Course description and objective:

Discrete event systems are systems for which the evolution from a state to another only depends on the occurrence of a sequence of discrete events over time. Such systems find their applications in various contexts and in various scales, from the modeling of a simple queuing system, through communication systems, to large scale distributed manufacturing processes.

The modeling and analysis of discrete event systems requires the understanding of a commonly used set of mathematical formalisms and methods. The mathematical formalisms will be introduced gradually in this course according to their power of expression and their need in the different methods used to model, specify, synthesize and analyze discrete event systems.

These formalisms and methods will also be illustrated using software tools.

On successful completion of the course, students will be able to:
- explain the behavior of common formalisms used in modeling of discrete event systems, such as finite state automata, for their non-timed and timed, basic and extended versions
- express equivalent behaviors using the above mentioned formalisms
- define functional and safety specifications in order to express what a system should perform or avoid
- define and analyze different properties of discrete event systems, such as reachability and controllability
- explain important methods used to specify and analyze the behavior of discrete event systems, especially Supervisory Control Theory
- analyze the performance of a system including uncertainties using Markov chains and queuing theory
- use software tools to perform the synthesis of a controller from models of the system and specifications of the desired behavior

Organization:

No prerequisite. Registration on TUMonline.
Lecture and exercise every Thursday afternoon (Lecture: 13:45 – 15:15, Exercise: 15:30 – 17:00)
Other lectures this semester: Fault-Tolerant Control and Supervisory Control Theory (Practical lab)
Selected topics on Safe Embedded Systems (Lecture)

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