

**Simulation:** is the process of design model of a real system to understanding the behavior of the system.

**Model:** is an abstract representation system or object that captures the essential characteristics of the system or object. Model used to understand the system.

**Mathematical Methods:** Uses symbolic notations and equations to represent a system. Their results are accurate. They have a few number of parameters. It is impossible for complex systems.

**Systems:** is a group of objects that are joined together in some regular interaction towards the accomplishment of some purpose.

**System:** is a collection of entities (people, parts, messages, machines, servers, ...) that act and interact together toward some end.

**Entity:** an object of interest in the system.

**Attribute:** the property of an entity.

**System state:** Collection of variables and their values necessary to describe the system at any time.

**Activity:** a time period with specified length, which entity can do/an action that takes place over a period of specified length and changes the state of the system

**Event:** an instantaneous occurrence that might change the state of the system.

**Endogenous:** activities and events occurring with the system.

**Exogenous:** activities and events occurring with the environment/ outside the system.

**Discrete system:** State variables of the system change only at discrete/separated set of points in time.

**Continuous system:** State variables of the change continuously over the time.

**Physical Model:** is a larger or smaller version of an object. The building of Physical Model is very expensive and has a size of space. It divides into static which not change with time and dynamic which change with time (have random variable or random number).

**Mathematical Model:** utilizes symbolic notations and equations to represent a system.

**Deterministic:** Contain no random variables. has a known set of inputs that will result in a unique set of outputs.

**Stochastic:** Has one or more random variables. Random inputs lead to random outputs. Random outputs only estimates of the true characteristics of the system

**Static:** Represents a system at a particular point in time.

**Dynamic:** Represents systems as they change over time

**Discrete:** Not always used to simulate a discrete system.

**Continuous:** Not always used to simulate a continuous system.

**Verified:** Is the computer program performing properly (correctly)?

**Validated:** is determination that a model is an accurate (agree) representation of the real system.

**Progress report:** provides the important written history of a simulation project.

**Discrete Event Simulation (DES):** is a model of a physical system that has changes at specific points in simulated time.

**Event list:** a list of event notices for future events, ordered by time of occurrence, also called the future event list (FEL) (contain even type and even time).

**Delay** (conditional wait): a duration of time unspecified indefinite length, which is not known until it ends.

**Clock:** a variable representing simulated time, which can be either continuous or discrete.

**Complete activity:** usually called primary event.

**A queue:** is the list that an entity enters if a resource is occupies.

**Queuing theory:** deals with problems that involve waiting (or queuing). it is the mathematical study of waiting lines or queues.

**The arrival rate:** is the number of arrivals per unit of time.

**The inter arrival time:** is the time between each arrival into the system and the next.

**Arrivals:** can be measured as the arrival rate or the inter-arrival time (time between arrivals). It may also come in batches of multiple customers, which is called batch or bulk arrivals.

**Balking:** The customer may decide not to enter the queue upon Arrival, perhaps because it is too long.

**Reneging:** The customer may decide to leave the queue after waiting a certain time in it.

**Jockeying:** If there are multiple queues in parallel the customers May switch between them.

**Drops:** Customers may be dropped from the queue for reasons outside of their control.

**Failure:** A server may fail while serving a customer, thereby interrupting service until a repair can be made.

**Changing service rate:** A server may speed up or slow down, depending on the number of customers in the queue.

**Batch processing:** A server may service several customers simultaneously.

**Stochastic Process:** is process has more random variable (random variable means that variables outcome unload).

**Markov model:** is a stochastic model used to model randomly changing systems.

**Markov property:** is assumed that future states depend only on the current state, not on the events that occurred before it.

**Markov Chain:** is a discrete-time stochastic process with the Markov property.

**Markov Process:** The future of a process doesn't depend on its past, only on its present.