

Unit 1

A. Warm up Activity

1. What does electronics deal with?
2. What does electricity deal with?
3. What is the relationship between electronics and electricity?

Electronics and Electricity

electronics:
science related
to the
behavior of
electrons in
devices

appreciation:
understanding

compact:
condensed;
concise

unique:
unusually
good and
special

The cliché, “*we live in an electronic age*”, implies the tremendous significance of the **electronics** field. Some feel that electronics is one of the most important fields in existence today.

The list of Table 1-1 includes several important areas or subfields of electronics that can lead to an **appreciation** for the effect *this field* has had on humanity. Just as the electronics field has a great impact on humanity, the electronic engineer has a great impact on the electronics field. The engineer is involved in the invention, design, and development of electronics devices and systems. In recent years, electronic engineers have led the way in the development of integrated circuits, **compact** disks (CDs), high-definition television (HDTV), the microprocessor, and personal computers.

The engineer plays an important part in the advancement of the challenging and exciting field of electronics that will yet produce many **unique** new developments.

electricity:
 science that states certain particles possess a force field which with electrons is negative and with protons is positive

vehicle:
 means of transportation

instruments:
 tools, devices

adjustment:
 adaption;
 regulation

By definition, electronics is the branch of technology or science that deals with the use of components to control the flow of *electricity* in a vacuum, gas, liquid, semiconductor, conductor, or superconductor. Both electrical and electronic components, circuits and systems control electron flow; however, their applications are distinctly different.

Table 1-1. Important areas of application of electronics.

Area	Examples
Communications and entertainment	Radios, telephones, televisions, CDs, communications satellites, military communications, VCRs, DVDs.
Computers and calculators	Digital circuits, microprocessors, personal computers, mainframe computers, supercomputers, hand calculators.
Automatic control systems	Space <i>vehicles</i> , guided missiles, airplane controls, numerically controlled lathes and milling machines, robotics, disk controllers, auto manufacturing, integrated circuit fabrication.
Instrumentation	Electronics instruments such as meters and oscilloscopes, medical instruments such as CAT scan, MRI, and X-ray equipment.
Automotive electronics	Electronic ignition systems, antiskid braking systems, automatic suspension <i>adjustment</i> , performance optimization, computation and display of performance parameters.

<p>enforcement: performance; execution</p>	<p>Power generation and distribution Control and optimization of generators, control of distribution paths, monitoring of system performance.</p> <p>Radar Air traffic control, security systems, military systems, law enforcement.</p> <p>Integrated circuits Design and fabrication of micro electronic circuits.</p>
<p>manage: control; run</p>	<hr/> <p>To properly manage power, electrical devices must perform such functions as generating, distributing and converting electrical power.</p>
<p>converting: changing into</p>	<p>To properly manage information, electronic devices must perform such functions as generating, sensing, storing, retrieving, amplifying, transmitting, receiving, and displaying information.</p>
<p>retrieving: finding sth & bringing it back</p>	<p>Some systems are designed specifically to manage the flow of power and therefore are only electrical, while other systems are designed to manage both power and information. For example, a television contains both electrical components and circuits that manage the flow of electrical power from the wall outlet and also electronic components and circuits that manage the flow of information or TV signals from the antenna or cable.</p>
<p>illustrates: shows, displays</p>	<p>The electrical circuits are needed because they supply</p>

power to the electronic circuits which in turn manage the flow of audio (sound) and video (picture) information signals.

Figure 1-1(a) **illustrates** the tree of electricity and electronics. Working from the bottom up, you can see the everything rests on the four basic electrical roots: voltage, current, resistance, and power. Electrical and electronic components were developed to generate and control these four

building blocks:
parts,
components

break up:
separate sth
into several
smaller parts

basic electrical phenomena. When a group of components are interconnected, they form a circuit. Just as components are the **building blocks** for circuits, circuits are in turn the building blocks for electronic equipment or systems.

Figure 1-1(b) **breaks up** your electronics courses into four basic steps, which correlate to the basic blocks shown in the tree. After completing step 1, 2 and 3, you will have obtained a good knowledge of electrical and electronic devices and circuits and be ready to apply this knowledge to communication, and biomedical system application. These six different branches or classifications of electrical and electronic equipment are shown at the top of the tree in Figure 1-1(a) and listed under step 4 in Figure 1-1(b).

Figure 1-1. The tree of electricity and electronics.

Comer & Comer (2003), pp. 1-2.

Cook (2001), pp. 2-3.

B. Comprehension Check

B1. Read each statement below. Decide whether it is true or false.

If false, correct it.

- 1. We can understand the impact of electronics field on humanity by studying the subfields of electronics.
- 2. CDs and HDTV show the important role of electronic engineers in the field of electronics.
- 3. Not only the roots but also the applications of both electricity and electronics are the same.
- 4. One task of electronics is to distribute electrical power.
- 5. The television is a good instance that can be used as an instrument to transmit both power and information at the same time.
- 6. According to the text, components are the building blocks for electronic equipments and systems.
- 7. Biomedical and data processing can be categorized under step 3; i.e., electrical and electronic systems.

B2. Choose a, b, c, or d which best completes each item.

- 1. Antenna is classified as one of the
 - a. electrical and electronic systems
 - b. electrical and electronic circuits
 - c. electrical and electronic components
 - d. basics of electricity
- 2. Components, circuits and systems are called
 - a. roots of electricity and electronics
 - b. branches of electricity and electronics
 - c. supporting frame of equipment
 - d. basics of electricity

3. In paragraph 2, “this field” refers to
 - a. electricity
 - b. electronics
 - c. system
 - d. humanity
4. Paragraph 6 mainly discusses the
 - a. functions of electrical devices
 - b. functions of electronic devices
 - c. converting of electrical power
 - d. converting of electronic information
5. All of the following statements are true except
 - a. electronics is used to control the flow of electricity in a conductor
 - b. monitoring of system performance is the subpart of power generation and distribution
 - c. electronic devices must perform such functions as sensing, storing, retrieving, etc.
 - d. electrical and electronic components were developed to generate and control over six basic electrical phenomena

B3. Answer the following questions orally.

1. How do you explain some areas of applications of electronics?
2. Mention examples that show the difference between electricity and electronics.
3. Why is the “airplane control” in the areas of application of electronics?
4. How can a system be both power and information simultaneously?
5. When is an electrical and electronic system ready to be applied?
6. Give your own version dealing with the tremendous significance of the electronics field.
7. Can you summarize in what fields the electronic engineer is involved?
8. Explain the parts and subparts of the “tree of electricity and electronics.”

C. Vocabulary

C1. Technical words and expressions: Match the words in column (I) with their appropriate equivalents in column (II). There is one more option in column (II) than required.

(I)	(II)
1. antiskid ()	a. an object or a weapon that is fired, thrown or dropped
2. missile ()	b. a machine that produces electrical oscillation
3. microprocessor ()	c. a test instrument that uses a cathode ray tube to make visible on a fluorescent tube
4. vacuum ()	d. a space that is completely empty of all gas
5. conductor ()	e. against the act of sliding or slipping over a surface
6. oscilloscope ()	f. a device that provides a path for current flow
	g. the central chip in a computer

C2. Fill in the blanks with the appropriate words from the list below. There are more options than required.

appreciation	impact	circuit	compact
significance	involved	equipment	outlet
in existence	supply	correlation	microprocessor

1. The electricity has great to the efficiency of the machine.
2. The organization has been for 25 years.

3. The consequence of the of the basics of electricity is an absolute prerequisite for the discussion of more sophisticated systems.
4. More than 30 software firms were in the project.
5. An electronic technician must be able to diagnose, and repair electrical and electronic and system malfunctions.
6. The 1970s experienced the development of the and the later use of this device for the low-cost personal computer.
7. The nation had an adequate of electricity.
8. You can provide the flow of electrical power from the wall
9. There's a direct between current, voltage and resistance in a circuit.
10. A lot of money was spent on the of the new nuclear power station.

C3. Word Forms: Fill in the blanks with the words from the following table to complete the sentences. Make necessary changes if required.

Verb	Noun	Adjective	Adverb
electrify	electricity	electric electrical	electrically
_____	electronics	electronic	electronically
amplify	amplification amplifier	amplifying amplified	_____
resist	resistor resistance	resistant resistible	resistibly

1. Electronics, radio, and television are practical applications of the general principles of

2. More and more equipment is used in cars for changing the battery, power-assist functions, measuring gauges, and monitoring and control of the engine performance.
3. The name transistor is derived from “trans resistor” meaning that it changes
4. When the beam strikes the receiving antenna, the electrical impulses travel to a powerful unit where they are given a ten-million fold increase in strength.
5. The railway line was in the 1950s.
6. The of sound can be done by an instrument called amplifier.
7. The early experiments in electronics involved currents in glass tubes.
8. This new electronic component is designed to heat.
9. The three quantities presented in electricity are voltage, current, and resistance.
10. History shows that started in the pioneer days of radio communications.

D. Language Study

Using a Dictionary

Good readers use a dictionary to get some information about words. ***Parts of speech*** is one type of information that a dictionary provides for us. Words have different parts of speech; for example:

- ***Scientists*** are investigators.
n.
- Great ***scientific*** discoveries seldom happen by accident.
adj.
- Electronics is the ***study*** of the behavior of electrons in devices.
n.
- Engineers who ***study*** electronics are called electronic engineers.
v.

D1. Check in a dictionary to determine the *parts of speech* of the words in bold type.

The field of *electronics* has greatly influenced world affairs *since* the *early* 1900s. This field is *entirely* responsible for the development of such *traditionally important areas* as communications, computers, instrumentation, aviation, and space-travel. Without *electronic devices* we could not have the telephone, radio, television, *high-performance* computer, or *precision* control circuit. Life as *we now know* was *drastically* different. *Today*, we *can describe some* of the milestones of the electronics field.

It is interesting to *note* that all of the significant developments *took place* after 1900 *when* a U.S. patent office employee *stated*, “Everything that can be invented has *already* been invented”.

D2. Underline the *adjectives* in the following paragraphs.

An electronic device is a component that utilizes some form of energy such as voltage or light to control the flow of electronic current. Some examples of electronic devices are bipolar transistors, field effect transistors, diodes, light emitting diodes, silicon inductors are also electronic devices, although these devices are generally called components.

An electronic circuit uses several electronic devices or components to control current flow in a meaningful way. The current may be used to drive a loudspeaker to produce audio sounds. It may be used to drive an antenna to produce electromagnetic waves that carry television signals through the atmosphere. It may be used to drive semiconductor memories that store digital information. It may be used to detect the energy carried by a laser light beam in a fiber optic light pipe.

Sentence Formation: That Clauses

In electronic texts, we are encountered with a lot of “*that clauses*”. “*That clauses*” function as nouns.

Examples:

- I know (that) electronics is one of the subdivisions of electrical engineering.
- The electrician says (that) there is something wrong with automotive meters.
- The man doubted (that) a computer was more expensive than a TV.

Note: The use of “*that*” in such statements is optional.

Some other verbs that can come before “*that clauses*” are as follows:
agree, answer, assume, believe, conclude, discover, doubt, guess, hope, imagine, notice, realize, remember, say, suppose, etc.

D3. Complete and arrange the following words to make meaningful sentences.

1. Some feel that (one of the most important fields – is – in existence – electronics – today).
2. We know that (requires – for making a recording – a mixer – a recorder – the equipment – a microphone – and – a master tape).
3. Reza says that (electronic engineering – at Shahid Rajaei – studying – is – he – in Tehran (Lavizan) – University).
4. I guess that (a new electrically – have designed – powered car – the Japanese).
5. We should know that (involving a large number of – usually – a computer – computation – requires – variables).
6. We should conclude that (has – the electronics – a great – on – the engineer – impact – field – electronic).

7. We can assume that (are – automatic – systems – vehicles – in the field – concerned with – and – guided missiles – control – space – of electronics).
8. He believes that (are – to manage – power – designed – both – information – systems – and – some).
9. She realizes that (the building – electronic – are – systems – components – for – or – equipment – blocks).
10. The electronic engineer notices that (classify – the – of – can – into – different – classifications – or – branches – we – and – electronics – six – electricity – tree).

E. Writing

E1. Put the following sentences in the right order to form a paragraph. Write the corresponding letters in the boxes provided.

Electronics

- a. The name electronics comes from the electron, which is a very small invisible quantity of electricity present in all materials.
- b. Electronics, radio, and television are practical applications of the general principles of electricity.
- c. The main factor in the operation of such materials is control of individual electrons for the desired effect.
- d. In terms of its many uses, electronics can be defined to include all applications involving the control of electricity in a vacuum, such as cathode ray tubes and in the solid semiconductor materials used for transistors and integrated circuits.
- e. In a transistor, as an example, the input can control a larger output current to provide amplification.
- f. Integrated circuit chips are used for the small personal computers.

- g. The integrated circuit (IC) contains many transistors on a small semiconductor chip.

1	2	3	4	5	6	7

E2. Paraphrase and write the following sentences in your own words.

1. “We live in an electronic age” implies the tremendous significance of the electronics field.
2. Just as the electronics field has a great impact on humanity, the electronic engineer has a great impact on the electronics field.
3. To properly manage information, electronic devices must perform such functions as generating, sensing and displaying information.
4. Just as components are the building blocks for circuits, circuits are in turn the building blocks for electronic equipment or system.
5. The engineer is involved in the invention, design, and development of electronics devices and systems.

E3. Write appropriate questions for the following answers.

1.?
It implies the tremendous significance of the electronics field.
2.?
The electronics engineer is involved in the invention, design and development of electronics devices and systems.
3.?
It can control the flow of electricity in a vacuum gas, liquid, conductor, etc.

4.?

Space vehicles, guided missiles and numerically controlled lathes are controlled by automatic control systems.
5.?

Air traffic controls, security systems and military systems are controlled by radar.
6.?

Electrical and electronic components were developed to generate and control four basic electrical phenomena.
7.?

They are building blocks for electronic equipment or systems.

E4. Guessing from the context. Try to complete the following statements with one word from the text.

1. Electronics is the branch of technology or science that deals with the use of components to control the of electricity in a vacuum, tube gas, liquid, semiconductor,, or superconductor.
2. Both electrical and electronic components, circuits, and systems control flow; however, their applications are distinctly different.
3. To properly manage power, electrical devices must perform such functions as generating, and converting electrical power.
4. To properly manage information, electronic must perform such functions as generating, sensing, storing,, amplifying, transmitting, receiving, and displaying information.
5. Some systems are designed specifically to manage the flow of power and therefore are only, while other systems are designed to manage both power and information.
6. A television contains both electrical components and that

manage the flow of electrical power from the wall outlet and also components and circuits that manage the flow of information or TV from the antenna or cable.

7. The electrical circuits are needed because they supply to the electronic circuits which in turn manage the flow of audio (.....) and video (picture) information signals.

F. Translation Activity

F1. Translate the following passage into Persian.

Applications of Electronics

In addition to its use in radio and television, electronics is used in almost industries for control functions, automation, and computing. There are so many applications that the broad field of electronics must be considered in smaller areas. Three logical groupings of electronics applications are defined here.

1. *Communications Electronics.* This field includes AM radio, FM radio with stereo, and television with color. The equipment is divided between transmitters and receivers. Also, transmitters can be divided between audio-frequency equipment to produce the carrier wave radiated from the antenna and the audio and video equipment in the studio that supplies the modulating signal with the desired information. High-fidelity audio equipment can be considered with radio receivers. The receiver itself has audio amplifiers to drive the load speakers that reproduce the sound. Communications satellite is also a transmit receive system using electromagnetic radio waves. The satellite just happens to be orbiting around the earth at a height of above 35500 Km in order to have a tremendous field of view. Actually, the satellite is a relay station for transmitter and receiver earth stations.

2. *Electric Power.* These applications are in the generation and distribution of 60-Hz ac power, as the source of the energy for electrical equipment included are lighting, heating, motors, and generators.

3. *Digital Electronics.* We see the digits 0 to 9 on an electronic calculator or digital watch, but digital electronics has a much broader meaning. The circuits for digital applications appropriate with pulses of voltage or current. A pulse waveform is either completely **ON** or **OFF** because of the sudden changes in amplitude. In-between values have no functions. Note that the on and off states can also be labeled **HIGH** and **LOW**, or 1 and 0 in *binary notation*, which uses only two digits. Effectively, the digital pulses correspond to the action of switching circuits that are either on or off.

In addition to all the general applications in communications, digital equipment, and electric power services, several fields that could be of specific interest include *automotive electronics*, *industrial electronics* and *medical electronics*. Both digital and analog techniques are used.

F2. Vocabulary List

Find the Persian equivalents of the following terms and expressions and write them in the spaces provided.

1. amplifier
2. amplitude
3. appreciation
4. aviation
5. binary notation
6. biomedical systems
7. building blocks
8. capacitors
9. carrier wave
10. cliché

11. compact disks	.....
12. components	.....
13. correlate	.....
14. distributing	.....
15. electrical phenomena	.....
16. electronic equipment	.....
17. fiber optic light pipe	.....
18. field effect transistors	.....
19. flow of audio	.....
20. high-definition television	.....
21. inductors	.....
22. instrumentation	.....
23. integrated circuits	.....
24. light emitting diodes	.....
25. loudspeaker	.....
26. measuring gauges	.....
27. modulating signal	.....
28. monitoring	.....
29. power-assisted functions	.....
30. precision control	.....
31. receivers	.....
32. resistor	.....
33. retrieving	.....
34. satellite	.....
35. semiconductor	.....
36. sensing	.....
37. signification	.....
38. silicon controlled rectifiers	.....
39. subfields	.....
40. superconductor	.....

- 41. ten-million fold increase
- 42. thyristors
- 43. transmitters
- 44. transmitting
- 44. unique
- 44. wall outlet