The material covered in this class will be as follows:
Binary logic
Switching circuits
Binary signals
Basic logic gates

Binary Logic:

Binary logic deals with variables e.g. x, y, z, A, B, C, ... etc., that take on two discrete values (e.g. 1 & 0, True & False, ... etc.) and logic operations.

There are three basic logic operations:

1. AND → $x.y=z$ → reads $x\ AND\ y\ is\ qual\ to\ z$ and it means that $z=1$ if and only if $x=1$ and $y=1$; otherwise $z=0$.

2. OR → $x+y=z$ → reads $x\ OR\ y\ is qual\ to\ z$ and it means that $z=1$ if $x=1$ or if $y=1$ or if both $x=1$ and $y=1$. If both $x\ and\ y=0$ then $z=0$.

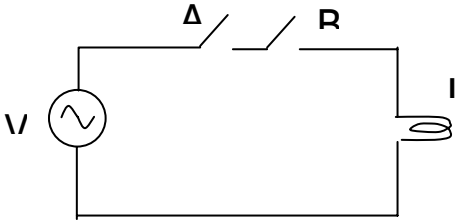
3. NOT → $x'=z\ (or\ \bar{x}=z)$ → reads $"not\ x\ is equal\ to\ z"$ meaning that z is what x is not.

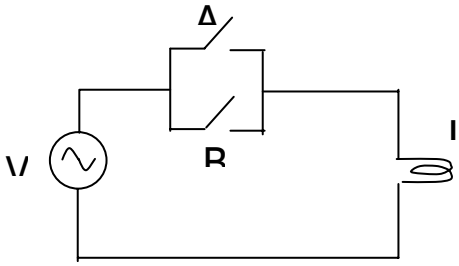
These logic operations can be illustrated in the form of truth tables:

AND			OR			NOT	
x	y	x.y	x	y	x+ y	x	x’
0	0	0	0	0	0	0	1
0	1	0	0	1	1	1	0
1	0	0	1	0	1		
1	1	1	1	1	1		

Switching Circuits & Binary Logic:

Binary logic can be demonstrated by switching circuits





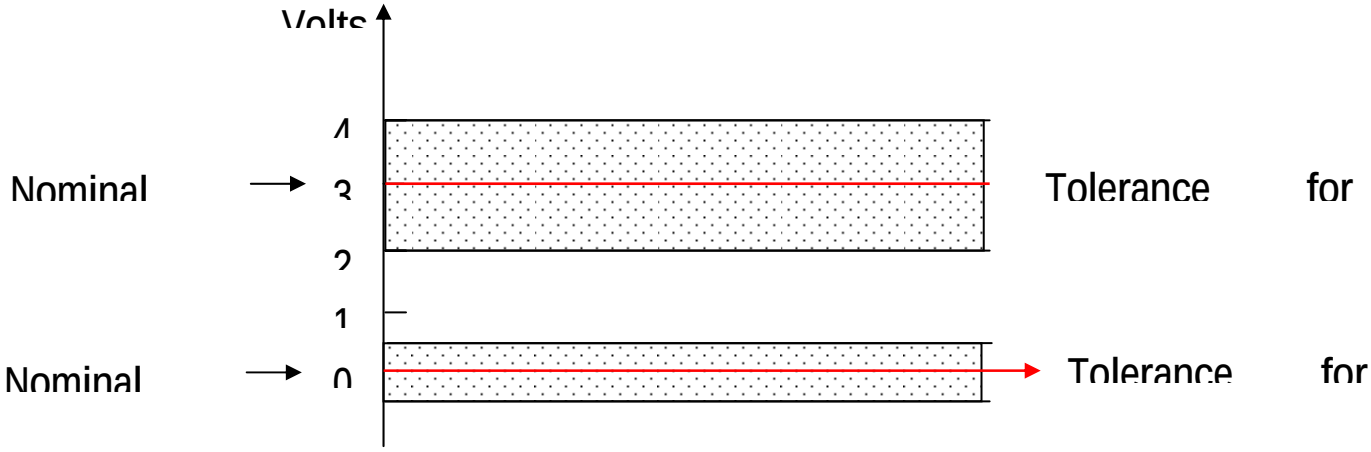
$$L = A.B$$

$$L = A + B$$

Binary Signals:

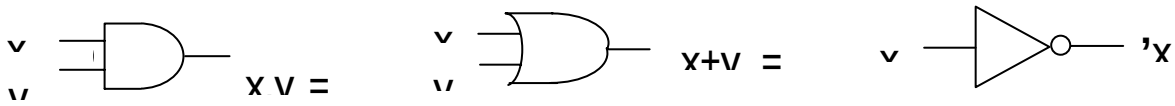
Electrical signals are used to change the state of electronic switches between the two states of conduction and non-conduction. An example is that the logical states of 1 and 0 can be

represented by electrical voltages of +3 V and 0 V respectively, as shown in the binary signal representation. Possible tolerance regions are indicates.



Basic Logic Gates and Signal Waveforms:

The conventional symbols for 2-input AND and OR gates and the single input inverter are shown:



2-input AND gate 2-input OR gate Inverter

The number of inputs for the “and” & “or” gates can be more than two.

Input output signals for logic gates may be represented in a signal waveform as shown.