

CS 4501-008/6501-005: Cyber-Physical Systems, Fall 2017

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Description:

Cyber-physical systems (CPS) are smart systems that include co-engineered interacting networks of physical and computational components. Examples of CPS include medical devices, cars, and robots. Increasingly, such systems are everywhere. It becomes more and more important to assure the safety of CPS, since many CPS applications are safety-critical and life-critical. This course will give you the required skills to formally analyze the CPS that are all around us, so that when you contribute to the design of CPS, you are able to understand important safety-critical aspects and feel confident designing and analyzing system models. It will provide an excellent foundation for students who seek industry positions and for students interested in pursuing research.

Prerequisites:

This course assumes mathematical maturity. Students are expected to have background in Discrete Mathematics and Probability Theory.

Textbook:

Principles of Cyber-Physical Systems; R. Alur, 2015, MIT Press.

Grading:

This course is a combined undergraduate and graduate course. To meet with the graduate level requirements, students will be asked to do advanced projects that focus on design, modeling, and formal analysis of representative problems using modeling tools.

Undergraduate

- Four Homeworks (40%)
- Midterm (20%)
- Final Exam (40%)

Graduate

- Four Homeworks (30%)
- Midterm (20%)
- Final Exam (30%)
- Project (20%)

List of topics (tentative):

- Introduction to CPS
- Synchronous Model
- Safety Requirements
- Asynchronous Model
- Liveness Requirements
- Dynamical Systems
- Timed Systems
- Probabilistic Systems