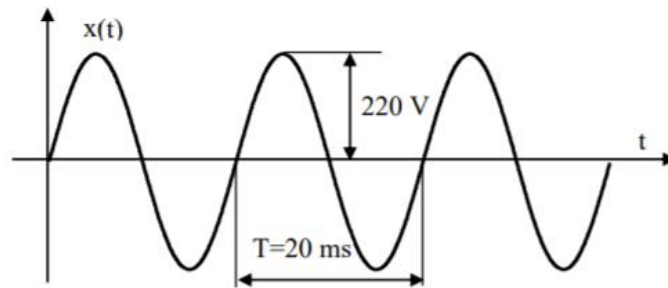


Signals

Signals A signal is a function representing a physical quantity, and typically it contains information about the behaviour or nature of the phenomenon. From a communication point of view a signal is any function that carries some information.



An example of a speech signal



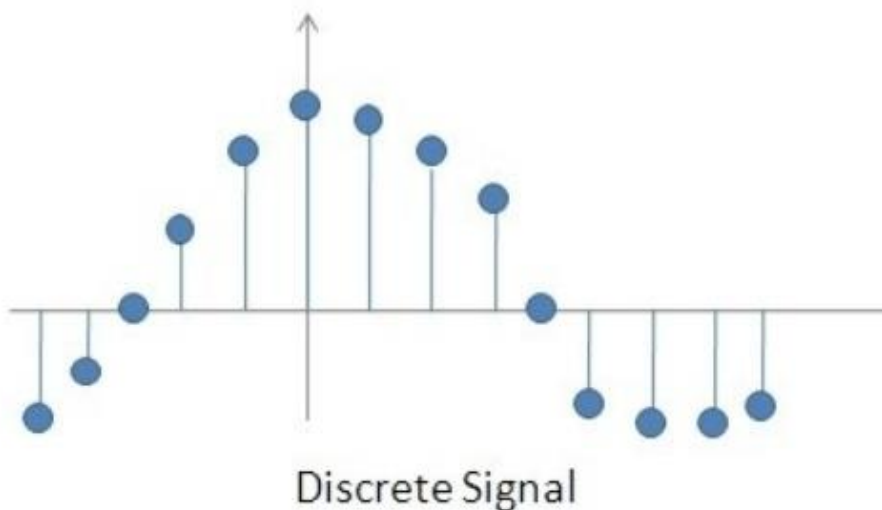
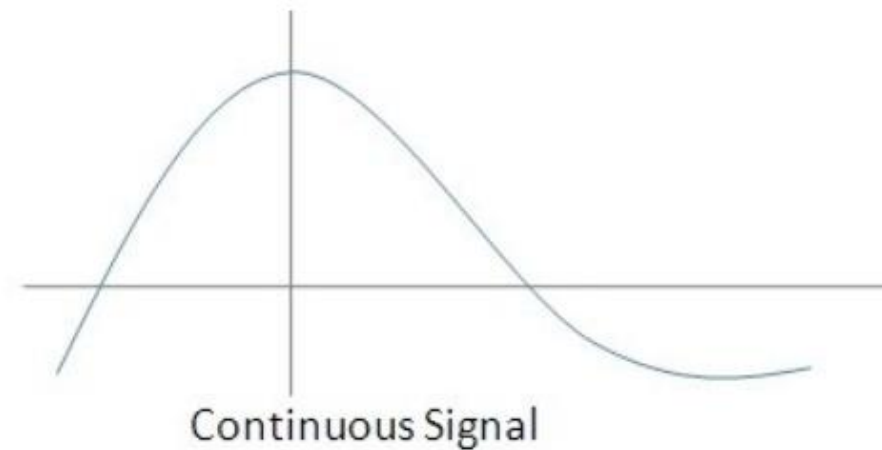
Classification of Signals and System: -

1. Continuous-time and discrete-time signals.
2. Even and Odd Signals.
3. Periodic and nonperiodic signals.
4. Deterministic and random signals.
5. Energy and Power types Signals.

1. Continuous-time and discrete-time signals

A signal is considered to be a continuous time signal if it is defined over a continuum of the independent variable (If a signal can take any value on the **x-axis (time axis)** then it is called as **continuous signal**).

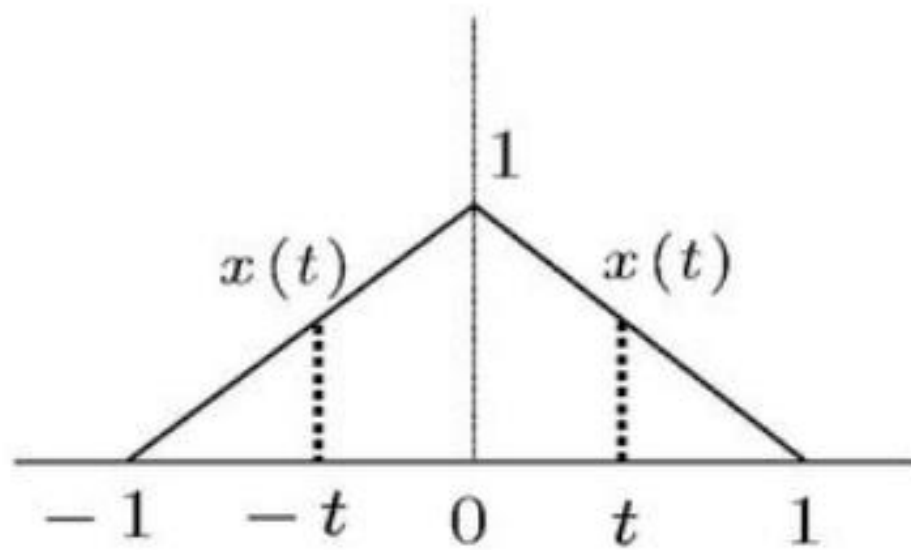
A signal is considered to be discrete time if the independent variable only has discrete values (if it can only take finite values on **x-axis (time axis)** then it will be a **discrete signal**).



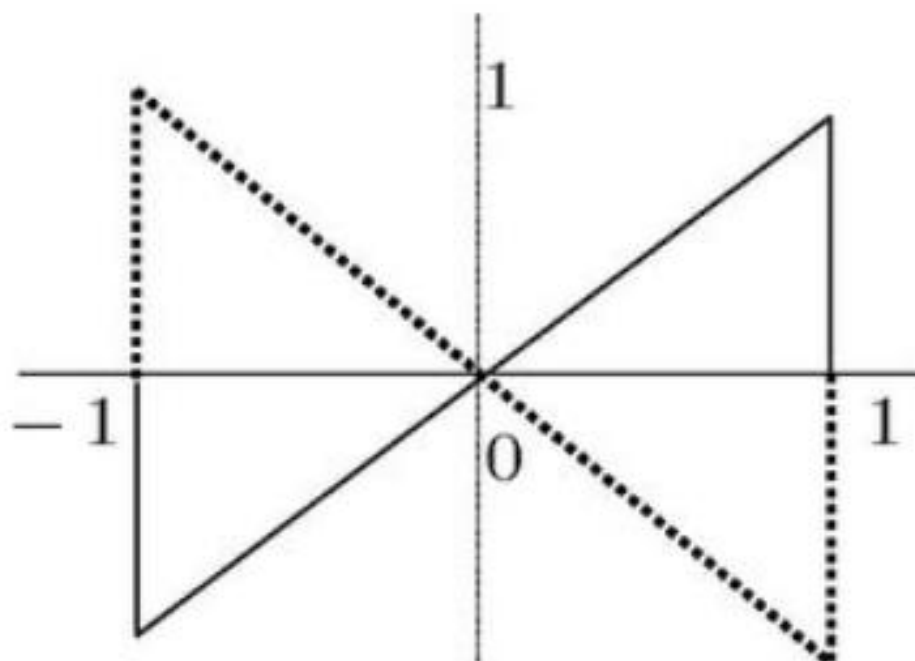
2. Even and Odd Signals.

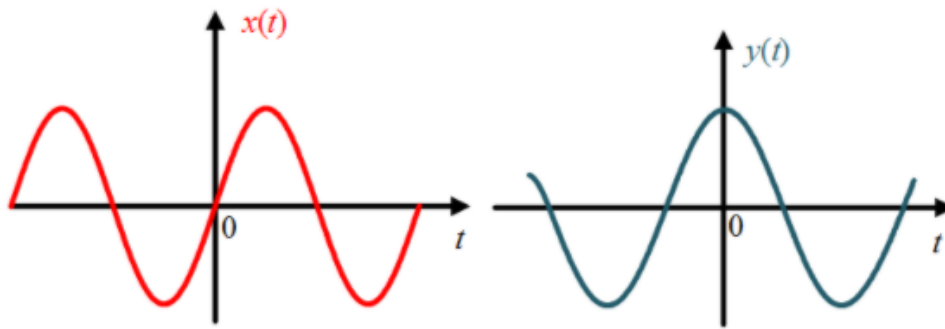
Even signals are symmetric around vertical axis, and Odd signals are symmetric about origin. Even Signal: A signal is referred to as an even if it is identical to its time-reversed counterparts; $x(t) = x(-t)$. Odd Signal: A signal is odd if $x(t) = -x(-t)$.

$x(t)$ is even



$x(t)$ is odd





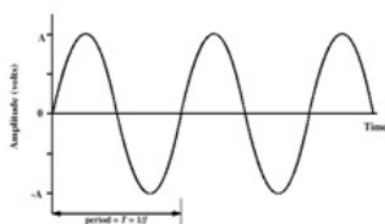
3. Periodic and nonperiodic signals:

A periodic signal is one that repeats the sequence of values exactly after a fixed length of time, known as the period. ... A non-periodic or aperiodic signal is one for which no value of T satisfies Equation

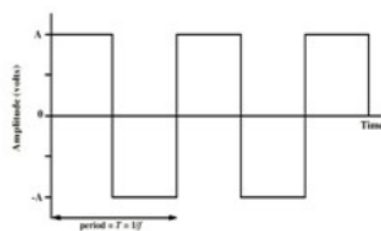
$$x(t) = x(t + T)$$

$$f = \frac{1}{T}$$

Periodic signals

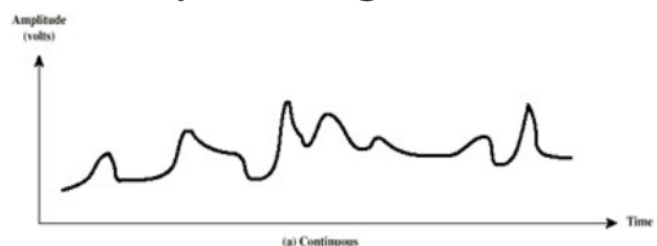


(a) Sin wave

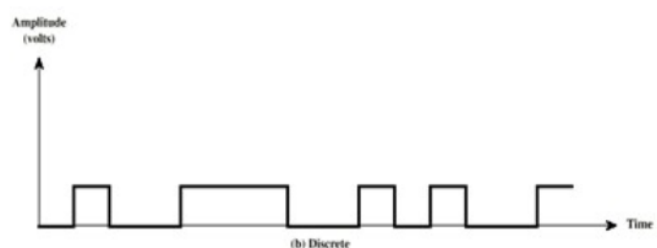


(b) Square wave

Nonperiodic signals



(a) Continuous

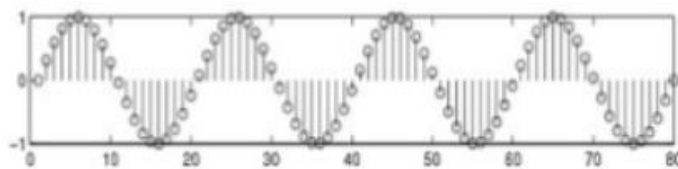


(b) Discrete

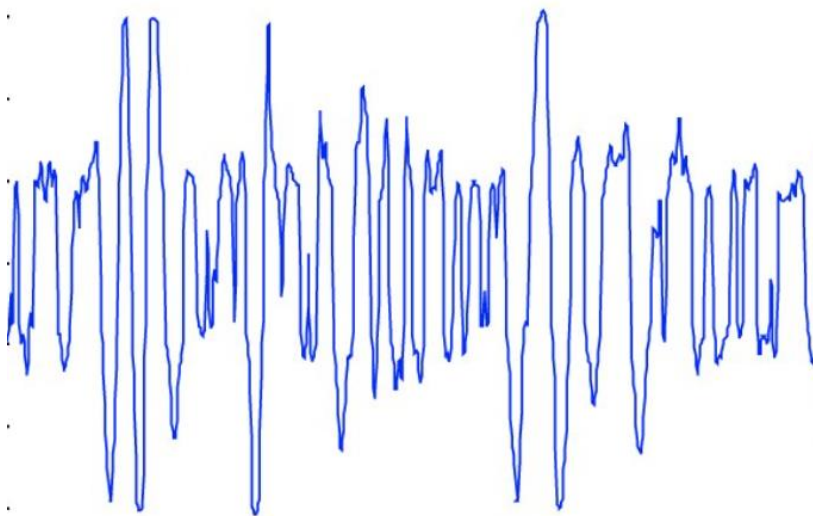
4. Deterministic and random signals:

A signal is said to be deterministic if there is no uncertainty with respect to its value at any instant of time. ... Non-deterministic signals are random in nature hence they are called random signals. Random signals cannot be described by a mathematical equation. They are modelled in probabilistic terms.

For example $x(t) = \sin(3t)$ is deterministic signal.



random signals Example: noise



5. Energy and Power types Signals.

Periodic and random signals are power signals.

Signals that are both deterministic and nonperiodic are energy signals.