CSC 8260: Embedded Networking for Cyber-Physical Systems and Internet of Things

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Objectives of the course

Gain insight into embedded networking for CPS and IoT

- Emerging embedded wireless networks for CPS/IoT
- Emerging time-triggered embedded networks and industrial Ethernet
- Traditional wired embedded networks
- Embedded network applications in next-generation transportation, industrial automation, building automation etc
Topics to cover

- CPS applications
  - Smart transportation, industrial automation, smart energy grid, smart health, etc

- Fundamentals of wireless communication
  - Wireless channel, signal propagation, modulation, link models

- Fundamentals of control theory and optimization (optional)

- Field area and control networks
  - HART, Modbus, PROFIBUS, PROFINET etc

- Industrial Ethernet

- Time-triggered communication
Topics (contd.)

- Safety and security of industrial networks
  - PROFI safe, SafetyNET etc

- Wireless industrial networks
  - WirelessHART, ISA100.11p, WIA-PA
  - Predictable wireless networking

- Embedded network applications in aerospace, automotive, rail, and building automation
Textbooks

- **Strongly recommended**

- **Recommended**
Logistics

- **To register**
  - Email Dr. Zhang at hongwei@wayne.edu to get permission for registering for the course; CC the email to the CS department graduate officer at csgradadvisor@cs.wayne.edu.

- **Class timings**
  - MW 3:00pm-4:20pm

- **Office hours**
  - MW 4:30pm-5:30pm in *Suite 14101.3, Maccabees Building*, or by appointment

- **Teaching Assistant**
  - TBA
Logistics (contd.)

- **Prerequisites**
  - Basic knowledge of computer networks (e.g., materials covered in CSC6290 or equivalent)
  - Or consent of instructor

- **Course website**
Logistics (contd.)

- Grading
  - Class participation: 10%
  - Presentation: 45%
  - Project: 45%

- Letter grades will be assigned based on performance *relative* to other students;
  A tentative grading scale:

  - A: 93-100
  - A-: 90-92
  - B+: 85-89
  - B: 80-84
  - B-: 75-79
  - C+: 70-74
  - C: 65-69
  - C-: 60-64
  - F: 0-60
Project

- Literature survey and solve a specific research issue(s) (e.g., predictable networking, real-time networking, energy efficiency, anti-jamming/security, software-defined networks/infrastructures, networking-control co-design, technology evolution & business models) in
  - Connected and automated vehicles: intra-vehicle networking, V2X communication, sensing and control, infotainment, etc.
  - Industrial automation: networking, control, machine health monitoring/prognostics, etc.
  - Smart energy grid: smart grid communication/networking, alternative energy microgrid, hybrid power grid, etc.
  - Unmanned aerial vehicles
  - Other CPS/IoT domains
Rules
- Students are allowed to form groups in doing projects, but the number of students per group should be no more than two

Deliverables
- Written project report (in the form of a research report)
- In-class presentation

Timeline
- Select the topic and form your project group by 01/31/2016
- Detailed project report outline & list of references are due on 02/29/2016
- Submit slides for your presentation at least one day before your presentation (date to be decided)
- Submit your project report electronically by midnight 04/28/2016
Policies

- Frequently check out the course website for updated information
- Actively participate in open discussions on research issues
- Read assigned articles/chapters, if any, before coming to class
- Project required
- Other WSU polices
How to succeed in this course?

- Attend/follow lectures, read books & papers
- Work on project
- Ask questions!!!

Questions?
Student questionnaire

- Name (optional):
- E-mail (optional):
- Major:
- Degree/Expected Year:
- Mathematics courses (e.g., elementary probability theory, statistics, and mathematical logic) taken:
- Computer Networking courses taken:
- What do you expect to learn from this course? How do you think this course should be taught?
- How might this course contribute to your career objectives?