وزارة التعليم العالي والبحث العلمي
جامعة المستقبل
كلية الهندسة والتقنيات الهندسية
قسم تقنيات الهندسة الكهربائية

Digital Electronics

1st stage

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الاهداف التربوية

الهدف الوسيط

اكساب الطلبة مفهوم الالكترونيات الرقمية وكل ما يتعلق بها من الدوائر الرقمية والأنظمة العددية.

الاهداف السلوكية

في نهاية المحاضرة يتمكن الطالب من ان :

1. يشرح الالكترونيات الرقمية.
2. يتعرف على الإشارة الرقمية.
3. يشرح الدوائر الالكترونية الرقمية.
4. يتعرف على الأنظمة العددية.
5. يعدد الأنظمة العددية.
6. يحول بين الأنظمة العددية.

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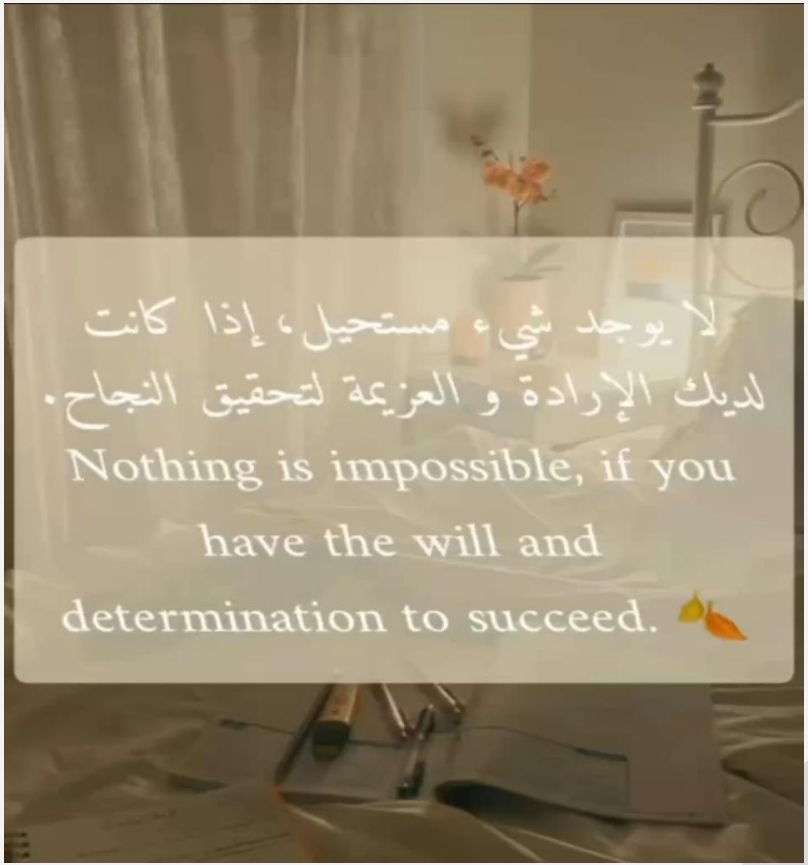
اهم المحتويات الموجودة في المحاضرة:

فديو قصير لبدء العام الدراسي الجديد

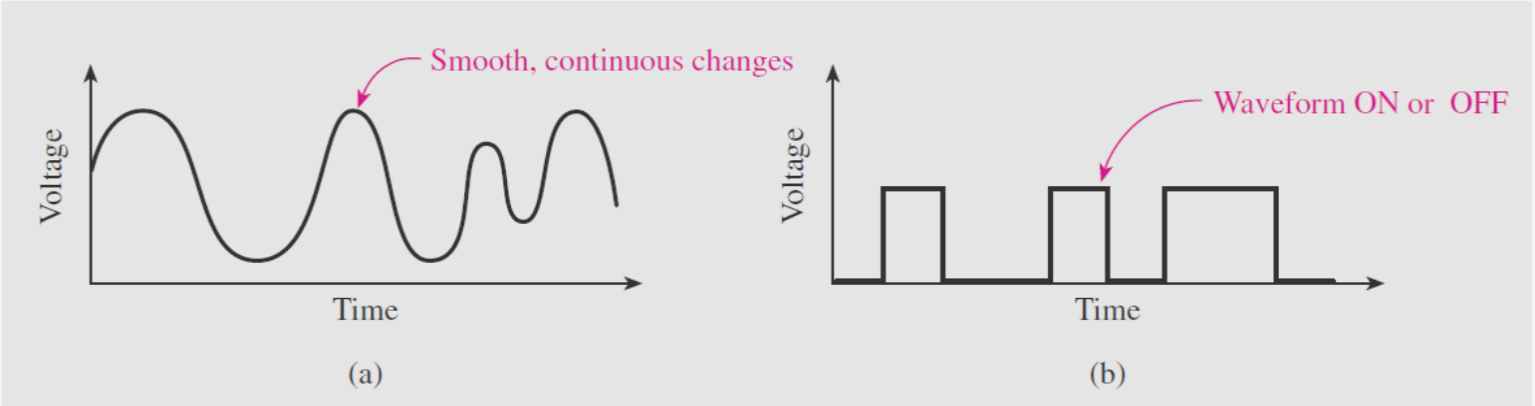


Digital Electronics

Digital Electronics is the sub-branch of electronics which deals with digital signals for processing and controlling various systems and sub-systems. In various applications like sensors, usage of digital electronics is increasing extensively.

Digital electronics is entirely the field in which digital signals is used. Digital signals are division of analog signals. A signal carries information, Digital signals form the basis of digital circuit and digital electronics.

Digital signal



Digital Electronics

Digital signals can be represented with two numbers or states, in most cases, the number of these states is two, and they are represented by two voltage bands: one near a reference value (typically termed as "ground" or zero volts), and the other a value near the supply voltage. These correspond to the "false" ("0") and "true" ("1") values.

Digital Electronic circuits

Digital electronic circuits are usually made from large of logic gates.

A digital circuit is typically constructed from small electronic circuits called logic gates that can be used to create combinational logic. Each logic gate is designed to perform a function of Boolean logic when acting on logic signals. A logic gate is generally created from one or more electrically controlled switches, usually transistors. The output of a logic gate can, in turn, control or feed into more logic gates.

Numbering systems

There are four types of number systems:
binary system, **decimal** system, **octal** system, and **hexadecimal** system.

Binary (0,1)
Decimal (0,1,2,3,4,5,6,7,8,9)
Octal (0,1,2,3,4,5,6,7)
Hexadecimal (0,1,2,3,4,…..,9,A,B,C,D,E,F)

Types of Numbering systems

1. *Decimal Numbering System (Base 10)*

In the decimal numbering system, each position contains 10 different possible digits. These digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

2. *Binary Numbering System (Base 2)*

Digital electronics use the binary numbering system because it uses only the digits 0 and 1.

Types of Numbering systems

3. *Octal Numbering System (Base 8)*

The octal numbering system is a method of grouping binary numbers in groups of three. The eight allowable digits are 0, 1, 2, 3, 4, 5, 6, and 7. The octal numbering system is used by manufacturers of computers that utilize 3-bit codes to indicate instructions or operations to be performed. By using the octal representation instead of binary, the user can simplify the task of entering or reading computer instructions and thus save time.

Types of Numbering systems

4. *Hexadecimal Numbering System (Base 16)*

The hexadecimal numbering system, like the octal system, is a method of grouping bits to simplify entering and reading the instructions or data present in digital computer systems. Hexadecimal (hex) uses 16 different digits and is a method of grouping binary numbers in groups of four.

Numbering systems conversation

Decimal	Binary	Octal	Hexadecimal
D → B	B → D	O → D	H → D
D → O	B → O	O → B	H → B
D → H	B → H	O → H	H → O

There are 12 conversation between the 4 numbering systems, we will explain each of this conversation with examples.

Decimal to Binary systems conversation

We will learn how to convert from decimal to binary and vice versa.

ex : convert $(75.625)_{10}$ to ($)_2$

2	75	Mod
2	37	1
2	18	1
2	9	0
2	4	1
2	2	0
	1	0
		1

(1001011)2

0.652 x 2 = 1.25 (1)
0.25 x 2 = 0.5 (0)
0.5 x 2 = 1 (1)

(1001011.101)2

Decimal to octal systems conversation

Convert $(77.3125)_{10}$ to $(\quad)_8$

8	77	Mod
8	9	5
8	1	1
		1

$(115)_8$

0.3125 x 8 = 2.5 (2)
0.5 x 8 = 4 (4)

$(115.24)_8$

Decimal to Octal systems conversation

In case of repeating the multiplication result, we take the first repetition and then finish the solution.

Convert $(20.9)_{10}$ to $(\quad)_8$

8	20	Mod
8	2	4
		2

$(24)_8$

0.9 x 8 = 7.2 (7)
0.2 x 8 = 1.6 (1)
0.6 x 8 = 4.8 (4)
0.8 x 8 = 6.4 (6)
0.4 x 8 = 3.2 (3)
0.2 x 8 = 1.6 (4)

$(24.714634)_8$

Decimal to hexadecimal systems conversation

Convert $(109.625)_{10}$ to $(\quad)_{16}$

16	109	Mod
16	6	13 (D)
		6

$(6\ D)_{16}$

$0.625 \times 16 = 10$ (A)

$(6D.A)_{16}$

Homework1

Scan the QR code and upload the solution in the link below:

Convert (82.25)10 to hexadecimal number?

https://forms.gle/dkvbKtVKRFE6XwgF8

THANKS