



SYSTEM SIMULATION AND
MODELLING

LECTURE 2

Section B

**TOPIC COVERED :Real Time
Simulation, Stochastic Variables.**

Real-time simulation

- **Real-time simulation** refers to a computer model of a physical system that can execute at the same rate as actual "wall clock" time. In other words, the computer model runs at the same rate as the actual physical system. For example if a tank takes 10 minutes to fill in the real-world, the simulation would take 10 minutes as well.

- Real-time simulation occurs commonly in computer gaming, but also is important in the industrial market for operator training and off-line controller tuning. Computer languages like VisSim and Simulink allow quick creation of such real-time simulations and have connections to industrial displays and Programmable Logic Controllers via OLE for process control or digital and analog I/O cards. Several real-time simulators are available on the market like xPC Target and RT-LAB for mechatronic systems and using Simulink, eFPGAsim and eDRIVEsim for power electronic simulation and eMEGAsim, HYPERSIM and RTDS for power grid real-time (RTS) simulation.

Stochastic Variables,

- In probability and statistics, a **random variable**, **aleatory variable** or **stochastic variable** is a variable whose value is subject to variations due to chance (i.e. randomness, in a mathematical sense).^{[1]:391} A random variable can take on a set of possible different values (similarly to other mathematical variables), each with an associated probability (if discrete) or a probability density function (if continuous), in contrast to other mathematical variables.

- A random variable's possible values might represent the possible outcomes of a yet-to-be-performed experiment, or the possible outcomes of a past experiment whose already-existing value is uncertain (for example, as a result of incomplete information or imprecise measurements). They may also conceptually represent either the results of an "objectively" random process (such as rolling a die) or the "subjective" randomness that results from incomplete knowledge of a quantity. The meaning of the probabilities assigned to the potential values of a random variable is not part of probability theory itself but is instead related to philosophical arguments over the interpretation of probability. The mathematics works the same regardless of the particular interpretation in use.