ESE-534 Cyber Physical Systems
Fall 2017

Suggested Bulletin Course Description

As computers and communication bandwidth become ever-faster and ever-cheaper, computing and communication capabilities will be embedded in all types of objects and structures in the physical environment. Applications with enormous societal impact and economic benefit will be created by harnessing these capabilities in time and across space. We refer to systems that bridge the cyber-world of computing and communications with the physical world as cyber-physical systems (CPS). This course covers important areas from the research literature on CPS. Three application domains are emphasized: medical devices for health care, smart transportation systems, and smart buildings. Several key cross-cutting principles, independent of the application domain, are also covered, including formal modeling, embedded systems, real-time systems, feedback control, and sensor networks.

***Prerequisite**:* Background in embedded systems and computer networking is necessary.

3 credits.

Instructor and Office Hours

Instructor: Shan Lin

Email: shan.x.lin@stonybrook.edu

Office Location: Light Eng. 249

Office Phone: 631-632-8398

Office Hours: Tue. and Thu. 2:00-4:00 PM or by appointment

Location: TBD

Time: TBD

Hours may change. Please check Blackboard for most up-to-date information. Room numbers are in the Light Engineering building.

Learning Objectives

By the end of this course, students will

1. Understand the concept of cyber physical systems, and know the fundamentals research challenges in this area.

   This will be evaluated with paper reviews, discussions, and final project.

2. Learn the cross-cutting research issues from the state of art CPS research in sensing, wireless networking, embedded system design, feedback control, and real-time theory. Learn novel system designs via paper study in health, transportation, energy, and other smart CPS systems and applications.

   This will be evaluated with paper reviews and discussions.

3. Learn system-modeling techniques, timed automata, and system timing property analysis.

   This will be evaluated with homework assignments and exam questions.

4. Learn real-time scheduling method and able to conduct real-time analysis on system tasks with physical constraints.

   This will be evaluated with homework assignments and exam questions.

5. Learn feedback control design and how to apply feedback control in computing systems.

   This will be evaluated with homework assignments.

6. Learn system design and building skills in real CPS implementation.

   This will be evaluated with final project.

Course Requirements

Attendance and Make Up Policy

Late work will not be accepted. Attendance at all exams is mandatory. In the case of 1) verifiable illness, 2) verifiable family emergency, 3) University-sanctioned religious holiday, or 4) participation in official University-sponsored events (for documented student athletes only), excuse must be documented on official letterhead (as appropriate) and will be verified by the instructor.

Textbook and Reading

Introduction to Embedded Systems - A Cyber-Physical Systems Approach, Edition 1.5, by E. A. Lee and S. A. Seshia, 2014. The book is available in two forms: a free PDF download and low-cost paperback.

Other readings for this course will be in the form of research papers, which will be distributed to students online.

Grading

Your grade will be based on attendance, paper reviews (written and oral), paper presentations, a midterm exam, and projects.

Attendance and participation	10%
Paper reviews	10%
Midterm exam	20%
Paper presentations	20%
Final project	40%

Disability

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, 128 ECC Building (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following web site: http://www.ehs.sunysb.edu and search Fire Safety and Evacuation and Disabilities.

Honor Policy

- All exams, homework, and project assignments are subject to the honor code. This means that placing your name on an exam or an assignment implicitly pledges that you abided by the terms of the honor code.

- The homework assignments are to be done alone. Any malpractice (e.g., reporting fraudulent data, copying another student's solution, plagiarism) will be treated as an Honor Code violation.

- For the project, collaboration with other people or groups is allowed, but collaboration does not mean copying each others' solutions. Such collaboration should be limited to discussing concepts. You must understand the project that you turn in and be able to explain and defend it.

Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/