Advanced Topics: Computing Principles of Mobile Embedded Systems

Classroom Location:	New Brunswick Campus
Instructor:	Dr. Yingying (Jennifer) Chen
Contact Info:	yingche@scarletmail.rutgers.edu, Core 507
Office Hours:	Wednesday 11AM-12PM or by appointment
Course Web Address:	SAKAI
Prerequisite(s):	some knowledge of C ++ or Java
Corequisite(s):	None
Cross-listed with:	None

COURSE DESCRIPTION

The scope of this course is to introduce students to understand applied computing principles in emerging mobile technologies and applications for embedded systems. This course will focus on emerging computing paradigms in the areas of context-aware pervasive systems, spatiotemporal access control with distributed software agents, vehicular computing, information systems cryptography, trust and privacy in mobile environments, location-aware services, RFID systems, wireless medical networks, and urban sensing. The students will be proficient with computing methods by studying the programming aspects in wireless sensor networks and learn how to program with sensor nodes, Raspberry Pi or smartphones.

LEARNING OBJECTIVES

Main Topics:

- Principles of real-time embedded systems
- Wireless sensor networks and urban sensing applications
- Wireless localization and location-based services (LBS)
- Methodology of distributed systems and access control computing paradigm
- Vehicular networks computing
- Computer and network security
- Privacy techniques
- RFID systems
- Mobile healthcare systems

After successful completion of this course, students will be able to:

- Understand applied computing principles in emerging mobile technologies and applications for embedded systems
- Read and discuss interesting recent work in several areas of emerging computing paradigms
- Be proficient with computing methods by studying the programming aspects in sensor networks and learn how to program with sensor nodes
- Understand emerging wireless and mobile technologies
  - How to determine what is important in the new technologies and research:
    - What is the trend
    - What are the challenges
    - What are the weaknesses

FORMAT AND STRUCTURE

Course based on a mixture of lectures, presentation of research papers, and discussions. Each student is expected to present one research paper, and write a term paper as the midterm exam. Additionally, a team (about 3 students) project involving sensor network programming would be carried out. Team members are expected to present their team project and show the demo. Furthermore, each student needs to actively participate in asking question and involve in the class discussion.

COURSE MATERIALS

Reference Textbook(s):

• Fundamentals of Mobile and Pervasive Computing by Frank Adelstein, Sandeep K.S. Gupta, Golden G. Richard III, and Loren Schwiebert, Publisher: McGraw-Hill Education, 2005, ISBN-10:0071412379, ISBN-13: 978-0071412377.

• Context-Aware Pervasive Systems: Architectures for a New Breed of Applications by Seng Loke, Publisher: AUERBACH, 1st edition (December 7, 2006), ISBN-10: 0849372550, ISBN-13:978-0849372551.

• Handbook of Research on Ubiquitous Computing Technology for Real Time Enterprises by Max Muhlhauser & Iryna Gurevych, 2008.

• Securing Emerging Wireless Systems, Yingying Chen, Wenyuan Xu, Wade Trappe, Yanyong Zhang, ISBN:978-0-387-88490-5,Springer, 2009.

Other Readings: Available online through SAKAI

Materials: Will be distributed in the class (e.g., Android phones/sensor nodes)

COURSE REQUIREMENTS

Presentations (treat it as your homework)

- ◦ No regular weekly or bi-weekly homework assignments
- ◦ Each student expects to present one paper during the whole semester – treat it as your homework for the whole semester
- ◦ Papers are from different topics
- ◦ Read and prepare slides before the class
- ◦ Lead the discussion and prepare questions

Midterm

- ◦ The same paper that is presented by the student

Online Discussion

- ◦ Discussion about the topics covered in the course materials

Final Project

- ◦ Participate in 1 project (team project) – 3~4 students form a team.
- ◦ Final exam: project presentation

Final Project Presentation

- ◦ Final exam: Team members present their final project and show the demo.

Class Participation

- ◦ Active participation and discussion in the class

GRADING PROCEDURES

Grades will be based on:

Class Participation	(15%)
Online discussion	(10%)
Individual Presentation	(25%)
Midterm	(25%)
Final Project & Team Presentation	(25%)