

Syllabus

Cleveland State University
Electrical and Computer Engineering
Distributed: Monday, Aug 27 2007

Class: Mon/Wed, 6:00 p.m. — 7:50 p.m., Room: SH 324.

Course Web Page: The following URL will contain class announcements, handouts, assignments, and other useful resources. In general, this will be the primary way in which I will communicate information to you (other than class lectures, of course)

<http://selab.csuohio.edu/~nsridhar/teaching/fall107/eec693/>

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Course Description: This is a research-oriented course that will cover topics relating to software engineering and design issues in the context of wireless sensor networks.

This course will introduce you to some of the most important software engineering issues and techniques associated with the development of reliable sensor networks. We will focus our studies on sensor networks consisting of Berkeley motes, running applications based on the TinyOS operating system, developed using the NesC programming language. This hardware/software platform is quickly becoming the de facto standard among researchers and practitioners.

This is a research course, and an opportunity for us to teach one another about an interesting new area emerging at the intersection of Computer Science and Electrical Engineering. The goal is to help us gain an appreciation of the current state of the art, and to assist us in identifying opportunities for improvement. I look forward to the exciting research topics that will emerge from our efforts.

Although I will be responsible for creating homework and laboratory assignments, the bulk of the teaching responsibilities will be shared with the class. We are responsible for teaching each other through regular lectures, development projects, and technical reports. By the end of the semester, each group will have undertaken a substantial development project, and will have produced a conference-quality research paper based on their work.

This is going to be an excellent semester. Welcome to your first course in sensor networks, fellow instructors!

Textbook: There is no required text for the class. Lecture notes and a (substantially large) set of research papers will be handed out in class.

References: The following books could be useful references:

- **Networking Wireless Sensors** by Bhaskar Krishnamachari.
- **Wireless Sensor Networks** by Feng Zhao and Leonidas Guibas.
- **Wireless Sensor Networks: A Systems Perspective** edited by Nirupama Bulusu and Sanjay Jha.

Grading: The following grade components will be assessed in this course:

Quizzes and Tests: 10%

Programming and Homework assignments: 40%

Mini-conference: 40%

Class Presentation: 10%

Note: A class participation penalty of up to 10% will be assessed if I cannot match your name to your face by the end of the semester.

The grading scale is a standard 90-80-70-60 scale. I reserve the right to adjust this scale in ways that are beneficial to students.

Important Dates: Please mark these dates in your calendars:

Pop Quizzes: Randomly scattered though the term

Mini-conference CFP: Monday, September 24

Mini-conference abstracts due: Monday, October 8, 6:00 p.m.

Research project demos: Wednesday, Nov 21, in class

Mini-conference paper submissions due: Wednesday, Nov 21, 10:00 a.m.

Mini-conference paper reviews due: Wednesday, Nov 28, 10:00 a.m.

Mini-conference camera-ready papers due: Monday, Dec 3, 6:00 p.m.

Mini-conference PC meeting: Wednesday, Dec 5, in class

Mini-conference presentations: Friday, Dec 7, 3:30 p.m. – 4:30 p.m.

Topics: We will cover the following topics during the semester:

1. **Introduction to TinyOS and nesC**
 - (a) TinyOS Event Driven Architecture & Component Based Object Model
 - (b) Concurrency Model of nesC (commands, events and tasks)
2. **Distributed Algorithms for Sensor Networks**
 - (a) Global state detection
 - (b) Diffusing computations
 - (c) Distributed Resource Allocation & Mutual Exclusion
 - (d) Time Synchronization
3. **Macro Programming for Sensor Networks**
 - (a) Abstract Regions
 - (b) TinyDB - Query Processing for Sensor Networks
 - (c) TASK - Tiny Application Sensor Kit
4. **Virtual Machines for Sensor Networks**
 - (a) Mate - A Tiny Virtual Machine for Sensor Networks
5. **MAC Layer Design**
 - (a) SMAC - An Energy-Efficient MAC Protocol for Wireless Sensor Networks
 - (b) BMAC - Versatile Low Power Media Access for Wireless Sensor Networks
6. **Security in Sensor Networks**
 - (a) TinySec - Link Layer Security Architecture for Wireless Sensor Networks

7. Mote Platform for Wireless Sensor Networks

- (a) Key Features of TelosB
- (b) Designing Proximity Sensor On TelosB

8. Programming Language design for Wireless Sensor Networks

Attendance: Since this is a lecture-based course, although there is no official attendance policy, students are strongly encouraged to attend every class. Since there is no textbook, the majority of the material will be covered only during the lecture periods. Based on previous experience, since each lecture builds upon the lectures that preceded it, missing even a single class can make it difficult for you to keep up with the course material. Please attend every class — it makes it easier to earn your participation points, and more important, makes it more enjoyable for me to grade your tests and assignments.

As a courtesy to me and to your fellow students, if you choose to attend class, please show up on time. As a further courtesy, *please turn off your cell phone before you come into class*. If you must miss a class, it is your responsibility to get any missed lecture notes, handouts, and project assignments from your fellow students.

If I will miss a class period, I will make every effort possible to notify you at least one class period in advance. If I am more than fifteen minutes late to class, you should assume that I am dealing with an emergency, and will not be able to make it to class. In such a rare case, class is automatically canceled, and you are free to leave.

Mini-conference: Students are *strongly* encouraged to work in groups of two or three for the purpose of writing papers for the mini-conference. (If you insist on working alone, you have to convince me that it is appropriate.) Papers for the mini-conference must report results of a project you work on through the semester. Literature review papers will not be accepted.

The mini-conference is worth 40% of your final grade, and will be broken into the following 5 parts:

1. **Project (10%).** On November 21, you will show a demonstration of your project to the class. The project will be evaluated based on the demo, and also based on your interaction with me throughout the semester.
2. **Paper (10%).** On November 23, you will submit a paper describing your work. The paper will be in response to the “call for papers” circulated in class. Papers **must** respect all the guidelines set forth in the mini-conference call for papers. Grades will be assigned to submitted papers according to the following criteria:
 - A: conference/workshop caliber (significant and original contribution, excellent presentation)
 - B+ to A-: department technical report caliber (original contribution, very good presentation)
 - C+ to B: research note (interesting contribution, very good presentation)
 - D+ to C: technical document (complete, good presentation)
 - D: project report (thorough, fair presentation)
3. **Peer-reviewed PC decision (6%).** Each submitted paper will be reviewed by 3 referees. Up to 3 papers will be accepted for presentation at our mini-conference. Grades will be assigned according to the following criteria:
 - 6: accepted paper; excellent presentation
 - 4 – 5: accepted paper
 - 2 – 3: weakly rejected paper
 - 0 – 1: rejected paper
4. **Quality of reviews (6%).** In addition to the paper, you will also be evaluated on the quality of the reviews you write for your classmates. I will assign a grade based on your reviews.
5. **Presentation at mini-conference (5%):** You will be evaluated on the quality of your presentation at the mini-conference. *Note: This component applies only to those papers that are accepted by the PC. For other students, this 5% will be spread across the other components of the mini-conference grade.*

6. **Teammate evaluation (3%).** You will give your collaborator(s) a score 0–3 based on their contribution to the project.

Pop Quizzes: At random times throughout the semester, I will give quick quizzes about current concepts and materials. The quizzes will be in a variety of formats. Most will be given during class, some at the start of class and some at the end of class. If you are not present for a pop quiz, you automatically receive a zero grade for the quiz. At the end of semester, the average of the quiz grades will be computed after dropping the lowest quiz grade. No make-up will be given for pop quizzes.

Late Assignments, Missed Quizzes, and Presentations: This is a research-oriented course, and is **programming-heavy**. There will be periodic lab assignments throughout the semester. Late submissions will not receive any credit. Similarly, failure to attend class on the day of a quiz, or scheduled presentation will result in an automatic zero grade for the work. If you arrive late on the day of a quiz or scheduled presentation, you will be allowed to participate, but will not be given additional time to compensate for being tardy. Make-up work will be granted only with a valid, written, medical, or university excuse. It is your responsibility to give me the written excuse and to arrange for the make-up work within one week of your absence.

Academic Integrity: This course is all about training to be a professional, so I will expect you to be professional during the course as well. No form of cheating will be condoned. If I find you cheating, I will be forced to refer you to University Academic Misconduct Committee. Further, in the event that the committee finds you guilty, you will receive an “F” grade for the course regardless of your scores.

It is not, however, wrong to refer to other sources when preparing your written submissions or in the course of doing your lab assignments. You **must**, however, cite the source properly when doing so. Failure to cite transforms such references into sources of plagiarism, and **will not be tolerated**.