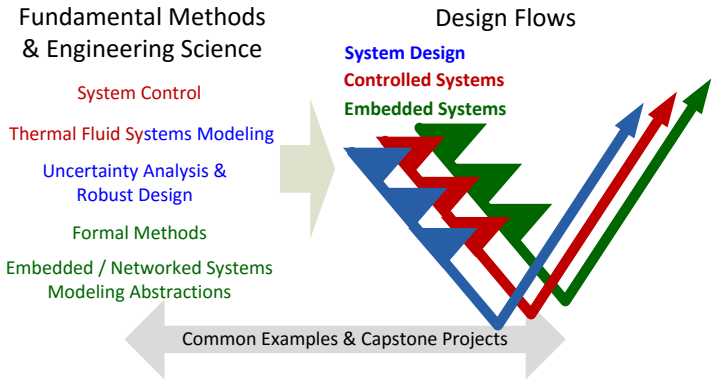
Graduate Certificate in Advanced Systems Engineering

Controlled Systems Track

Motivated by the digital revolution and the need to produce high quality products in a globally competitive economy, we aim to train engineers in urgently needed areas of advanced systems engineering. Advanced Systems Engineering brings together model based engineering and interdisciplinary themes into a requirements and architecture centric environment where new levels of systems understanding can be achieved.

The Institute curriculum decomposes the system development process into three overlapping design flows, 1) System Design, 2) Controlled Systems, and 3) Embedded Systems.



The curriculum includes three certificate tracks that are organized around each of these design flows. Each certificate program will begin with two courses in Fundamental Methods and Engineering Science followed by a Design Flow course.

The 4-course or 12-credit Controlled Systems certificate program will build system engineering competency related to controlled system design and verification of physical systems - areas that are pivotal to innovation and product enhancement. The goal is to advance the science base for the design of large scale systems and accelerate its technological translation into sustained industrial growth. The principles of model-based design and verification will be emphasized. Courses are sequenced to allow students to establish a solid understanding of the pillars for requirements analysis, architecture selection, model-based development methods and tools, and design flows. These are first applied to a course on physical systems modeling and followed by a course on control systems. The third course builds an understanding of the design flows for model-based design and verification of controlled systems. The final capstone project design course will provide an opportunity for the student to implement and reinforce the learning from the courses to a real-world problem.

Application Requirements

Advanced Engineering Certificate students are admitted to the graduate school. The following documents must be submitted to the graduate school:

- Application – Online
- Transcripts – Uploaded and sent directly to graduate school
- Resume – Uploaded and sent directly to graduate school
- Residence Affidavit – Uploaded and sent directly to graduate school
- One Letter of Recommendation (e.g. Supervisor)

Course Descriptions

The Controlled Systems Certificate program is comprised of the following four courses:

SE 5101: Foundations of Physical Systems Modeling

http://utc-iase.uconn.edu/education/course-descriptions/se-5101/

This course is designed to provide students with the foundations of physical systems modeling and computational methods for performance analysis. Students will develop skills in fundamental physical and mathematical representations as well as architecture and design of fluid dynamics, thermodynamics, electro-mechanics, and propulsion 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 models within the Functional Mockup Interface for co-simulation and Model Exchange. Relevant examples from industry are used to demonstrate the theoretical and modeling aspects of physical system modeling.

SE 5202: Foundations of Control

http://utc-iase.uconn.edu/education/course-descriptions/se-5202/

This course is designed to provide students with a thorough understanding of the fundamental principles of controlling cyber-physical systems. Topics include a review of physics-based modeling (including sensors and actuators), requirements specification, classical and modern digital control design methods, and the associated computational algorithms for real-time closed-loop control, their implementation, validation, testing, diagnostics and tuning.

SE 5203: Design Flows for Control and Verification

http://utc-iase.uconn.edu/education/course-descriptions/se-5203/

This course is designed to provide students with the platform-based design flows for control and verification of cyber-physical systems. The student will develop skills in specifying requirements for dynamics & control of thermal fluid systems, control architecture evaluation and selection, model-based control system design, and verification and validation of control systems at various model abstraction levels. Special emphasis will be placed on development processes spanning requirements, dynamics & control, robustness, safety and computational and implementation issues.

SE 5295: Capstone Projects for Controlled Systems

This project course is designed to provide students with a thorough understanding of physical systems modeling, control, and design through a comprehensive capstone project. These projects will be practical and relevant to industry needs.

Course Information

All courses are comprised of 14 sessions. Each session is 3 hours long and typically meets once a week. All courses are also available to remote students for online study (synchronous and asynchronous options).

Contacts

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