from the telegraph. Teletype and telex systems still exist, but they have been largely replaced by facsimile machines, which are inexpensive and better able to operate over the existing telephone network. The Internet increasingly provides an even more inexpensive and convenient option. The teletype, essentially a printing telegraph, is primarily a point-to-multipoint system for sending text. The teletype converts the same pulses used by telegraphs into letters and numbers, and then prints out readable text. It was often used by news media organizations to provide newspaper stories and stock market data to subscribers. Telex is primarily a point-to-point system that uses a keyboard to transmit typed text over telephone lines to similar terminals situated at individual company locations.

Facsimile transmission now provides a cheaper and easier way to transmit text and graphics over distances. Fax machines contain an optical scanner that converts text and graphics into digital, or machine-readable, codes. This coded information is sent over ordinary analogue telephone lines through the use of a modem included in the fax machine. The receiving fax machine’s modem demodulates the signal and sends it to a printer also contained in the fax machine.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, decide whether the information given in the statements below is true (T) or false (F). Correct the false statements (the specifications in brackets refer o the section in the text where the answer can be found):**

1. Individual people, businesses, and governments use the same type of telecommunications systems.

2. Some systems, such as the telephone system, use a network of cables, wires, and switching stations for point-to-multipoint communication.

3. Some systems make use of several types of media to complete a transmission.

4. Telegraph services use both wire line and wireless media for transmissions.

5. Wire line telegraphy made it practical for ocean-going ships as well as aircraft to stay in constant contact with land-based stations.

6. The part of the telephone network that currently serves individual residences and many businesses operates in an analogue mode, uses copper wires, and relays electronic signals that are continuous, such as the human voice.

7. The telephone network is stable and reliable, because it uses its own wire system that is powered by high-voltage alternating current from the telephone company.

8. Teletype, telex, and facsimile transmission are all methods for transmitting sounds rather than text.

9. Fax machines contain an optical scanner that converts text and graphics into digital, or machine-readable, codes.

10. The receiving fax machine’s modem demodulates the signal and sends it to a printer outside the fax machine.

**A.2. Fill in the following table with information about telecommunications systems given in the text. Some of the spaces may remain blank, as the information is not given.**

**Table 9.1.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type of telecommunications system** | **Devices employed in its operation** | **Operation principle** | **Type of information transmitted** | **Use** | **Current importance** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Match each of the terms in column A with a word in column B:**

**A B**

|  |  |
| --- | --- |
| fax machine  to demodulate  telephone network  keyboard  reliable | fiabil  a demodula  tastatură  reţea de telefonie  aparat fax |

**B.2. Fill in the gaps in the following sentences with the terms randomly listed below:**

**List 9.1.**

aircraft , network, fibre-optic cable, land-based, broadcast, wireless, ships, copper wire, to receive, digital, sender, radio waves, via, voice, wire line, optic;

**Text 9.1.**

1. Other systems, such as radio and television, \_\_\_\_\_\_radio signals over the air that can be received by anyone who has a device \_\_\_\_\_\_\_\_them.
2. For example, a telephone call may travel by means of \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_as the call is sent from \_\_\_\_\_\_\_to receiver.
3. Wireless telegraphy made it practical for ocean-going \_\_\_\_\_as well as \_\_\_\_\_\_\_\_to stay in constant contact with \_\_\_\_\_\_\_\_stations.
4. The telephone network also uses both \_\_\_\_\_\_\_\_ and\_\_\_\_\_\_\_\_methods to deliver \_\_\_\_\_\_\_communications between people, and data communications between computers and people or other computers.
5. \_\_\_\_\_\_\_\_transmission via fibre-\_\_\_\_\_\_ cables is now used in some sections of the telephone \_\_\_\_\_\_that send large amounts of calls over long distances.

**C. LANGUAGE FOCUS: QUANTIFIERS**

**The purpose of the following exercises is to develop language awareness in terms of quantifiers and their use with countable nouns and uncountable nouns.**

**C.1. Look at the list below and decide which quantifier is suitable in the given context:**

**List 9.2.**

|  |  |
| --- | --- |
| **MUCH**  **SOME**  **LITTLE**  **A PIECE OF**  **A LOT OF**  **LITTLE** | **MANY**  **FEW**  **A SINGLE**  **PLENTY OF**  **SEVERAL/A NUMBER OF**  **FEW** |

1. Individual people, businesses, and governments use\_\_\_\_\_\_\_\_different types of telecommunications systems.

2. \_\_\_\_\_\_\_\_systems make use of several types of media to complete a transmission.

3. \_\_\_\_\_\_ recent improvement, for example, offers high-speed broadband connections that are needed to send multimedia information over the Internet.

4. The telephone network also uses both wire line and wireless methods to deliver voice communications between people, and \_\_\_\_\_\_\_\_\_\_\_data communications between computers and people or other computers.

5.\_\_\_\_\_\_\_\_\_\_coded information is sent over \_\_\_\_\_\_\_\_\_ordinary analogue telephone lines through the use of a modem included in the fax machine.

**C.2. Enter the following terms under the appropriate heading in the table below:**

**List 9.3.**

information, data, knowledge, advance, progress, development, cooper, fibre-optics, medium, technology, feature, advantage, disadvantage, improvement, increase, decrease;

**Table 9.3.**

|  |  |
| --- | --- |
| **COUNTABLE** | **UNCOUNTABLE** |
|  |  |
|  |  |

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following sentences into English:**

1. Unele sisteme utilizează mai multe tipuri de medii de transmisie.

2. Spre exemplu, un apel telefonic poate fi transmis prin intermediul cablurilor de cupru, al cablurilor de fibră optică, şi al undelor radio succesiv.

3. Acea parte a reţelei de telefonie care deserveşte locuinţe sau sedii de firmă funcţionează pe principiul analogic utilizând cabluri de cupru.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on describing several telecommunications systems, their reliability and operation principles.**

**E.1. Presentation**

**Make a brief presentation of the telephone system.**

**(Make sure you include information about the performance, reliability, network, transmission media, type of data transmission, devices and components, operation principles and possible future development in the field).**

**Unit 10**

**DATA TRANSMISSION AND COMPUTER NETWORKS**

**AIM:**

To recognize the English technical terms related to data transmission and computer networks;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining radio-, television-, and computer technology;
* recognise the specific terms related to GPS and GLONASS networks;
* describe the functions performed by specialized equipment;
* identify the types of equipment used for data transmission and its operation principles;
* describe the different types of networks;
* assimilate at least 30 terms specific of data transmission within telecommunications networks.

**KEY TERMS:**

*preset frequency, commercial broadcasts, within range, powerful transmitter, shortwave radio, electrically charged layer, commercial television, very high frequency (VHF) radio waves, ultrahigh frequency (UHF) radio waves, teleconferencing, videophones, video camera, private or public television, terrestrial links, scrambled signal, unscrambled signal, network operator, European Phase Alternative Line standard, high-resolution picture, sound quality, aspect ratio, Global Positioning System (GPS), Global Orbiting Navigation Satellite System (GLONASS), positioning information, GPS receiver, process of triangulation, military use, navigational tool, road maps, graphical information, GPS location data, audio services, video services, text services, software services, multimedia services, Integrated Services Digital Network (ISDN), Digital Subscriber Lines (DSL), upgrade, high-speed data transmission, cable modem service, electronic mail (e-mail), text-based message delivery system, automated banking terminals, credit card transactions.*

**DATA TRANSMISSION AND COMPUTER NETWORKS**

**10.1. RADIO-, TV COMMUNICATIONS**

**10.1.1. Radio**

Radios transmit and receive communications at various preset frequencies. Radio waves carry the signals heard on AM and FM radio, as well as the signals seen on a television set receiving broadcasts from an antenna. Radio is used mostly as a public medium, sending commercial broadcasts from a transmitter to anyone with a radio receiver within its range, so it is known as a point-to-multipoint medium. However, radio can also be used for private point-to-point transmissions. Two-way radios, cordless telephones, and cellular radio telephones are common examples of transceivers, which are devices that can both transmit and receive point-to-point messages.

Personal radio communication is generally limited to short distances (usually a few kilometres), but powerful transmitters can send broadcast radio signals hundreds of kilometres. Shortwave radio, popular with amateur radio enthusiasts, uses a range of radio frequencies that are able to bounce off the ionosphere. This electrically charged layer of the atmosphere reflects certain frequencies of radio waves, such as shortwave frequencies, while allowing higher-frequency waves, such as microwaves, to pass through it. Amateur radio operators use the ionosphere to bounce their radio signals to other radio operators thousands of kilometres away.

**10.1.2. Television**

Television is primarily a public broadcasting medium, using point-to-multipoint technology that is broadcast to any user within range of the transmitter. Televisions transmit news and information, as well as entertainment. Commercial television is broadcast over very high frequency (VHF) and ultrahigh frequency (UHF) radio waves and can be received by any television set within range of the transmitter. Televisions have also been used for point-to-point, two-way telecommunications. Teleconferencing, in which a television picture links two physically separated parties, is a convenient way for businesspeople to meet and communicate without the expense or inconvenience of travel. Video cameras on computers now allow personal computer users to teleconference over the Internet. Videophones, which use tiny video cameras and rely on satellite technology, can also send private or public television images and have been used in news reporting in remote locations.

Cable television is a commercial service that links televisions to a source of many different types of video programming using coaxial cable. The cable provider obtains coded, or scrambled, programming from a communications satellite, as well as from terrestrial links, including broadcast television stations. The signal may be scrambled to prevent unpaid access to the programming. The cable provider electronically unscrambles the signal and supplies the decoded signals by cable to subscribers. Television users with personal satellite dishes can access satellite programming directly without a cable installation. Personal satellite dishes are also a subscriber service. Fees are paid to the network operator in return for access to the satellite channels.

Most television sets outside of the United States that receive programming use different types of standards for receiving video signals. The European Phase Alternative Line standard generates a higher-resolution picture than the sets used in the United States, but these television sets are more expensive. Manufacturers now offer digital video and audio signal processing, which features even higher picture resolution and sound quality. The shape of the television screen is changing as well, reflecting the *aspect ratio* (ratio of image height to width) used for movie presentation.

**10.2. DIGITAL COMMUNICATION NETWORKS**

**10.2.1. Global Positioning and Navigation Systems**

The United States Global Positioning System (GPS) and the Russian Global Orbiting Navigation Satellite System (GLONASS) are networks of satellites that provide highly accurate positioning information from anywhere on Earth. Both systems use a group of satellites that orbit around the north and south poles at an altitude of 17,500 km (10,900 mi). These satellites constantly broadcast the time and their location above Earth. A GPS receiver picks up broadcasts from these satellites and determines its position through the process of triangulation. Using the time information from each satellite, the receiver calculates the time the signal takes to reach it. Factoring in this time with the speed at which radio signals travel, the receiver calculates its distance from the satellite. Finally, using the location of three satellites and its distance from each satellite, the receiver determines its position.

GPS services, originally designed for military use, are now available to civilians. Handheld GPS receivers allow users to pinpoint their location on Earth to within a few meters. One type of navigational tool used in automobiles integrates a GPS receiver with an intelligent compact disc player capable of displaying road maps and other graphical information. Upon receiving the GPS location data, the CD player can pinpoint the location visually on one of the road maps contained on disc.

**10.2.2. Personal Computers**

Personal computers use telecommunications to provide a transmission link for the delivery of audio, video, text, software, and multimedia services. Many experts believe that the convergence of these services will generate consumer demand for new generations of high-speed, broadband networks. Currently, the delivery of most of these audio, video, and text services occurs over existing telephone connections using the Internet. Some computers connect directly to the digital portion of the telephone network using the Integrated Services Digital Network (ISDN) or Digital Subscriber Lines (DSL), but this requires special equipment at user locations. Telephone and cable television companies must also make upgrades to their lines so that they can handle high-speed data transmission. In many locations companies and individuals with high-speed data requirements now have the option of securing DSL service from telephone companies and cable modem service from cable television companies.

Electronic mail, or e-mail, is a key attraction of the Internet and a common form of computer telecommunications. E-mail is a text-based message delivery system that allows information such as typed messages and multimedia to be sent to individual computer users. Local e-mail messages (within a building or a company) typically reach addressees by travelling through wire-based internal networks. E-mail that must travel across town or across a country to reach the final destination usually travels through the telephone network. Other computer telecommunications technologies that businesses frequently use include automated banking terminals and devices for credit card transactions that bill charges directly to a customer’s bank account.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Re-read section 10.1. and 10.2.2. and decide on the uses of these types of communications:**

**1. Radio**

**2. Television**

**3. Computers**

**A.2. In 10.2.1. of the text the operation principles of GPS and GLONASS are described. Explain the applications that these systems are most suitable for.**

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Enter in the following table information related to television (see 10.1.2):**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type of technology** | **Transmission**  **media** | **Applications** | **Standards** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**B.2. Add three more terms to the following lists:**

**1.** two-way radios, cordless telephones, cellular radio telephones;

**2.** very high frequency (VHF), two-way telecommunications, videophones;

**3.** satellite, receiver, calculate;

**B.3. Fill in the missing terms:**

1. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(GPS) and the \_\_\_\_\_\_\_\_\_\_\_\_\_(GLONASS) are networks of satellites that provide highly accurate positioning information from anywhere on Earth.

2. Both systems use a group of \_\_\_\_\_\_\_\_that \_\_\_\_\_\_\_\_\_ around the north and south poles at a \_\_\_\_\_\_\_\_\_\_\_\_\_of 17,500 km (10,900 mi).

3. Handheld GPS \_\_\_\_\_\_\_\_\_allow users to \_\_\_\_\_\_\_\_\_their location on Earth to within a few meters.

4. Some computers connect directly to the digital portion of the telephone network using the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(ISDN) or \_\_\_\_\_\_\_\_\_\_\_\_\_\_(DSL), but this requires special equipment at user locations.

5. Commercial television is broadcast over \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (VHF) and \_\_\_\_\_\_\_\_\_ (UHF) radio waves and can be received by any television set within range of the transmitter.

**C. LANGUAGE FOCUS: ACRONYMS AND ABBREVIATIONS**

**The purpose of the following exercises is to develop language awareness in terms of acronyms and abbreviations.**

**C.1. In the technical register you will frequently encounter multi-word terms that are not pronounced in their complete form, their acronyms or abbreviations are used instead. Find at least five such terms and their acronyms in the text.**

**C.2. Read the following acronyms and abbreviations and decide on the correct way to pronounce them (as a new word/reading the letters separately) and identify the complete term.**

**List 10.1.**

1. UHF
2. VHF
3. GPS
4. GLONASS
5. CD
6. ISDN
7. PC
8. DSL
9. E-mail
10. mi

**C.3. What are the corresponding Romanian acronyms and abbreviations.**

**C.4. Think of other 10 abbreviations or acronyms that you are familiar with.**

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following text into Romanian.**

Personal radio communication is generally limited to short distances (usually a few kilometers), but powerful transmitters can send broadcast radio signals hundreds of kilometers. Shortwave radio, popular with amateur radio enthusiasts, uses a range of radio frequencies that are able to bounce off the ionosphere. This electrically charged layer of the atmosphere reflects certain frequencies of radio waves, such as shortwave frequencies, while allowing higher-frequency waves, such as microwaves, to pass through it. Amateur radio operators use the ionosphere to bounce their radio signals to other radio operators thousands of kilometers away.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on presenting different applications of data transmission and computer networks.**

**E.1. Which are, in your opinion, the most important applications of GPS and GLONASS . Justify your answer.**

**Unit 11**

**COMPUTERS**

**AIM:**

To recognize the English technical terms related to prototype computing devices and the first stages in the evolution of computers;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms describing the basic functions performed by computers;
* recognise the specific terms related to early types of computing machines;
* describe the operation principles of these rudimentary computers;
* identify the types of equipment used for performing the various computational operations;
* describe the evolutionary path in this domain;
* assimilate at least 30 terms specific of prototype computing devices and the functions they were able to provide;

**KEY TERMS:**

*calculation, electronic communication, instruction, program, to retrieve, to process, to store, to route, output device, video display monitors printer, bar code, scanner, embedded, electronic circuitry, appliances, control, security system, videocassette recorders (VCRs), digitized sound, stereo systems, digitally encoded laser disc, computer applications, advanced calculus, computer-controlled projection unit, graphics, , sound, animation, to encode, to unscramble messages, analogue machine, logarithm tables, add, subtract, , multiply, divide, digit, devise, silk loom, punched cards, early mechanical computer, difference engine, mathematician, analytical engine, arithmetic operations, programming language, capacity to store instructions, primitive memory, computational time, Computing-Tabulating-Recording Company, International Business Machines (IBM), equations, Turing machine, automatic typewriter, universal machine, modern digital computer, computational theorist, Mark I calculating machine, solid state transistor, binary numbers, computer science program, data, program instruction, Electronic Discrete Variable Automatic Computer (EDVAC), the Electronic Numerical Integrator And Computer (ENIAC), Automatic Computer (UNIVAC), prototype computing device.*

**COMPUTERS**

**11. 1. Introduction**

Computer, machine that performs tasks, such as calculations or electronic communication, under the control of a set of instructions called a program. Programs usually reside within the computer and are retrieved and processed by the computer’s electronics. The program results are stored or routed to output devices, such as video display monitors or printers. Computers perform a wide variety of activities reliably, accurately, and quickly.

**11.2. Uses of Computers**

People use computers in many ways. In business, computers track inventories with bar codes and scanners, check the credit status of customers, and transfer funds electronically. In homes, tiny computers embedded in the electronic circuitry of most appliances control the indoor temperature, operate home security systems, tell the time, and turn videocassette recorders (VCRs) on and off. Computers in automobiles regulate the flow of fuel, thereby increasing gas mileage. Computers also entertain, creating digitized sound on stereo systems or computer-animated features from a digitally encoded laser disc. Computer programs, or applications, exist to aid every level of education, from programs that teach simple addition or sentence construction to programs that teach advanced calculus. Educators use computers to track grades and communicate with students; with computer-controlled projection units, they can add graphics, sound, and animation to their communications (*see* Computer-Aided Instruction). Computers are used extensively in scientific research to solve mathematical problems, investigate complicated data, or model systems that are too costly or impractical to build, such as testing the air flow around the next generation of aircraft. The military employs computers in sophisticated communications to encode and unscramble messages, and to keep track of personnel and supplies.

**11.3 HISTORY OF COMPUTERS**

**11.3.1 Beginning**

The history of computing began with an analogue machine. In 1623 German scientist Wilhelm Schikard invented a machine that used 11 complete and 6 incomplete sprocket wheels that could add, and with the aid of logarithm tables, multiply and divide.

French philosopher, mathematician, and physicist Blaise Pascal invented a machine in 1642 that added and subtracted, automatically carrying and borrowing digits from column to column. Pascal built 50 copies of his machine, but most served as curiosities in parlours of the wealthy. Seventeenth-century German mathematician Gottfried Leibniz designed a special gearing system to enable multiplication on Pascal’s machine.

**11.3.2. First Punch Cards**

In the early 19th century French inventor Joseph-Marie Jacquard devised a specialized type of computer: a silk loom. Jacquard’s loom used punched cards to program patterns that helped the loom create woven fabrics. Although Jacquard was rewarded and admired by French emperor Napoleon I for his work, he fled for his life from the city of Lyon pursued by weavers who feared their jobs were in jeopardy due to Jacquard’s invention. The loom prevailed, however: When Jacquard died, more than 30,000 of his looms existed in Lyon. The looms are still used today, especially in the manufacture of fine furniture fabrics.

**11.3.3. Precursor to Modern Computer**

Another early mechanical computer was the Difference Engine, designed in the early 1820s by British mathematician and scientist Charles Babbage. Although never completed by Babbage, the Difference Engine was intended to be a machine with a 20-decimal capacity that could solve mathematical problems. Babbage also made plans for another machine, the Analytical Engine, considered the mechanical precursor of the modern computer. The Analytical Engine was designed to perform all arithmetic operations efficiently; however, Babbage’s lack of political skills kept him from obtaining the approval and funds to build it.

Augusta Ada Byron, countess of Lovelace, was a personal friend and student of Babbage. She was the daughter of the famous poet Lord Byron and one of only a few woman mathematicians of her time. She prepared extensive notes concerning Babbage’s ideas and the Analytical Engine. Lovelace’s conceptual programs for the machine led to the naming of a programming language (Ada) in her honour. Although the Analytical Engine was never built, its key concepts, such as the capacity to store instructions, the use of punched cards as a primitive memory, and the ability to print, can be found in many modern computers.

**11.4. Developments in the 20th Century**

**11.4.1. Early Electronic Calculators**

Herman Hollerith, an American inventor, used an idea similar to Jacquard’s loom when he combined the use of punched cards with devices that created and electronically read the cards. Hollerith’s tabulator was used for the 1890 U.S. census, and it made the computational time three to four times shorter than the time previously needed for hand counts. Hollerith’s Tabulating Machine Company eventually merged with two companies to form the Computing-Tabulating-Recording Company. In 1924 the company changed its name to International Business Machines (IBM).

In 1936 British mathematician Alan Turing proposed the idea of a machine that could process equations without human direction. The machine (now known as a Turing machine) resembled an automatic typewriter that used symbols for math and logic instead of letters. Turing intended the device to be a “universal machine” that could be used to duplicate or represent the function of any other existing machine. Turing’s machine was the theoretical precursor to the modern digital computer. The Turing machine model is still used by modern computational theorists.

In the 1930s American mathematician Howard Aiken developed the Mark I calculating machine, which was built by IBM. This electronic calculating machine used relays and electromagnetic components to replace mechanical components. In later machines, Aiken used vacuum tubes and *solid state transistors* (tiny electrical switches) to manipulate the binary numbers. Aiken also introduced computers to universities by establishing the first computer science program at Harvard University in Cambridge, Massachusetts. Aiken obsessively mistrusted the concept of storing a program within the computer, insisting that the integrity of the machine could be maintained only through a strict separation of program instructions from data. His computer had to read instructions from punched cards, which could be stored away from the computer. He also urged the National Bureau of Standards not to support the development of computers, insisting that there would never be a need for more than five or six of them nationwide.

**11.4.2. EDVAC, ENIAC, and UNIVAC**

At the Institute for Advanced Study in Princeton, New Jersey, Hungarian-American mathematician John von Neumann developed one of the first computers used to solve problems in mathematics, meteorology, economics, and hydrodynamics. Von Neumann's 1945 design for the Electronic Discrete Variable Automatic Computer (EDVAC)—in stark contrast to the designs of Aiken, his contemporary—was the first electronic computer design to incorporate a program stored entirely within its memory. This machine led to several others, some with clever names like ILLIAC, JOHNNIAC, and MANIAC.

American physicist John Mauchly proposed the electronic digital computer called ENIAC, the Electronic Numerical Integrator And Computer. He helped build it along with American engineer John Presper Eckert, Jr., at the Moore School of Engineering at the University of Pennsylvania in Philadelphia. ENIAC was operational in 1945 and introduced to the public in 1946. It is regarded as the first successful, general digital computer. It occupied 167 sq m (1,800 sq ft), weighed more than 27,000 kg (60,000 lb), and contained more than 18,000 vacuum tubes. Roughly 2,000 of the computer’s vacuum tubes were replaced each month by a team of six technicians. Many of ENIAC’s first tasks were for military purposes, such as calculating ballistic firing tables and designing atomic weapons. Since ENIAC was initially not a stored program machine, it had to be reprogrammed for each task.

Eckert and Mauchly eventually formed their own company, which was then bought by the Rand Corporation. They produced the Universal Automatic Computer (UNIVAC), which was used for a broader variety of commercial applications. The first UNIVAC was delivered to the United States Census Bureau in 1951. By 1957, there were 46 UNIVACs in use.

Between 1937 and 1939, while teaching at Iowa State College, American physicist John Vincent Atanasoff built a prototype computing device called the Atanasoff-Berry Computer, or ABC, with the help of his assistant, Clifford Berry. Atanasoff developed the concepts that were later used in the design of the ENIAC. Atanasoff’s device was the first computer to separate data processing from memory, but it is not clear whether a functional version was ever built. Atanasoff did not receive credit for his contributions until 1973, when a lawsuit regarding the patent on ENIAC was settled.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, answer the following questions (the specifications in brackets refer to the section in the text where the answer can be found):**

1. What is a computer? (11.1.)

2. What is its operation principle? (11.1.)

3. What are the main applications of computers? (11.2.)

4. Which were the first steps towards the development of prototype computing devices?

(11.3.)

5. Which were the next stages in the evolution of computers in the 20th century? (11.4.)

**A.2. Having read the text, decide whether the information given in the statements below is true (T) or false (F). Correct the false statements:**

1. Computer, machine that performs tasks, such as calculations or electronic communication, under the control of a set of instructions called a program.

2. The program results are stored or routed to input devices, such as video display monitors or printers.

3. The history of computing began with a digital machine.

4. French philosopher, mathematician, and physicist Blaise Pascal invented a machine in 1642 that added and subtracted, automatically carrying and borrowing digits from column to column.

5. Hollerith’s Tabulating Machine Company eventually merged with two companies to form the Computing-Tabulating-Recording Company and 1924 the company changed its name to International Business Machines (IBM).

6. Turing’s machine was the theoretical precursor to the modern digital computer.

7. In the 1930s American mathematician Howard Aiken developed the Mark I calculating machine, which was built by IBM. This electronic calculating machine used relays and mechanical components to replace electromagnetic components.

8. American physicist John Mauchly proposed the electronic digital computer called ENIAC, the Electronic Numerical Integrator And Computer.

9. Electronic Discrete Variable Automatic Computer (EDVAC) is regarded as the first successful, general digital computer and it occupied 167 sq m (1,800 sq ft), weighed more than 27,000 kg (60,000 lb), and contained more than 18,000 vacuum tubes.

10. Atanasoff’s device was the second computer to separate data processing from memory, but it is not clear whether a functional version was ever built.

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Match each of the terms in column A with a word in column B:**

**A B**

|  |  |
| --- | --- |
| to retrieve  to process  to store  to route  output devices  electronic circuitry  advanced calculus  graphics  analogue machine  logarithm tables  to add  to subtract  multiply  to divide  digital computer | a înmulţi  circuitele electronice  a înmagazina  a direcţiona  grafică  aparat analogic  periferice de ieşire  a scădea  calculator digital  a împărţi  a înmulţi  tabele logaritmice  calcul matematic special  a recupera  a procesa |

**B.2. Enter in the following table information related to prototype computing devices:**

**Table 11.1.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name of the scientist** | **Year** | **Name of the machine** | **Functions**  **performed** | **Particularities** | **Impact on the future developments** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**B.3. Enter the following information under the appropriate heading in the table below:**

**List 11.1.**

1 .roughly 2,000 of the computer’s vacuum tubes were replaced each month by a team of six technicians;

2. first electronic computer design to incorporate a program stored entirely within its memory;

3. is regarded as the first successful, general digital computer;

it occupied 167 sq m (1,800 sq ft), weighed more than 27,000 kg (60,000 lb), and contained more than 18,000 vacuum tubes;

**Table 11.2.**

|  |  |  |
| --- | --- | --- |
| **EDVAC** | **ENIAC** | **UNIVAC** |
|  |  |  |
|  |  |  |

**C. LANGUAGE FOCUS: EXEMPLIFICATION**

**The purpose of the following exercises is to develop language awareness in terms of exemplification.**

**C.1. It is often useful to give examples when describing, defining or classifying. This action is known as exemplification (or exemplifying); e.g. is the abbreviation meaning for example. Read section 11.1. and section 11. 3.3. and identify the terms used for exemplification.**

**C.2. Use the following terms in sentences describing early computing devices. Make sure the latter part is based upon the information contained in the former part of the sentence.**

**AN ILLUSTRATION OF, FOR EXAMPLE, FOR INSTANCE, A CASE IN POINT, SUCH AS, AN EXAMPLE, PARTICULARLY;**

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate section 11.1. text into Romanian:**

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on presenting the chronological evolution of computing devices and exemplifying.**

**E.2. Presentation**

**Taking turns, present each stage in the development of early computers and give examples of prototype computing devices.**

**Unit 12**

**RECENT DEVELOPMENTS AND THE FUTURE OF COMPUTING**

**AIM:**

To recognize the English technical terms related to recent developments and the future of computing;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining recent developments in computer architecture and design;
* recognise the specific terms related to transistor and integrated circuits technology;
* characterise the main transformations brought about by transistors and integrated circuits;
* identify the types of equipment used for increasing computer power and versatility;
* describe possible future improvements in computer technology and the applications aimed at;
* assimilate at least 30 terms specific of integrated circuit technology;

**KEY TERMS:**

*electric switch, transistor, integrated circuits, miniaturize, single computer circuit, microprocessor, integrated circuit technology, personal computers (PCs), 8-bit Intel 8080 microprocessor, RAM, input, switches, front panel, output, display, light-emitting diode (LEDs), storage device, CPU, computational abilities, graphical user interface (GUI), sophisticated operating system, Windows, Mac OS, Linux, supercomputer, to compute, parallel processing machine, Moore’s Law, power, versatility, virus, worms, malfunction, digital revolution, speech recognition, virtual reality, virtual-reality program languages, Virtual Reality Modelling Language (VRML), biological computing, molecular computing, future computational platforms, limitation.*

**RECENT DEVELOPMENTS AND THE FUTURE OF COMPUTING**

**12.1. The Transistor and Integrated Circuits Transform Computing**

In 1948, at Bell Telephone Laboratories, American physicists Walter Houser Brattain, John Bardeen, and William Bradford Shockley developed the transistor, a device that can act as an electric switch. The transistor had a tremendous impact on computer design, replacing costly, energy-inefficient, and unreliable vacuum tubes.

In the late 1960s integrated circuits (tiny transistors and other electrical components arranged on a single chip of silicon) replaced individual transistors in computers. Integrated circuits resulted from the simultaneous, independent work of Jack Kilby at Texas Instruments and Robert Noyce of the Fairchild Semiconductor Corporation in the late 1950s. As integrated circuits became miniaturized, more components could be designed into a single computer circuit. In the 1970s refinements in integrated circuit technology led to the development of the modern microprocessor, integrated circuits that contained thousands of transistors. Modern microprocessors can contain more than 40 million transistors.

Manufacturers used integrated circuit technology to build smaller and cheaper computers. The first of these so-called personal computers (PCs)—the Altair 8800—appeared in 1975, sold by Micro Instrumentation Telemetry Systems (MITS). The Altair used an 8-bit Intel 8080 microprocessor, had 256 bytes of RAM, received input through switches on the front panel, and displayed output on rows of light-emitting diodes (LEDs). Refinements in the PC continued with the inclusion of video displays, better storage devices, and CPUs with more computational abilities. Graphical user interfaces were first designed by the Xerox Corporation, then later used successfully by Apple Computer, Inc.. Today the development of sophisticated operating systems such as Windows, the Mac OS, and Linux enables computer users to run programs and manipulate data in ways that were unimaginable in the mid-20th century.

Several researchers claim the “record” for the largest single calculation ever performed. One large single calculation was accomplished by physicists at IBM in 1995. They solved one million trillion mathematical sub problems by continuously running 448 computers for two years. Their analysis demonstrated the existence of a previously hypothetical subatomic particle called a glue ball. Japan, Italy, and the United States are collaborating to develop new supercomputers that will run these types of calculations 100 times faster.

In 1996 IBM challenged Garry Kasparov, the reigning world chess champion, to a chess match with a supercomputer called Deep Blue. The computer had the ability to compute more than 100 million chess positions per second. In a 1997 rematch Deep Blue defeated Kasparov, becoming the first computer to win a match against a reigning world chess champion with regulation time controls. Many experts predict these types of parallel processing machines will soon surpass human chess playing ability, and some speculate that massive calculating power will one day replace intelligence. Deep Blue serves as a prototype for future computers that will be required to solve complex problems. At issue, however, is whether a computer can be developed with the ability to learn to solve problems on its own, rather than one programmed to solve a specific set of tasks.

**12.2. The Future of Computers**

In 1965 semiconductor pioneer Gordon Moore predicted that the number of transistors contained on a computer chip would double every year. This is now known as Moore’s Law, and it has proven to be somewhat accurate. The number of transistors and the computational speed of microprocessors currently doubles approximately every 18 months. Components continue to shrink in size and are becoming faster, cheaper, and more versatile.

With their increasing power and versatility, computers simplify day-to-day life. Unfortunately, as computer use becomes more widespread, so do the opportunities for misuse. Computer hackers—people who illegally gain access to computer systems—often violate privacy and can tamper with or destroy records. Programs called viruses or worms can replicate and spread from computer to computer, erasing information or causing malfunctions. Other individuals have used computers to electronically embezzle funds and alter credit histories. New ethical issues also have arisen, such as how to regulate material on the Internet and the World Wide Web. Long-standing issues, such as privacy and freedom of expression, are being re-examined in light of the digital revolution. Individuals, companies, and governments are working to solve these problems through informed conversation, compromise, better computer security, and regulatory legislation.

Computers will become more advanced and they will also become easier to use. Improved speech recognition will make the operation of a computer easier. Virtual reality, the technology of interacting with a computer using all of the human senses, will also contribute to better human and computer interfaces. Standards for virtual-reality program languages—for example, Virtual Reality Modelling language (VRML)—are currently in use or are being developed for the World Wide Web.

Other, exotic models of computation are being developed, including biological computing that uses living organisms, molecular computing that uses molecules with particular properties, and computing that uses deoxyribonucleic acid (DNA), the basic unit of heredity, to store data and carry out operations. These are examples of possible future computational platforms that, so far, are limited in abilities or are strictly theoretical. Scientists investigate them because of the physical limitations of miniaturizing circuits embedded in silicon. There are also limitations related to heat generated by even the tiniest of transistors.

Intriguing breakthroughs occurred in the area of quantum computing in the late 1990s. Quantum computers under development use components of a chloroform molecule (a combination of chlorine and hydrogen atoms) and a variation of a medical procedure called magnetic resonance imaging (MRI) to compute at a molecular level. Scientists use a branch of physics called quantum mechanics, which describes the behaviour of subatomic particles (particles that make up atoms), as the basis for quantum computing. Quantum computers may one day be thousands to millions of times faster than current computers, because they take advantage of the laws that govern the behaviour of subatomic particles. These laws allow quantum computers to examine all possible answers to a query simultaneously. Future uses of quantum computers could include code breaking and large database queries. Theorists of chemistry, computer science, mathematics, and physics are now working to determine the possibilities and limitations of quantum computing.

Communications between computer users and networks will benefit from new technologies such as broadband communication systems that can carry significantly more data faster or more conveniently to and from the vast interconnected databases that continue to grow in number and type.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, answer the following questions (the specifications in brackets refer to the section in the text where the answer can be found):**

1. When did integrated circuits replace individual transistors in computers? (12.1)

2. What led to the development of modern microprocessors? (12.1)

3. Which corporation designed first graphical user interfaces? (12.1)

4. What was the large calculation accomplished by the physicists at IBM in 1995? (12.1)

5 What is the name of the powerful computers performing such calculations? (12.1)

**A.2. Having read the text, decide whether the information given in the statements below is true (T) or false (F). Correct the false statements (the specifications in brackets refer o the section in the text where the answer can be found):**

1. The transistor had a tremendous impact on computer design, replacing costly, energy-inefficient, and unreliable integrated circuits. (12.1)

2. Modern microprocessors can contain more than 4 million transistors. (12.1)

3. The Altair used an 8-bit Intel 8080 microprocessor, had 256 bytes of RAM, received input through switches on the front panel, and displayed output on rows of light-emitting diodes (LEDs). (12.1)

4. In 1996 IBM challenged Garry Kasparov, the reigning world chess champion, to a chess match with a supercomputer called Deep Blue. The computer had the ability to compute more than 100 million chess positions per second. (12.1)

5. Deep Blue serves as a prototype for future computers that will be required to solve complex problems. (12.1)

6. In 1965 semiconductor pioneer Gordon Moore predicted that the number of transistors contained on a computer chip would double every decade. (12.2)

7. The number of transistors and the computational speed of microprocessors currently doubles approximately every 18 months. (12.2)

8. Standards for virtual-reality program languages—for example, Virtual Reality Modelling language (VRML)—are currently in use or are being developed for the World Wide Web. (12.2)

9. Other, exotic models of computation have been already developed, including biological computing that uses living organisms, molecular computing that uses molecules with particular properties, and computing that uses deoxyribonucleic acid (DNA), the basic unit of heredity, to store data and carry out operations. (12.2)

10. Scientists use a branch of physics called quantum mechanics, which describes the behaviour of subatomic particles (particles that make up atoms), as the basis for quantum computing. (12.2)

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Enter the following terms under the appropriate heading in the table below:**

**List 12.1.**

virtual-reality program languages, code breaking and large database queries, broadband communication systems, computational speed of microprocessors, Virtual Reality Modelling language (VRML), parallel processing machines, ability to learn to solve problems, biological computing, deoxyribonucleic acid (DNA), silicon, work of Jack Kilby at Texas Instruments and Robert Noyce of the Fairchild Semiconductor Corporation in the late 1950s, to store data and carry out operations, quantum computing, the development of the modern microprocessor, miniaturization;

**Table 12.1.**

|  |  |  |
| --- | --- | --- |
| **INTEGRATED CIRCUITS** | **FUTURE COMPUTING** | **FUTURE APPLICATIONS** |
|  |  |  |
|  |  |  |
|  |  |  |

**B.2. Fill in the gaps in the following text with the terms randomly listed below:**

**List 12.1.**

refinements, the Mac OS, prototype, doubles, miniaturized, run programs, transistors, operating systems, integrated, microprocessor, data, computational,

**Text 12.1.**

1. As integrated circuits became\_\_\_\_\_\_\_\_\_\_\_\_\_, more components could be designed into a single computer circuit.

2. In the 1970s \_\_\_\_\_\_\_\_\_\_\_\_in integrated circuit technology led to the development of the modern\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_circuits that contained thousands of\_\_\_\_\_\_\_\_\_.

3. Today the development of sophisticated \_\_\_\_\_\_\_\_\_-such as Windows, \_\_\_\_\_\_\_\_\_, and Linux enables computer users to \_\_\_\_\_\_\_\_and manipulate\_\_\_\_\_\_\_\_\_ in ways that were unimaginable in the mid-20th century.

4. Deep Blue serves as a \_\_\_\_\_\_\_ for future computers that will be required to solve complex problems.

5. The number of transistors and the \_\_\_\_\_\_\_\_\_\_ speed of microprocessors currently \_\_\_\_\_\_\_\_\_ approximately every 18 months.

**C. LANGUAGE FOCUS: PROBABILITY**

**The purpose of the following exercises is to develop language awareness in terms of expressing probability and teach modal verbs and equivalent expressions.**

**C.1. Read the sentences below and match the underlined terms/expressions with their meaning in the list.**

**List 12.2.**

**A. REMOTE PROBABILITY**

**B. PROBABILITY**

**C. FUTURE OF PREDICTION**

**D. LOGICAL DEDUCTION FOR A FUTURE EVENT**

1. In 1965 semiconductor pioneer Gordon Moore predicted that the number of transistors contained on a computer chip would /should/ought to double every year.

2. Computers are going to/will become more advanced and they may/are likely to/can also become easier to use.

3. Virtual reality, the technology of interacting with a computer using all of the human senses, might/ are likely to/could also contribute to better human and computer interfaces. Standards for virtual-reality program languages—for example, Virtual Reality Modelling language (VRML)—are currently in use or are being developed for the World Wide Web.

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following sentences into English:**

1. Producătorii au utilizat tehnologia circuitelor integrate în construirea unor calculatoare cu dimensiuni şi costuri de producţie reduse.

2. În anii 1970 îmbunătăţirile aduse tehnologiei circuitelor integrate au condus la dezvoltarea microprocesorului modern, circuite integrate ce conţineau mii de tranzistori.

3. Numeroşi experţi preconizează că acest tip de calculatoare cu procesare în paralel vor depăşi în curând anumite capacităţi umane, unii chiar emit speculaţii conform cărora potenţialul enorm de calcul al acestora va înlocui la un moment dat inteligenţa umană.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on**

**E.1. Which are, in your opinion, the next stages in the development of computing and what will be their impact. Justify your answer.**

**Unit 13**

**COMPUTER ARCHITECTURE AND ORGANISATION**

**AIM:**

To recognize the English technical terms related to computer architecture and organization;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining each category of computer components;
* recognise the specific terms related to operating systems, busses, input devices, output devices and the central processing unit;
* characterise the operation process of each component;
* identify the types of equipment used for performing each specific operation;
* describe the structure of computer components;
* assimilate at least 30 terms specific of computer architecture and organization;

**KEY TERMS:**

*hardware, physical computer, memory, data, program instructions, central processing unit (CPU), keyboard, mouse, printer, software, video display monitor, to display, operating system, to prompt, command, to control, to store and manage data, sequence, to run a program, to load a program, icon, file, to access files, to access commands, to click, to press a combination of keys, input method, binary digits, bit, possible representations, byte, numeric digits, kilobyte, gigabyte, terabyte, programmers, figure, physical memory, random access memory (RAM), read-only memory (ROM), external storage devices, magnetic floppy disks, hard drives, compact disc (CD), digital video disc (DVD), bus, memory circuit, parallel wires, to transmit, simultaneous transmission, joystick, digital image, scanner, touch panel, microphone, voice recognition software, “Tablet” computer, screen, microprocessor chip, register, CPU memory location, program counter, decoder, instruction cycle, pipeline processing, output device, a flat liquid crystal display, overhead projector, videocassette recorder (VCR), speaker, printer.*

**COMPUTER ARCHITECTURE AND ORGANISATION**

**13.1. HOW COMPUTERS WORK**

The physical computer and its components are known as hardware. Computer hardware includes the memory that stores data and program instructions; the central processing unit (CPU) that carries out program instructions; the input devices, such as a keyboard or mouse, that allow the user to communicate with the computer; the output devices, such as printers and video display monitors, that enable the computer to present information to the user; and *buses* (hardware lines or wires) that connect these and other computer components. The programs that run the computer are called software. Software generally is designed to perform a particular type of task—for example, to control the arm of a robot to weld a car’s body, to write a letter, to display and modify a photograph, or to direct the general operation of the computer.

**13.2. THE OPERATING SYSTEM**

When a computer is turned on it searches for instructions in its memory. These instructions tell the computer how to start up. Usually, one of the first sets of these instructions is a special program called the operating system, which is the software that makes the computer work. It prompts the user (or other machines) for input and commands, reports the results of these commands and other operations, stores and manages data, and controls the sequence of the software and hardware actions. When the user requests that a program run, the operating system loads the program in the computer’s memory and runs the program. Popular operating systems, such as Microsoft Windows and the Macintosh system (Mac OS), have graphical user interfaces (GUIs)—that use tiny pictures, or icons, to represent various files and commands. To access these files or commands, the user clicks the mouse on the icon or presses a combination of keys on the keyboard. Some operating systems allow the user to carry out these tasks via voice, touch, or other input methods.

**13.3. COMPUTER MEMORY**

To process information electronically, data are stored in a computer in the form of binary digits, or bits, each having two possible representations (0 or 1). If a second bit is added to a single bit of information, the number of representations is doubled, resulting in four possible combinations: 00, 01, 10, or 11. A third bit added to this two-bit representation again doubles the number of combinations, resulting in eight possibilities: 000, 001, 010, 011, 100, 101, 110, or 111. Each time a bit is added, the number of possible patterns is doubled. Eight bits is called a byte; a byte has 256 possible combinations of 0s and 1s.

A byte is a useful quantity in which to store information because it provides enough possible patterns to represent the entire alphabet, in lower and upper cases, as well as numeric digits, punctuation marks, and several character-sized graphics symbols, including non-English characters such as . A byte also can be interpreted as a pattern that represents a number between 0 and 255. A kilobyte—1,024 bytes—can store about 1,000 characters; a megabyte can store about 1 million characters; a gigabyte can store about 1 billion characters; and a terabyte can store about 1 trillion characters. Computer programmers usually decide how a given byte should be interpreted—that is, as a single character, a character within a string of text, a single number, or part of a larger number. Numbers can represent anything from chemical bonds to dollar figures to colours to sounds.

The physical memory of a computer is either random access memory (RAM), which can be read or changed by the user or computer, or read-only memory (ROM), which can be read by the computer but not altered in any way. One way to store memory is within the circuitry of the computer, usually in tiny computer chips that hold millions of bytes of information. The memory within these computer chips is RAM. Memory also can be stored outside the circuitry of the computer on external storage devices, such as magnetic floppy disks, which can store about 2 megabytes of information; hard drives, which can store gigabytes of information; compact discs (CDs), which can store up to 680 megabytes of information; and digital video discs (DVDs), which can store 8.5 gigabytes of information. A single CD can store nearly as much information as several hundred floppy disks, and some DVDs can hold more than 12 times as much data as a CD.

**13.4. THE BUS**

The bus enables the components in a computer, such as the CPU and the memory circuits, to communicate as program instructions are being carried out. The bus is usually a flat cable with numerous parallel wires. Each wire can carry one bit, so the bus can transmit many bits along the cable at the same time. For example, a 16-bit bus, with 16 parallel wires, allows the simultaneous transmission of 16 bits (2 bytes) of information from one component to another. Early computer designs utilized a single or very few buses. Modern designs typically use many buses, some of them specialized to carry particular forms of data, such as graphics.

**13.5. INPUT DEVICES**

Input devices, such as a keyboard or mouse, permit the computer user to communicate with the computer. Other input devices include a joystick, a rod like device often used by people who play computer games; a scanner, which converts images such as photographs into digital images that the computer can manipulate; a touch panel, which senses the placement of a user’s finger and can be used to execute commands or access files; and a microphone, used to input sounds such as the human voice which can activate computer commands in conjunction with voice recognition software. “Tablet” computers are being developed that will allow users to interact with their screens using a pen like device.

**13.6. THE CENTRAL PROCESSING UNIT**

Information from an input device or from the computer’s memory is communicated via the bus to the central processing unit (CPU), which is the part of the computer that translates commands and runs programs. The CPU is a microprocessor chip—that is, a single piece of silicon containing millions of tiny, microscopically wired electrical components. Information is stored in a CPU memory location called a register. Registers can be thought of as the CPU’s tiny scratchpad, temporarily storing instructions or data. When a program is running, one special register called the program counter keeps track of which program instruction comes next by maintaining the memory location of the next program instruction to be executed. The CPU’s control unit coordinates and times the CPU’s functions, and it uses the program counter to locate and retrieve the next instruction from memory.

In a typical sequence, the CPU locates the next instruction in the appropriate memory device. The instruction then travels along the bus from the computer’s memory to the CPU, where it is stored in a special instruction register. Meanwhile, the program counter changes—usually increasing a small amount—so that it contains the location of the instruction that will be executed next. The current instruction is analyzed by a decoder, which determines what the instruction will do. Any data the instruction needs are retrieved via the bus and placed in the CPU’s registers. The CPU executes the instruction, and the results are stored in another register or copied to specific memory locations via a bus. This entire sequence of steps is called an instruction cycle. Frequently, several instructions may be in process simultaneously, each at a different stage in its instruction cycle. This is called pipeline processing.

**13. 7. OUTPUT DEVICES**

Once the CPU has executed the program instruction, the program may request that the information be communicated to an output device, such as a video display monitor or a flat liquid crystal display. Other output devices are printers, overhead projectors, videocassette recorders (VCRs), and speakers.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Read the text and identify 6 main categories of computer components as well as their functions.**

**A.2. Using the background knowledge and the information provided in the text about computer architecture and organization, answer the following questions:**

1. What is the term used to define the physical computer?

2. What is the term used to define the programs that run in a computer?

3. Describe the operating system and give examples.

4. Which is the operating principle of computer memory?

5. What is the difference between the two types of computer memory?

6. What is the bus and what is its function?

7. Name at least three types of input devices.

8. What is the CPU?

9. How does the CPU operate?

10. Name at least three output devices.

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Fill in the following diagrams with the missing terms:**

**INPUT DEVICES**

**OUTPUT DEVICES**

**B.2. Finish the following sentences by providing the missing word:**

**...is/are called…**

1. The physical computer and its components……………….
2. The unit that carries out program instructions……………
3. Devices that allow the user to communicate with the computer……….
4. Devices hat enable the computer to present information to the user…….
5. Hardware lines or wires that connect these and other computer components……
6. The programs that run the computer…………………..
7. 1,024 bytes that can store about 1,000 characters ……….
8. The memory within these computer chips…………
9. The flat cable with numerous parallel wires allowing the simultaneous transmission of 16 bits (2 bytes) of information from one component to another………..
10. The CPU memory location where information is stored………

**B.3. Add at least two more terms to each of the series given below:**

1. CPU, computer memory

2. Windows, Linux

3. Byte, megabyte,

**C. LANGUAGE FOCUS: ENUMERATION**

**The purpose of the following exercises is to develop language awareness in terms of enumeration.**

**C.1. When classifying it is often necessary to enumerate the items belonging to a specific category. They are usually listed in an descending sequence reflecting relevant characteristics, such as their importance, size, capacity etc. All terms are separated by commas, except the last one usually proceeded by AND (also). Sometimes the comma is replaced by a semi-colon. It coordinates or joins two independent but related clauses or sentences.**

**C.2. Reread the text and identify at least 3 different enumeration patterns.**

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following terms into English:**

1. magistrală

2. microprocesor

3. periferice de intrare

4. periferice de ieşire

5. sistem de operare

6. imprimantă

7. monitor

8. grafică

9. a rula un program

10. interfaţă

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on computer architecture and organization.**

**E.2. Presentation**

**Describe your computer and think of three necessary improvements and explain the reasons.**

**Unit 14**

**TYPES OF COMPUTERS AND COMPUTER NETWORKS**

**AIM:**

To recognize the English technical terms related to types of computers, range of computer ability and computer networks;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining analogue and digital computers;
* recognise the specific terms related to computer ability;
* characterise the different types of computer networks;
* identify the types of devices used computer operations;
* describe computer network operation;
* assimilate at least 30 terms specific of digital/analogue computers, computing capacity and computer network operation;

**KEY TERMS:**

*digital, analogue, calculation, slide rule, neural networks, specialized computer design, to mimic, continuous electrical signals, finite number of states, number, letter, graphics, sound, program instructions, sizes power, circuitry, pre-programmed, tuning, “hard-wired”, reprogrammed, programmable computer, computational power, speed, memory, physical size, personal digital assistant (PDA), exchange information, connect, worldwide computer network, equipped, cellular phone, portable laptop, notebook computer, desktop PC, word processing, tracking finances, internal memory, trackball, pointing device, video display monitor / liquid crystal display (LCD), flat lightweight LCD, television-like video display monitor, workstation, extensive mathematical ability, scientific environment, industrial environment, business environment, complex fast computation, mainframe computer, supercomputer, sets of CPUs, parallel processors, sophistication, distributed computing, connection, associated hardware, hard-disk space, local area network (LAN), server, “local” memory, bulk of storage, maintenance, terminal, “dumb” terminal, central computer, wide area networks (WAN), span, computerized archives, common communication program , cross-indexed data, protocol, site, search engine.*

**TYPES OF COMPUTERS AND COMPUTER NETWORKS**

**14.1. TYPES OF COMPUTERS**

**14.1.1. Digital and Analogue**

Computers can be either digital or analogue. Virtually all modern computers are digital. Digital refers to the processes in computers that manipulate binary numbers (0s or 1s), which represent switches that are turned on or off by electrical current. A bit can have the value 0 or the value 1, but nothing in between 0 and 1. Analogue refers to circuits or numerical values that have a continuous range. Both 0 and 1 can be represented by analogue computers, but so can 0.5, 1.5, or a number like ¶ (approximately 3.14).

A desk lamp can serve as an example of the difference between analogue and digital. If the lamp has a simple on/off switch, then the lamp system is digital, because the lamp either produces light at a given moment or it does not. If a dimmer replaces the on/off switch, then the lamp is analogue, because the amount of light can vary continuously from on to off and all intensities in between.

Analogue computer systems were the first type to be produced. A popular analogue computer used in the 20th century was the slide rule. To perform calculations with a slide rule, the user slides a narrow, gauged wooden strip inside a ruler like holder. Because the sliding is continuous and there is no mechanism to stop at any exact values, the slide rule is analogue. New interest has been shown recently in analogue computers, particularly in areas such as neural networks. These are specialized computer designs that attempt to mimic neurons of the brain. They can be built to respond to continuous electrical signals. Most modern computers, however, are digital machines whose components have a finite number of states—for example, the 0 or 1, or on or off bits. These bits can be combined to denote information such as numbers, letters, graphics, sound, and program instructions.

**14. 1.2. Range of Computer Ability**

Computers exist in a wide range of sizes and power. The smallest are embedded within the circuitry of appliances, such as televisions and wristwatches. These computers are typically pre-programmed for a specific task, such as tuning to a particular television frequency, delivering doses of medicine, or keeping accurate time. They generally are “hard-wired”—that is, their programs are represented as circuits that cannot be reprogrammed.

Programmable computers vary enormously in their computational power, speed, memory, and physical size. Some small computers can be held in one hand and are called personal digital assistants (PDAs). They are used as notepads, scheduling systems, and address books; if equipped with a cellular phone, they can connect to worldwide computer networks to exchange information regardless of location. Hand-held game devices are also examples of small computers.

Portable laptop and notebook computers and desktop PCs are typically used in businesses and at home to communicate on computer networks, for word processing, to track finances, and for entertainment. They have large amounts of internal memory to store hundreds of programs and documents. They are equipped with a keyboard; a mouse, trackball, or other pointing device; and a video display monitor or liquid crystal display (LCD) to display information. Laptop and notebook computers usually have hardware and software similar to PCs, but they are more compact and have flat, lightweight LCDs instead of television-like video display monitors. Most sources consider the terms “laptop” and “notebook” synonymous.

Workstations are similar to personal computers but have greater memory and more extensive mathematical abilities, and they are connected to other workstations or personal computers to exchange data. They are typically found in scientific, industrial, and business environments—especially financial ones, such as stock exchanges—that require complex and fast computations.

Mainframe computers have more memory, speed, and capabilities than workstations and are usually shared by multiple users through a series of interconnected computers. They control businesses and industrial facilities and are used for scientific research. The most powerful mainframe computers, called supercomputers, process complex and time-consuming calculations, such as those used to create weather predictions. Large businesses, scientific institutions, and the military use them. Some supercomputers have many sets of CPUs. These computers break a task into small pieces, and each CPU processes a portion of the task to increase overall speed and efficiency. Such computers are called parallel processors. As computers have increased in sophistication, the boundaries between the various types have become less rigid. The performance of various tasks and types of computing have also moved from one type of computer to another. For example, networked PCs can work together on a given task in a version of parallel processing known as distributed computing.

**14.2. COMPUTER NETWORKS**

Computers can communicate with other computers through a series of connections and associated hardware called a network. The advantage of a network is that data can be exchanged rapidly, and software and hardware resources, such as hard-disk space or printers, can be shared. Networks also allow remote use of a computer by a user who cannot physically access the computer.

One type of network, a local area network (LAN), consists of several PCs or workstations connected to a special computer called a server, often within the same building or office complex. The server stores and manages programs and data. A server often contains all of a networked group’s data and enables LAN workstations or PCs to be set up without large storage capabilities. In this scenario, each PC may have “local” memory (for example, a hard drive) specific to itself, but the bulk of storage resides on the server. This reduces the cost of the workstation or PC because less expensive computers can be purchased, and it simplifies the maintenance of software because the software resides only on the server rather than on each individual workstation or PC.

Mainframe computers and supercomputers commonly are networked. They may be connected to PCs, workstations, or terminals that have no computational abilities of their own. These “dumb” terminals are used only to enter data into, or receive output from, the central computer.

Wide area networks (WANs) are networks that span large geographical areas. Computers can connect to these networks to use facilities in another city or country. For example, a person in Los Angeles can browse through the computerized archives of the Library of Congress in Washington, D.C. The largest WAN is the Internet, a global consortium of networks linked by common communication programs and *protocols* (a set of established standards that enable computers to communicate with each other).

The Internet is a mammoth resource of data, programs, and utilities. American computer scientist Vinton Cerf was largely responsible for creating the Internet in 1973 as part of the United States Department of Defense Advanced Research Projects Agency (DARPA). In 1984 the development of Internet technology was turned over to private, government, and scientific agencies. The World Wide Web, developed in the 1980s by British physicist Timothy Berners-Lee, is a system of information resources accessed primarily through the Internet. Users can obtain a variety of information in the form of text, graphics, sounds, or video. These data are extensively cross-indexed, enabling users to browse (transfer their attention from one information site to another) via buttons, highlighted text, or sophisticated searching software known as search engines.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Having read the text, decide whether the information given in the statements below is true (T) or false (F). Correct the false statements (the specifications in brackets refer o the section in the text where the answer can be found):**

1. A bit can have the value 0 or the value 1, and everything in between 0 and 1. (14.1.1.)

2. New interest has been shown recently in analogue computers, particularly in areas such as neural networks. (14.1.1.)

3. Most modern computers, however, are digital machines whose components have a finite number of states—for example, the 0 or 1, or on or off bits. (14.1.1.)

4. Laptop and notebook computers usually have hardware and software very different from PCs, but they are more compact and have flat, lightweight LCDs instead of television-like video display monitors. (14.1.2.)

5. Workstations are similar to personal computers but have greater memory and more extensive mathematical abilities, and they are connected to other workstations or personal computers to exchange data. (14.1.2.)

6. Mainframe computers have more memory, speed, and capabilities than workstations and are usually shared by multiple users through a series of interconnected computers. (14.1.2.)

7. Some supercomputers have many sets of CPUs. These computers break a task into small pieces, and each CPU processes a portion of the task to decrease overall speed and efficiency. Such computers are called parallel processors. (14.1.2.)

8. The disadvantage of a network is that data can be exchanged slowly, and software and hardware resources, such as hard-disk space or printers, can be shared. (14.2.)

9. A server often contains all of a networked group’s data and enables LAN workstations or PCs to be set up without large storage capabilities. In this scenario, each PC may have “local” memory (for example, a hard drive) specific to itself, but the bulk of storage resides on the server. (14.2.)

10. The largest LAN is the Internet, a global consortium of networks linked by common communication programs and *protocols* (a set of established standards that enable computers to communicate with each other). (14.2.)

**A.2. Fill in the following table with information about the different types of computers given in the text. Some of the spaces may remain blank, as the information is not given.**

**Table 14.1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Computers embedded in circuitry** | **PDAs** | **Desktop PCs** | **Laptops**  **/**  **notebooks** | **Workstations** | **Mainframe computers**  **/ supercomputers** |
| **Characteristics** |  |  |  |  |  |  |
| **Operation speed** |  |  |  |  |  |  |
| **Memory** |  |  |  |  |  |  |
| **Use** |  |  |  |  |  |  |
| **Application** |  |  |  |  |  |  |

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Fill in the gaps in the following text with the terms randomly listed below:**

**List 14.1.**

protocols, embedded computers, computer scientist, internal memory, consortium of networks, portable laptop and notebook, the Internet, largest WAN, “hard-wired”;

**Text 14.1.**

1. American \_\_\_\_\_\_\_\_\_Vinton Cerf was largely responsible for creating\_\_\_\_\_\_\_ in 1973 as part of the United States Department of Defence Advanced Research Projects Agency (DARPA).

2. The ­­­­­­\_\_\_\_\_\_\_\_\_is the Internet, a global\_\_\_\_\_\_\_\_\_ linked by common communication programs and \_\_\_\_\_\_\_\_\_-(a set of established standards that enable computers to communicate with each other).

3. \_\_\_\_\_\_\_\_\_-computers and desktop PCs are typically used in businesses and at home to communicate on computer networks, for word processing, to track finances, and for entertainment, having large amounts \_\_\_\_\_\_\_\_\_of to store hundreds of programs and documents.

4.\_\_\_\_\_\_ generally are\_\_\_\_\_\_\_\_\_\_\_\_—that is, their programs are represented as circuits that cannot be reprogrammed.

**B.2. Fill in the missing terms:**

1. \_\_\_\_\_\_\_\_\_\_\_computers are equipped with a keyboard; a mouse, trackball, or other pointing device; and a video display monitor or liquid crystal display (LCD) to display information.

1. Most sources consider the terms “laptop” and “notebook” \_\_\_\_\_\_\_\_\_.

3. Laptop and notebook computers usually have hardware and software similar to PCs, but they are more compact and have \_\_\_\_\_\_\_\_\_instead of television-like video display monitors.

**C. LANGUAGE FOCUS: CLASSIFICATION**

**The purpose of the following exercises is to develop language awareness in terms of classifying and teach classification patterns to help students produce classifications.**

**C.1. When dividing something into groups, classes, categories we are classifying those items. Classification is usually made according to a criterion or several criteria (standards or principles on which judgments are based).**

**Look at the classifying patterns provided below and use them to produce classifications of computers.**

**1. criterion/criteria; basis/bases; features; characteristics;**

**to (sub-)classify two (sub-) categories**

**categorise several classes**

**group a number types**

**fall into various kinds**

**distinguish sorts**

**differentiate families**

**2. X consists of…..according to…….. whether or not**

**comprises**

**3. X may be classified according to**

**on the basis of**

**depending (up)on**

**\* note the sequence: …. may be divided…**

**…. may be sub-divided…**

**…. may be further sub-divided…**

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following text into Romanian:**

Computers can be either digital or analogue. Virtually all modern computers are digital. Digital refers to the processes in computers that manipulate binary numbers (0s or 1s), which represent switches that are turned on or off by electrical current. A bit can have the value 0 or the value 1, but nothing in between 0 and 1. Analogue refers to circuits or numerical values that have a continuous range. Both 0 and 1 can be represented by analogue computers, but so can 0.5, 1.5. A desk lamp can serve as an example of the difference between analogue and digital. If the lamp has a simple on/off switch, then the lamp system is digital, because the lamp either produces light at a given moment or it does not. If a dimmer replaces the on/off switch, then the lamp is analogue, because the amount of light can vary continuously from on to off and all intensities in between.

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on presenting the distinctive features of computer networks.**

**E.1. Describe the two basic types of computer networks. Speak about its: (1) type; (2) main parts; (3) technical features;(4) applications;**

**Unit 15**

**DIGITAL LOGIC AND BOOLEAN ALGEBRA**

**AIM:**

To recognize the English technical terms related to digital logic;

**OBJECTIVES:**

On successfully completing this unit the student should be able to:

* identify correctly the terms defining digital logic gates, families;
* recognise the specific terms related to Boolean algebra;
* characterise the operation principle of digital logic circuits;
* identify the types of operators;
* describe the Boolean truth tables;
* assimilate at least 30 terms specific of digital logic and Boolean algebra;

**KEY TERMS:**

*digital circuit, binary number system, circuit variable, Boolean algebra, logic, actual numeric value, logical proposition, true or false, digital value, diagram, gate, electronic switch, specific Boolean operation, logical multiplication (AND gate), logical addition (OR gate), logical inversion (NOT gate), truth tables, potential input combinations, control, embedded systems, individual bits, operators, multiple inputs, one output, on, high and 1, off, low and 0, AND, OR, any input, NAND operation, only if, NOR, inversion, exclusive OR / XOR, inverter, opposite in state to, buffer, output drive capability, repowering, C language, variable.*

**DIGITAL LOGIC AND BOOLEAN ALGEBRA**

|  |
| --- |
| **15.1. Digital Circuits and Boolean Truth Tables** |
|  |
|  |
|  |
| Digital circuits operate in the binary number system, which means that all circuit variables must be either 1 or 0. The algebra used to solve problems and process information in digital systems is called Boolean algebra; it deals with logic, rather than calculating actual numeric values. Boolean algebra is based on the idea that logical propositions are either true or false, depending on the type of operation they describe and whether the variables are true or false. “True” corresponds to the digital value of 1, while “false” corresponds to 0. These diagrams show various electronic switches, called gates, each of which performs a specific Boolean operation. There are three basic Boolean operations, which may be used alone or in combination: logical multiplication (AND gate), logical addition (OR gate), and logical inversion (NOT gate). The accompanying tables, called truth tables, map all of the potential input combinations against yielded outputs. |
|  |

**15.2. CONTROL AND EMBEDDED SYSTEMS**

**Boolean Logic**

Control and embedded systems frequently deal with individual bits in order to control specific operations or to determine the condition of part of a system. For example, a bit might be turned on to light a lamp or activate a relay, or a bit might be off to indicate a switch is on (off meaning on is very common due to the nature of hardware.

**Boolean logic**, developed by George Boole (1815-1864), is often used to refine the determination of system status or to set or clear specific bits. Boolean logic is simply a way of comparing individual bits. It uses what are called **operators** to determine how the bits are compared. They simulate the **gates** that you will see in the hardware.

Think of operators as boxes with multiple inputs and one output. Feed in various combinations of bit values, and the output will be high or low depending on the type of operation. The examples show 2 inputs, although gates can have more. Also, gates are often combined to form more complex logic. A modern microprocessor contains huge numbers of them with many inputs and many varying combinations. Please note that the terms **on**, **high** and **1** will be considered the same logical state, and **off**, **low** and **0** will be considered the same logical state in the discussions that follow.

**15.3. OPERATORS**

The operators used most often are **AND** and **OR**. The **AND** operation says if and only if **all** inputs are on, the output will be on. The output will be off if any of the inputs are off. The **OR** operation says if **any** input is on, the output will be on. It's easy to see all of the combinations by using what are called **truth tables**, illustrated below. At the bottom of each table is shown the schematic symbol found in circuit diagrams.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | **AND** (all high = high, else low) | | | | Input 1 | Input 2 | Output | | 0 | 0 | 0 | | 0 | 1 | 0 | | 1 | 0 | 0 | | 1 | 1 | 1 | |  | | | | |  |  |  | | --- | --- | --- | | **OR** (any high = high, else low) | | | | Input 1 | Input 2 | Output | | 0 | 0 | 0 | | 0 | 1 | 1 | | 1 | 0 | 1 | | 1 | 1 | 1 | |  | | | |

There are two operations that have the same logic as above, but with an inverted output. The **NAND** operation says if and only if all inputs are on, the output will be **off**. The output will be on if any of the inputs are off. The **NOR** operation says if any input is on, the output will be **off**. Notice the bubble on the output of the schematic symbol used to indicate an inversion.

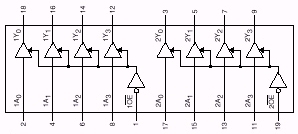
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | **NAND** (all high = low, else high) | | | | Input 1 | Input 2 | Output | | 0 | 0 | 1 | | 0 | 1 | 1 | | 1 | 0 | 1 | | 1 | 1 | 0 | |  | | | | |  |  |  | | --- | --- | --- | | **NOR** (any high = low, else high) | | | | Input 1 | Input 2 | Output | | 0 | 0 | 1 | | 0 | 1 | 0 | | 1 | 0 | 0 | | 1 | 1 | 0 | |  | | | |

There is a variation on the OR logic called **Exclusive OR** or **XOR**. Exclusive OR says the output will be **on** if the inputs are **different**.

Another one, the **inverter** or **NOT** operation, says that the output will be opposite in state to the input. It obviously has only one input and one output. Note that it will change an AND to a NAND, an OR to a NOR and an XOR to a NXOR if connected to their outputs. It simply changes 1s to 0s and 0s to 1s.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | **XOR** (different = high, same = low) | | | | Input 1 | Input 2 | Output | | 0 | 0 | 0 | | 0 | 1 | 1 | | 1 | 0 | 1 | | 1 | 1 | 0 | |  | | | | |  |  | | --- | --- | | **NOT** (inverter) | | | Input = 1 | Output = 0 | | Input = 0 | Output = 1 | |  | | |

One other basic digital device is on the board. It actually performs no logic. It looks like an inverter without the bubble, and is called a buffer. It's a triangle with a single input and output. It is not used for logic, but to increase the output drive capability of a line, or to lighten the load seen by circuits outside of ours. This is sometimes called repowering. Some buffers have a third line entering the side of the triangle. When it is not activated, the output of the buffer is removed from the circuit to keep it from interfering with other devices. The 74LS244 is an example:



In C, symbols are substituted for the full description or abbreviation of a Boolean operation. They are as follows for the operations covered:

|  |  |  |
| --- | --- | --- |
| Logical Operation | Abbreviation | Symbol |
| And | AND | & |
| Or | OR | | |
| Exclusive OR | XOR | ^ |
| Inversion | NOT | ~ |

It is common in the C language to perform logical operations on bytes or terms. Combinations of on and off conditions are often important determinants of condition, and the use of logical combinations as outputs can be used to cause complex actions. To determine the result when logical operations are applied to larger variable types, simply work with one bit at a time.

**You may want to go back to the key words listed at the beginning of the unit and check that you are familiar with each one. Give their Romanian equivalents (if necessary, you can use the glossary provided at the end of the textbook).**



**EXERCISES**

**A. READING**

**The purpose of the following exercises is to develop reading strategies and reinforce topic related vocabulary, not to check background knowledge.**

**A.1. Look through the text and answer the following questions:**

1. What is the system digital circuits operate in?

2. What is the name of the branch of algebra used to solve problems and process information in digital systems?

3. What is the basic idea of Boolean algebra with respect to the truth value of the logic propositions?

4. Which are the three basic logic operations?

5. What types of systems deal with individual bits in order to control specific operations or to determine the condition of part of a system.

**A.2. Having read the text, decide whether the information given in the statements below is true (T) or false (F). Correct the false statements (the specifications in brackets refer o the section in the text where the answer can be found):**

1. Boolean logic is often used to refine the determination of system status or to set or clear specific bytes. Boolean logic is simply a way of comparing bytes.

2. It uses what are called gatesto determine how the bits are compared. They simulate the operators that you will see in the hardware.

3. A modern microprocessor contains huge numbers of gates with many inputs and many varying combinations.

3. The NAND operation says if and only if all inputs are on, the output will be on.

4. The inverter or NOT operation, says that the output will be opposite in state to the input.

5. Some buffers have a third line entering the side of the triangle.

**B. VOCABULARY WORK**

**The purpose of the following exercises is to promote the acquisition of new lexical items by providing collocations, terms followed by prepositions lexical sets and translations of the terms considered relevant to the topic.**

**B.1. Fill in the following diagram with the missing terms:**

LOGIC GATES

BASIC BOOLEAN OPERATIONS

**B.2. Fill in the gaps in the following sentences with the terms randomly listed below:**

**List 15.1.**

digital, solve, output, digital value, actual numeric values, NAND, 0, operators, Boolean algebra, process, gates, “True”, on;

1. The algebra used to \_\_\_\_\_\_\_\_problems and \_\_\_\_\_\_information in \_\_\_\_\_\_\_\_systems is called; it deals with logic, rather than calculating\_\_\_\_\_\_\_\_.

2. \_\_\_\_\_\_\_corresponds to the \_\_\_\_\_\_\_\_\_of 1, while “false” corresponds to\_\_\_.

3. \_\_\_\_\_\_\_\_ are often combined to form more complex logic.

4. The \_\_\_\_\_\_\_\_\_used most often are AND and OR.

5. The \_\_\_\_\_\_\_operation says if and only if all inputs are on, the output will be off, so the output will be on if any of the inputs are off. The NOR operation says if any input is\_\_\_\_, the \_\_\_\_\_\_\_\_\_will be off.

**C. LANGUAGE FOCUS: EXPRESSING CONDITIONS**

**The purpose of the following exercises is to develop language awareness in terms of expressing conditions, logical necessity and teach conditional clauses.**

**C.1. When expressing conditions the conjunction (IF, IN CASE, /ONLY IF) differentiates between simple condition or logical necessity. On the other hand the verb phrase reflects the difference between real type conditions, hypothetical conditions and conditions of the unreal type.**

1. The AND operation says if and only if all inputs *are* on, the output *will be* on.

2. The output *will be* off if any of the inputs *are* off.

3. The OR operation says if any input *is* on, the output will be on.

**C.2. Match the conditional clauses below with the type of condition they express and look at the verb phrase to identify the patterns.**

**Types of conditional meaning:**

**Type 1. Real type conditions**

**Type 2. Hypothetical conditions**

**Type 3. Conditions of the unreal type**

1. The output *will be* off if any of the inputs *are* off.

2. The output *would have been* off if any of the inputs *had been* off.

3. The output *would be* off if any of the inputs *were* off.

**D. TRANSLATION**

**The purpose of this exercise is to develop translating skills.**

**D.1. Translate the following terms into English:**

1. algebra booleană

2. poartă logică

3. operaţii logice

4. circuite logice digitale

5. inversor

6. dacă

7.dacă şi numai dacă

8. cu condiţia să/ca

9. în cazul în care

10. (doar) atunci

**D.2. Translate the sentences in C.1. into Romanian.**

**E. SPEAKING**

**The purpose of these exercises is to develop speaking skills with a focus on interpreting Boolean truth tables.**

**E.1. Look at the truth tables in section 15.3. Choose one logical operation and present it to your desk mate interpreting the information in the table.**