Department of Computer Science
National Tsing Hua University

CS 5244: Introduction to Cyber Physical Systems

Unit 0: Course Format and Logistics

Instructor: Cheng-Hsin Hsu

Acknowledgement: The instructor thanks Profs. Edward A. Lee & Sanjit A. Seshia at UC Berkeley for sharing their course materials

About This Course

- Almost all the course materials are based on two courses developed at
  - National Taiwan University,智慧整合感控系統(CPS)概論, 施吉昇教授
  - University of California Berkeley, Introduction to Embedded Systems, Profs. Edward A. Lee and Sanjit A. Seshia

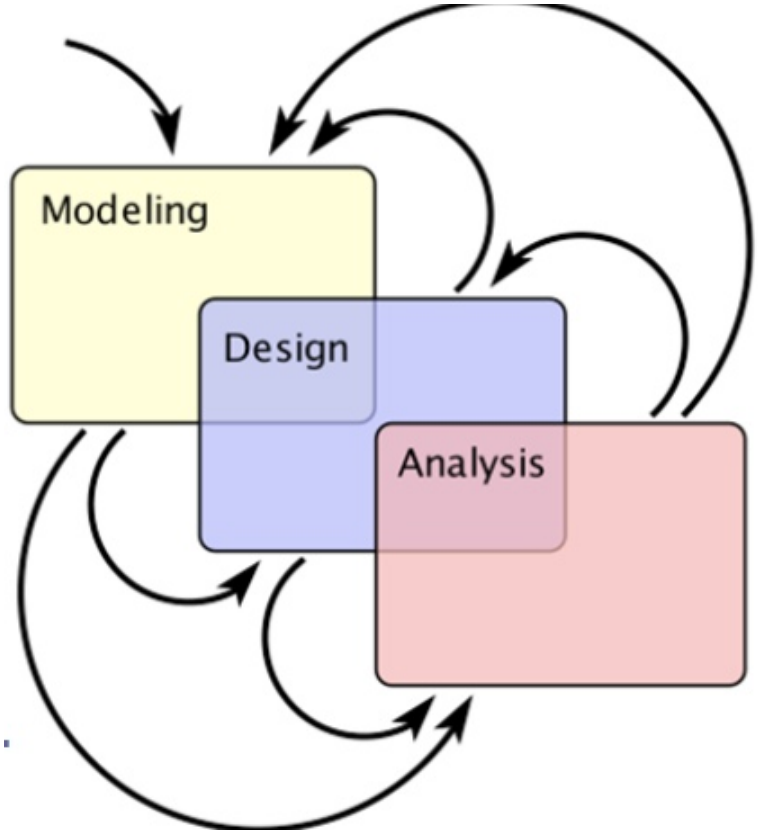
- This is the first time we offer this course
  - All the plans are tentative
  - Fell free to suggest *anything*

Yet Another Embedded Systems Course?

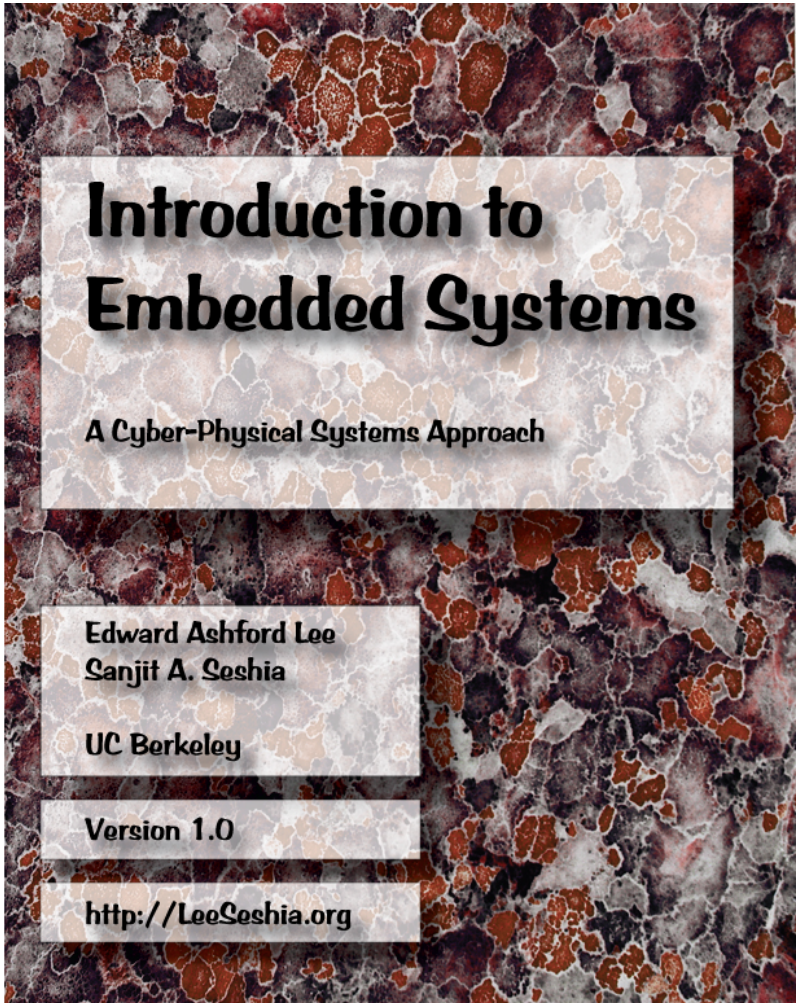
- BTW, what are embedded systems?
  - Computers whose job is not primarily information processing, but rather is interacting with physical processes
  - Examples: Automotive controllers, avionics, medical devices, industrial control, and energy management/conservation
- Cyber-Physical Systems (CPS): a broader view
- So, the course is about embedded systems, but
  - Not only hacking → hacking without a sound plan may lead to disaster
- The course is more about: A scientific approach to designing and implementing cyber-physical systems

Model, Design, and Analysis

- **Modeling** is the process of gaining a deeper understanding of a system through imitation. Models specify **what** a system does.
- **Design** is the structured creation of artifacts. It specifies **how** a system does what it does.
- **Analysis** is the process of gaining a deeper understanding of a system through dissection. It specifies **why** a system does what it does or fails to do what a model says it should do.



Textbook



- Available at http://LeeSeshia.org
- The emphasis is on modeling, design, and analysis of cyber-physical systems, which integrate computing, networking, and physical processes.

STARMAC Quadrotor Aircraft

STARMAC Quadrotor Aircraft (cont.)

How STARMAC is Related to This Course

- **Modeling**
  - Flight dynamics (ch2)
  - Modes of operation (ch3)
  - Transitions between modes (ch4)
  - Composition of behaviors (ch5)
  - Multi-vehicle interaction (ch6)
- **Design**
  - Processors (ch7)
  - Memory system (ch8)
  - Sensor interfacing (ch9)
  - Concurrent software (ch10)
  - Real-time scheduling (ch11)
- **Analysis**
  - Specifying safe behavior (ch12)
  - Achieving safe behavior (ch13)
  - Verifying safe behavior (ch14)
  - Guaranteeing timeliness (ch15)

Lectures

- **Time: Tuesdays 10:10 – 11:00 a.m., Thursdays 10:10 a.m. – 12:00 p.m.**
- **Location: EECS 132**
- **Format:**
  - **The lectures will be given in English**
  - **All written reports, assignments, and exams must be in English**
  - **In-class discussion, questions, and comments can be in Mandarin**
- **Course Website, please read carefully:**

http://nmsl.cs.nthu.edu.tw/index.php/courses

Grading

- **Assignments: 20%**
  - **Four written assignments: 5% each**
- **Programming Projects: 50%**
  - **Five projects: 10% each**
- **Midterm and Final Exams: 30%**
  - **Midterm: 15%**
  - **Final: 15%**

Questions?