

# CE/CSE 5710 - Modeling and Simulation

*Lecture 1: Law 1.2, 1.3 + Readings online*

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## Definitions

*System*: A collection of entities that act and interact together toward the accomplishment of some logical end. The *state* of a system is a collection of variables necessary to describe a system at a point of time. (read Sanchez 2007)

These variables can be *continuous* or *discrete*. In continuous systems the state variables change continuously with respect to time (most physical systems), while in a discrete system variables change instantaneously at separated points in time.

A *Model* is an abstraction of a system! This is an overloaded term and it would be probably more accurate to refer to it as a *family of abstractions*. There are many different ways of classifying these abstractions. Read Fishwick (1998) for a good hearty discussion.

Discussion on models: Prescriptive Models, Descriptive models, Conceptual models, Constraint models, Flow models, Spatial models, Physical models etc.

A *Simulation* is a tightly coupled and iterative three component process composed of: (Fishwick 1998)

- model design
- model execution
- execution analysis

The chain links: Conceptual model  $\Rightarrow$  Executable model  $\Rightarrow$  Formalism, Program (Fishwick 1998)

Discussion on the incompleteness of models - they are *all* incomplete, some are *useful*.

Discussion on why we build simulations. What are interactive vs. non-interactive simulations? What is a general purpose simulation? What is an expert system?

Where does all this fit into a design philosophy defined over the life-cycle of a product, the processes involved and the organizations used?