

Instructor: Prof. Wenchao Li

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Office Location PHO 336
Office Hours Monday 3 – 4 pm

Course Description:

This course introduces students to the principles underlying the design and analysis of cyber-physical systems – computational systems that interact with the physical world. We will study a wide range of applications of such systems ranging from robotics, through medical devices, to smart manufacturing plants. A strong emphasis will be put on building high-assurance systems with real-time and concurrent behaviors. The students will gain both in-depth knowledge and hands-on experience on the specification, modeling, design, and analysis of representative cyber-physical systems.

Prerequisites:

ENG EC 327, CAS MA 193, and ENG EC 401 (recommended); or equivalent basic knowledge of programming, data structure and algorithms, discrete mathematics, and signals and systems.

References:

Textbook: Edward A. Lee and Sanjit A. Seshia, Introduction to Embedded Systems, A Cyber-Physical Systems Approach, Second Edition, MIT Press, ISBN 978-0-262-53381-2, 2017.
https://ptolemy.berkeley.edu/books/leeseshia/releases/LeeSeshia_DigitalV2_2.pdf

Additional reading will be posted on Blackboard.

List of Topics:

We may cover only a subset of the following.

- Modeling of dynamical behaviors: continuous dynamics, discrete systems, timed automata, hybrid systems, concurrent model of computation.
- Design of CPS: sensor and actuators, embedded processors, memory architectures, I/O, scheduling of real-time systems.
- Specification and analysis of CPS: temporal logic, simulation and refinement, reachability analysis, model checking, timing analysis, QoS properties.

Grading:

Homework Assignments: 35%
Midterm: 25% (Nov 6)
Project: 35%
Participation: 5%

Assignments:

Homework assignments will be posted on Blackboard and are due at the beginning of class. They must be turned in online on Blackboard. You will be given one 'late day' which you must use as a whole. This is intended to handle a contingency that you might have. If you want to use this 'late day', you must write it clearly at the beginning of your submission. Other than this 'late day', no late homework will be accepted, except for legitimate excuses backed by written and dated documentation.

We take cheating very seriously. You must clearly acknowledge all sources (e.g., textbooks, websites) at the top of your homework. You must write all answers in your own words, and you may not discuss/share your answer/code with any of your classmate. You must also be able to fully explain your answers upon demand.

Academic Honesty:

All students are responsible for reading Boston University's academic conduct policy. If you are unclear about any item related to academic honesty, you should immediately ask the professor. Dishonesty in representing one's academic work is a serious ethical violation, and will be reported according to university policy.

Course Website and Communication:

You are required to periodically check the course website on BU Blackboard (learn.bu.edu) and your e-mail. Blackboard will have the course schedule, slides, links to reading materials, assignments, announcements, and a discussion board. Please use the discussion board for your class-related questions.

When you email the instructor, please put "EC500-Fa19" in the subject line to ensure timely response.