

- EXAMPLE SYSTEM,
- WHAT ARE CHARACTERISTICS
- HOW TO STUDY

**Static**

**Dynamic**

**Continuous-time**

**Discrete-time**

**Continuous-time**

**Stochastic**

**Deterministic**

<ul style="list-style-type: none"> <li>•Noise in a fixed electronic circuit</li> <li>•Random, continuous-time processes, fixed system</li> <li>•Analytically if tractable mathematically (if noise can be represented in closed form solution) otherwise use discrete-time simulation with high sampling rate</li> </ul>	<ul style="list-style-type: none"> <li>•Adaptive control system with noisy inputs</li> <li>•Noise induced randomness, continuous-time operation, variable system description</li> <li>•Discrete-time simulation with high sampling rate to model continuous-time</li> </ul>
<ul style="list-style-type: none"> <li>•Memory-less games of chance, coin-flipping, calculation of <math>\pi</math> with dartboard.</li> <li>•Random, discrete events in time, unchanging system.</li> <li>•Monte Carlo simulation</li> </ul>	<ul style="list-style-type: none"> <li>•Queuing system,</li> <li>•Random arrivals, service times, happening at discrete times, time-varying system character</li> <li>•Discrete-event simulation</li> </ul>
<ul style="list-style-type: none"> <li>•Mechanical cuckoo clock with energy supplied by drive weights</li> <li>•Swing of pendulum ratchets mechanism at discrete times; state of device is non-random, system description is fixed (until weights hit bottom)</li> <li>•Study analytically</li> </ul>	<ul style="list-style-type: none"> <li>•Games of contract bridge played with fixed bidding strategies,</li> <li>•The hands are fixed by the order of the deck; events (bidding and playing cards) are discrete; play strategy is fixed for a given deck, but varies with deck</li> <li>•Multiple monte-carlo simulations</li> </ul>
<ul style="list-style-type: none"> <li>•Pendulum,</li> <li>•No randomness, continuous-time motion, fixed system description</li> <li>•Analytical, differential equations</li> </ul>	<ul style="list-style-type: none"> <li>•Steam engine</li> <li>•Future state of system (pressure, position) can be predicted based on current state and inputs (heat, input forces), system description can be changed with changing input (e.g., adding heat energy)</li> <li>• Study analytically</li> </ul>