






	Module Focus/Specific Learning Outcomes: make sure that you write the key unit objectives to be acquired at the end of the unit.
	Learning Activity: Complete a learning activity. This will help you to review or practise what you have learned and to prepare you for an assignment or an examination. You will not submit learning activities to your tutor/marker. Instead, you will compare your responses to those provided in the Learning Activity Answer Key found at the end of the applicable module.
	Video/Flashcard app: View a video.
	Stop/Caution: Use caution when conducting this learning activity or experiment.
	Assignment: Complete an assignment. You will submit your completed assignments to your tutor/marker for assessment in accordance with the chart found in the course Introduction.
	Learning Partner: Ask your learning partner to help you with this task.
	Note: Take note of and remember this important information or reminder.
	Examination: Write your final examination at this time.

UNIT 4	VOCABULARY	SKILLS WORK	FUNCTIONS	QUIZ
<p>4</p> <p>Mechatronics</p>	<p>Lead-in activity</p> <p>Work in pairs and answer the questions</p> <p>Watch the videos</p>	<p>Reading</p> <p>Mechatronics</p> <p>Reading</p> <p>The electronic ignition system in automobiles</p> <p>Reading</p> <p>Anti Blocking System. A mechatronics application</p>	<p>Learn the meaning of mechatronics</p> <p>The first mechatronic system in automobiles</p> <p>How a microcontroller is used for engine management?</p>	<p>Choose the correct answers</p> <p>Match words with the relevant pictures</p> <p>Match the phrases given</p>

In this Unit, you will learn:

- What is the meaning of mechatronics
- Which was the first mechatronic system in an vehicle
- How a micro-controller is used for engine's management



UNIT 4

Automotive Engineering

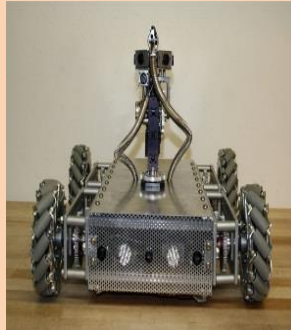
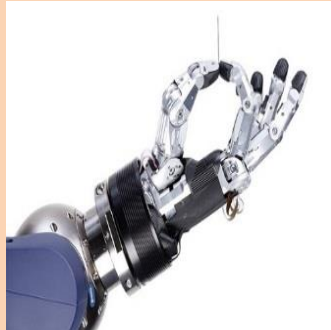
Mechatronics

- What does the word “mechatronics” means?
- The electronic ignition system
- ABS system, a mechatronic application

1



Lead-in Activity: What can you see in the next photos?

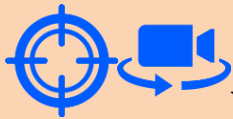




Work in pairs and answer the next questions

- a. Which was the most impressive photo?
- b. The robotic hand is an electronic or a mechanical system?
- c. Have you ever seen before an electronically-controlled suspension?

2



Watch the next video for more. Click on the icon.

What does the word mechatronics means?

The definition of mechatronics has evolved since the original definition by the Yasakawa Electric Company. In trademark application documents, Dr. Yasakawa defined mechatronics in this way:

“The word, mechatronics, is composed of “**mecha**” from mechanism and the “**tronics**” from electronics. In other words, technologies and developed products will be incorporating electronics more and more into mechanisms, intimately and organically, and making it impossible to tell where one ends and the other begins.

The evolution of modern mechatronics can be illustrated with the example of the automobile. Until the 1960s, the radio was the only significant electronics in an automobile. All other functions were entirely mechanical or electrical, such as the starter motor and the battery charging systems. There were no “intelligent safety systems”.

3



Application I

Choose the correct answers

<p>A. The word mechatronics is..</p> <ol style="list-style-type: none">1. A word for new electronics application2. A word for modern mechanism application3. Composed of “mecha” from mechanism and the “tronics” from electronics4. A nonexistent word	<p>B. Until 1960’s all functions in a car were..</p> <ol style="list-style-type: none">1. Entirely mechanical or electrical2. Only mechanical3. All electronic4. Mechanical and electronic
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Reading B

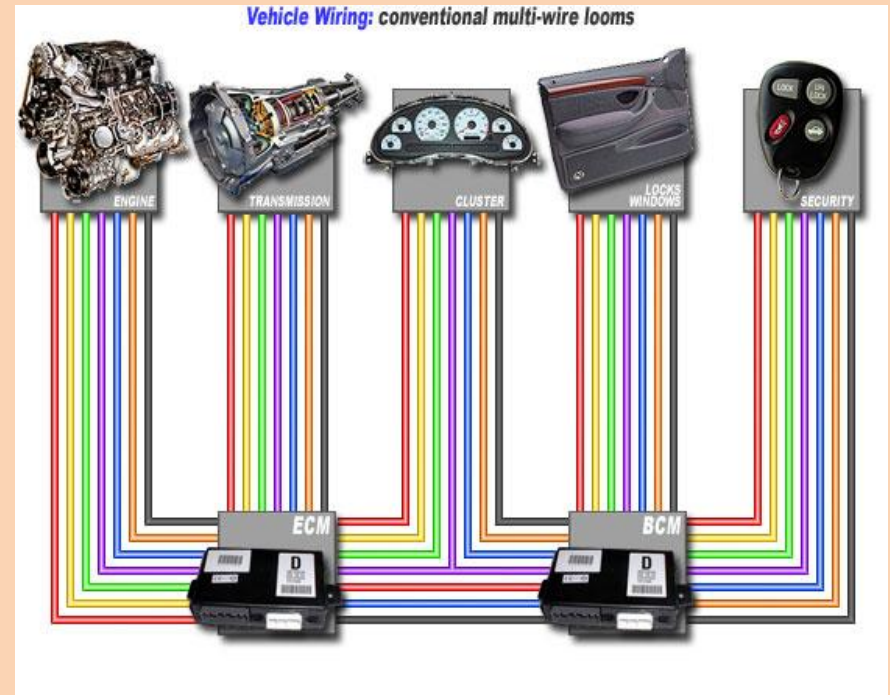
The electronic ignition system in automobiles

Before the introduction of sensors and microcontrollers, a mechanical [distributor](#) was used to select the specific [spark plug](#) to fire when the fuel–air mixture was compressed.

The timing of the [ignition](#) was the control variable. The mechanically controlled [combustion](#) process was not optimal in terms of fuel efficiency..

The electronic ignition system was one of the first mechatronic systems to be introduced in the automobile in the late 1970s.

The electronic ignition system consists of a [crankshaft position sensor](#), [airflow rate](#), [throttle position sensor](#), and a dedicated microcontroller determining the timing of the spark plug firings. Early implementations involved only a [Hall effect sensor](#) to sense the position of the rotor in the distributor accurately.



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Application II

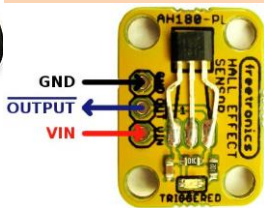
Match the words with the appropriate pictures.

1. Crankshaft position sensor	2. Airflow rate sensor	3. Throttle position sensor	4. Distributor	5. Sparkplug	6. Hall effect sensor	7. ECU – electronic control unit

A



B



C



D



E



F



G





Anti Blocking System. Just another mechatronic application

The ABS –Anti blocking Braking System- works by sensing lockup of any of the wheels and then modulating the hydraulic pressure as needed to minimize or eliminate sliding.

In some cases, the ABS is used to slow down the vehicle to achieve desired control. In automobiles today, typically, 8, 16, or 32-bit CPUs are used for implementation of the various control systems. The [microcontroller](#) has onboard memory ([EEPROM/EPROM](#)), digital and analog inputs, [A/D converters](#), [pulse width modulation \(PWM\)](#), timer functions, such as event counting and pulse width measurement, prioritized inputs, and in some cases digital signal processing. The 32-bit processor is used for engine management, transmission control, and airbags; the 16-bit processor is used for the ABS, [instrument cluster](#), and air conditioning systems; the 8-bit processor is used for seat, mirror control, and window lift systems. Today, there are about 30–60 microcontrollers in a car. This is expected to increase with the drive towards developing modular systems for plug-n-play mechatronics subsystems. Mechatronics has become a necessity for product differentiation in automobiles.

While developments in auto motives provide vivid examples of mechatronics development, there are numerous examples of intelligent systems in all walks of life, including smart home appliances such as dishwashers, vacuum cleaners, microwaves, and wireless network enabled devices. In the area of “human-friendly machines” we can expect advances in robot-assisted surgery, and implantable sensors and actuators.

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Test

Match the phrases in list A with those in list B.

LIST A

1. In some cases, ABS is used to..
2. A32-bit processor is used for..
3. Plug–n-play mechatronics systems means..
4. The microcontroller has onboard..

1.	2.	3.	4.
.....

LIST B

- A) ..engine management, transmission control and air-bags.
- B) ..that facilitates device installation and enables automatic configuration of the system.
- C) ..slow down the vehicle to achieve desired control.
- D) ..memory e.g EPROM, digital and analog inputs, A/D converters.

8



Homework. Write an essay about the image below.

Search the web search engines for information about it. Text must be not less than 150 words.

