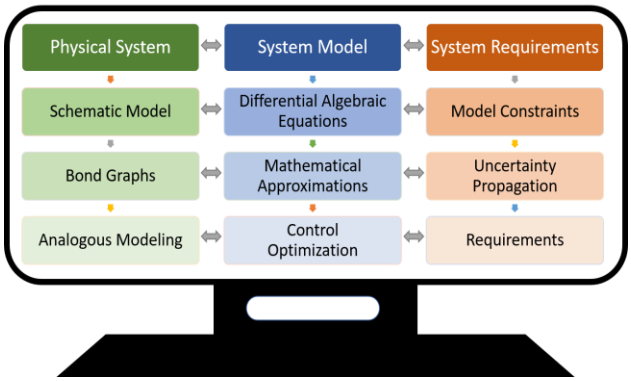
UCONN
SCHOOL OF ENGINEERING

United Technologies Corporation
Institute for Advanced Systems Engineering
UNIVERSITY OF CONNECTICUT

Graduate Courses in Systems Engineering

SE 5101 Acausal Physical Systems Modeling

What's Exciting About this Course? Developing skills in the areas of fundamental physical and mathematical representations of heat transfer, fluid transport, separations, and their incorporation in large-scale systems. Introducing concepts on how systems can be architected and designed with the aid of models and the basic principles of model-based systems engineering. Understanding the key aspects and advantages of acausal, equation-oriented modeling languages.



Course Description. This course introduces concepts on how systems can be architected and designed with the aid of models and the basic principles of model-based systems engineering. Topics include system and component requirements specification, creation of system models for design and control analysis of physical systems. Emphasis is placed on the modeling of such systems in the equation oriented programming environment of the Modelica language, and the utilization of these system models within the Functional Mockup Interface for co-simulation and Model Exchange. Examples of Aircraft Environmental Control, Chiller Plants, Engines, Power Generation, and Manufacturing Systems are used for the demonstration of the theoretical and modeling aspects of physical system modeling.

Course Outcomes

- Exhibit proficiency in simulating systems with heat and mass transfer, separation, and mixing, at different levels of complexity
- Become comfortable with concepts of acausal, equation oriented modeling
- Become knowledgeable of the role of modeling abstraction, reduction, and meta-modeling in the field of model-based systems engineering
- Understand how cyber-physical systems can be architected and designed with the aid of models
- Integrate acquired knowledge in the analysis of a physical system of their field.

Topics: Industry product development processes and Model-Based Systems Engineering principles, Cyber-Physical Systems, Component Modeling, Thermal fluid system models and applications, Large-scale system modeling, Model abstraction and exchange, Mathematical approximations in system modeling, Analogous Models, Systems Thinking, Model Exchange, Modelica, Functional Mockup Interface.

Course Objectives and Links to Overall Program Goals

Engineers obtain a strong foundational knowledge of systems modeling principles and practices, which can be leveraged and applied in system analysis, design, control and specification, with focus on the analysis and design of cyberphysical systems.